- Fiber rolls could be installed along slopes above the high-water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow, and remove sediment from the runoff (CASQA 2003).

- Certified weed-free straw bale barriers could be installed to control sediment in runoff water. Straw bale barriers should only be installed where sediment-laden water can pond, thus allowing the sediment to settle out (CASQA 2003).

- Check dams (i.e., small barriers constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products) could be placed across a constructed swale or drainage ditch to reduce the velocity of flowing water, allowing sediment to settle and reducing erosion (CASQA 2003).

- Padding could be placed in a stream below the work site to trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream and placed on the bank to assist in revegetation (CASQA 2003).

- Clean, washed gravel could be used in construction activities to reduce solid suspension in adjacent surface waters (CASQA 2003).

- Non-stormwater management IOPs should be adopted, which are source control actions that prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with stormwater. These practices involve day-to-day operations of the construction site and are usually under the control of the contractor. These IOPs are also referred to as "good housekeeping practices," which involve keeping a clean, orderly construction site (NDOT 2004).

- Waste management should be adopted for handling, storing, and disposing of wastes generated by a construction project to prevent the release of waste materials into stormwater discharges. Waste management includes the following IOPs: spill prevention and control, construction debris and litter management, concrete waste management, sanitary/septic waste management, and liquid waste management (NDOT 2004).

- Successful reclamation could ensure that construction and dismantling impacts are not permanent. During the life of the development, all disturbed areas not needed for active support of production operations should undergo "interim" reclamation in order to minimize the environmental impacts of development on other resources and uses. At final abandonment, pipelines, compressors, powerlines, and access roads must undergo "final" reclamation so that the character and productivity of the land and water are restored (DOI and USDA 2006).

3.6 AIR QUALITY

3.6.1 What Air Quality Resources Are Associated with Section 368 Energy Corridors in the 11 Western States?

3.6.1.1 What Are the Existing Climate and Meteorology?

Climate varies substantially across the 11-state area, influenced by variations in elevation, topographic features, latitude, and proximity to the ocean. In Arizona, the average number of days with measurable precipitation per year varies from nearly 70 in the Flagstaff area to 15 at Yuma. A large portion of Arizona is classed as semiarid, and long periods often occur with little or no precipitation. Humidity is low, compared to most other states. Cold air from Canada can penetrate into Arizona, bringing temperatures well below zero in the high plateau and mountainous regions in the central and northern areas of the state (WRCC 2006b).

In California, the easternmost mountain chains protect much of the state from the extremely cold air of the Great Basin. The westernmost coastal ranges offer some protection to the interior from the strong flow from the Pacific Ocean. Thus, the precipitation is heavy on the western sides of the Coast Range and the Sierra Nevada and lighter on the eastern sides. Between the eastern and western mountain chains, hot summers and moderate-to-cold winters are the rule. There are wide variations in climate along the coast. Temperatures have been recorded as low as –45°F and as high as 134°F. Annual precipitation exceeding 161 inches has been recorded, while other locations have gone for more than a year with no rain (WRCC 2006c).

Colorado has an inland continental location, and most of the state has a cool highland or mountain continental climate. In the western portion of the state, local climates are heavily influenced by elevation, and there can be wide variations within short distances. In the eastern plains, the climate is fairly uniform with low humidity, sunshine, light rain, and a large daily temperature range. Daily highs of 95 to 100°F have been recoded throughout the region, and temperatures can exceed 115°F. Usual winter extremes range from 0°F to –15°F. The rugged topography of western Colorado precludes climatic generalizations. Temperatures on snow-covered mountain tops and valleys can reach –50°F and may exceed 90°F in the summer (WRCC 2006d).

The pattern of average annual temperatures in Idaho shows the effect of both latitude and altitude. The highest annual averages occur at lower elevations in river basins. At Swan Falls, the annual mean is 55°F, highest in the state, while at Obsidian, at an elevation of 6,780 feet, the lowest annual mean is 35.4°F. Precipitation patterns are complex and generally heavier in the north than in the south. Sizeable areas receive an average of 40 to 50 inches/year, while other large areas receive less than 10 inches annually (WRCC 2006e).

The Continental Divide cuts through the western half of Montana in a north-south direction and exerts a strong influence on the climates of adjacent areas. To the west of the Divide, the climate is similar to that on the north Pacific Coast; in the west, the climate is continental. To the west, winters are milder, precipitation more evenly distributed throughout the year, summers cooler, and winds lighter than to the east. The west also has more cloudiness and higher humidity. Cold waves cover northeast parts of the state 6 to 12 times per winter, with temperatures reaching to –50°F (with a –70°F record). Summers can be hot in the eastern part of the state with temperatures over 100°F at lower elevations (with a record of 117°F). However, nights are generally cool. Precipitation varies widely and is influenced by topography. Areas near mountains tend to be wettest, but there are exceptions. The west tends to be wettest, and the north-central area the driest (WRCC 2006f).

Nevada lies on the eastern, lee side of the Sierra Nevada Range, causing its air to be warm and dry. Daily temperature ranges are caused by strong surface heating during the day and rapid nighttime cooling, due to its dry air and a temperature range between about 30 and 35°F. Summers are short and hot in the northeast with long, cold winters. Summers are short and hot with moderately cold winters in the west. In the south, summers are long and hot, and winters short and mild. Extreme cold is rare because mountains east and north of the state prevent intrusions of cold Arctic air. Summer temperatures above 100°F occur frequently in the south, and temperature extremes have ranged from 120°F to –50°F. Precipitation is lightest in the west, opposite California’s Death Valley northward to Idaho. In valleys in this area, annual precipitation is less than 5 inches and reaches about 40 inches in the Sierra Nevada (WRCC 2006g).

New Mexico is divided into three major areas by mountains and highlands running generally north-south. Mean annual temperatures range from 64°F in the extreme southeast to 40°F or lower in the high mountains and valleys of the north; elevation has a greater impact on temperature than location. During the summer, daytime temperatures often exceed 100°F at elevations below 5,000 feet and range from 70 to 90°F at higher elevations. Minimum temperatures below freezing are common throughout the state during the winter; subzero temperatures are rare except in the mountains. The lowest recorded temperature was –50°F, and the highest was 116°F. Annual precipitation ranges from less than 10 inches over much of the southern desert and Rio Grande and San Juan valleys to more than 20 inches at higher elevations. Annual extremes range from 3 to 34 inches (WRCC 2006h).

The most important geographic feature affecting Oregon's climate is the Pacific Ocean on its western border. Temperatures are moderated by the presence of the ocean, which also provides abundant moisture for heavy rainfall in western Oregon and the higher elevations of the western portion of the state. Mountain ranges such as the Coast Range and Cascades also exert a strong influence on the climate. Despite moderating influences, temperature extremes have ranged form –54°F to 119°F. However, these extremes are seldom approached. In half of the years studied, no temperatures above 110°F were recorded. In January, the average temperature is 45°F, only 15°F below that of July. Average annual rainfall varies from less than 8 inches in drier plateau regions to as much as 200 inches at places along the western slopes of the Coast Range (WRCC 2006i).

Text Box 3.6-1
Wind Rose

A *wind rose* summarizes wind speed and direction graphically as a series of bars pointing in different directions. The direction of each bar shows the direction *from* which the wind blows. Each bar is divided into segments. Each segment represents wind speeds in a given range, for example, 10 to 12 miles/hour. The length of a segment represents the percentage of the summarized hours that winds blew from the indicated direction with a speed in the given range.

The topography of Utah is extremely varied, with most of the state being mountainous. Mountains run generally north-south through the middle of the state, and the Uinta Mountains run east-west through the northeast portion of the state. Mountains in the western United States result in dry air reaching Utah, resulting in light precipitation over most of the state. Temperatures vary with altitude and latitude. Temperatures below zero are uncommon in most of the state, and long extremely cold spells are rare. The lowest recorded temperature is –50°F. Daily temperature ranges widely, resulting from strong daytime insolation and rapid nocturnal cooling. Precipitation varies greatly from less than 5 inches annually west of the Great Salt Lake to more than 40 inches in some parts of the Wasatch Mountains. Areas in the south of the state below an elevation of 4,000 feet receive less than 10 inches of precipitation annually (WRCC 2006j).

Washington's location on the windward coast produces a predominantly marine climate west of the Cascade Mountains, where the climate possesses continental and marine characteristics. West of the Cascades, summers are cool and dry, and winters are mild, wet, and cloudy. The average number of clear or partly cloudy days each month varies from four to eight in winter to 15 to 20 in summer. The percent of possible sunshine received each month ranges from about 25% in winter to 60% in summer. The annual precipitation ranges from approximately 20 inches in an area northeast of the Olympic Mountains to 150 inches along the southwestern slopes of these mountains. Eastern Washington is part of the large inland basin between the Cascade and Rocky Mountains. East of the Cascades, summers are warmer, winters cooler, and precipitation less than in western Washington. The average number of clear or partly cloudy days each month varies from five to ten in winter to 20 to 28 in summer. The percent of possible sunshine received each month ranges from 20 to 30% in winter to 80 to 85% in summer. Annual precipitation ranges from 7 to 9 inches near the confluence of the Snake and Columbia Rivers to 70 to 90 inches near the summit of the Cascades (WRCC 2006k).

The Continental Divide splits Wyoming from near its northwest corner to the center of its southern border. The state's outstanding topographic features are mountains and high plains. The mountains generally run in a north-south direction, perpendicular to the prevailing westerlies; the state is semiarid east of the mountains. The state has an average elevation of 6,700 feet, and 6,000 feet excluding the mountains. Because of its elevation, Wyoming has a relatively cool climate. Above 6,000 feet, temperatures rarely exceed 100°F. The warmest portions of the state are at lower elevations. The highest recorded temperature is 114°F, while for most of the state, the mean maximum temperatures in July range between 85 and 95°F. At elevations above 9,000 feet, some places have July average maxima close to 70°F. In January, minimum temperatures range mostly from 5 to 10°F. The record low is –66°F. Precipitation varies greatly and is greater over the mountain ranges and at higher elevations. In the southwest at elevations between 6,500 and 8,500 feet, annual averages are 7 to 10 inches. At lower elevations along the eastern border at elevations between 4,000 and 5,500 feet, annual averages are from 12 to 16 inches. The driest portion of the state has an annual mean precipitation of 4 to 8 inches, and only a few locations receive as much as 40 inches per year (WRCC 2006l).

Temperature and precipitation in the region vary widely with elevation, latitude, season, and time of day. Table 3.6-1 presents historical average temperatures and precipitation at selected locations throughout the 11-state area (WRCC 2006a). Temperature extremes range from a low of 9.0°F in Sheridan, Wyoming, to a high of 105.4°F in Phoenix, Arizona. Phoenix has no recorded snowfall, while Salt Lake City,

Text Box 3.6-2
Air Quality Terms

A *State Implementation Plan (SIP)* is developed by a state to demonstrate how it will attain and maintain the NAAQS. SIPs include the regulations, programs, and schedules that a state will impose on sources and must demonstrate to the EPA that the NAAQS will be attained and maintained. An area where air quality is above NAAQS levels is called a nonattainment area. Previously nonattaining areas where air quality has improved to meet the NAAQS are redesignated maintenance areas and are subject to an air quality maintenance plan.

Particulate matter (PM) is dust, smoke, and other solid particles and liquid droplets in the air. The size of the particulate is important and is measured in micrometers (μm). A micrometer is 1 millionth of a meter (0.000039 inch).

PM_{10} is PM with an aerodynamic diameter less than or equal to 10 μm, and $PM_{2.5}$ is PM with an aerodynamic diameter less than or equal to 2.5 μm. The EPA has set standards for PM_{10} and $PM_{2.5}$ designed to protect human health and welfare.

Criteria pollutants are pollutants for which the EPA has prepared documents detailing health and welfare impacts and set standards specifying the air concentrations that avoid these impacts. The criteria pollutants are sulfur oxides, nitrogen dioxide, carbon monoxide, PM_{10}, $PM_{2.5}$, lead, and ozone.

Volatile organic compounds (VOCs) are organic vapors in the air that can react with other substances, principally nitrogen oxides, to form ozone in the presence of sunlight.

A *glide path* is a uniform rate of visibility progress needed to attain natural visibility conditions by the year 2064.

Utah, has more than 5 feet. Las Vegas, Nevada, averages only 4 inches of precipitation each year, compared to more than 3 feet in Seattle, Washington.

The predominant prevailing wind aloft is from the southwest, as in most of the United States. However, surface winds are greatly modified by local terrain and ground cover. The wind roses in Figure 3.6-1 demonstrate the variation in surface winds at heights ranging from 20 to 33 feet over a 10-state area. As shown in the figure, the prevailing wind directions vary from site to site, and the distribution of wind frequencies between the various directions is also highly site-dependent. The figure shows a wide variation in prevailing wind direction between sites, as well as substantial variation in wind speeds. Low wind speeds or calms are associated with conditions of poor atmospheric dispersion. Of the twelve stations shown, four — Portland, Oregon; Elko, Nevada; Sacramento, California; and Phoenix, Arizona — have calms over 10% of the time. Billings, Montana, and Casper, Wyoming, on the other hand, have calms less than 3% of the time.

3.6.1.2 What Are Air Pollutant Levels?

Table 3.6-2 presents statewide criteria pollutant and volatile organic compound (VOC) emissions for the 11-state area (WRAP 2006). The data upon which the table is based represent six source categories: point, area, on-road vehicles, nonroad vehicles, biogenic sources, and fire. Fire sources include wildfires, prescribed burning, and agricultural burning. Biogenic emissions are naturally occurring emissions from vegetation.

What Are the Applicable Ambient Air Quality Standards? The EPA has set National Ambient Air Quality Standards (NAAQS) for criteria pollutants. Primary NAAQS specify maximum ambient (outdoor air) concentration levels of the criteria pollutants with the aim of protecting public health with an adequate margin of safety. Secondary NAAQS specify maximum concentration levels with the aim of protecting public welfare. The NAAQS specify different averaging times as well as maximum concentrations. Some of the NAAQS for averaging times of 24 hours or less allow the standard values to be exceeded a limited number of times per year, and others specify other procedures for determining compliance. Each of the 11 western states has its own State Ambient Air Quality Standards (SAAQS). If a state has no standard corresponding to one of the NAAQS, the NAAQS apply. Table 3.6-3 presents the NAAQS and the SAAQS for criteria pollutants.

The standards for criteria pollutant lead have not been included, as lead has ceased to be an issue except in localized areas, with the elimination of lead from gasoline. Several of the states have standards for additional pollutants, which have not been tabulated. Most of the state standards are identical to or more stringent than NAAQS. Arizona, California, Colorado, Montana, Nevada, Oregon, and Washington have retained some form of a 1-hour ozone standard, most of them being identical to the old ozone NAAQS. California, Montana, and New Mexico also have short-term (1- or 24-hour) nitrogen dioxide (NO_2) standards for which there are no corresponding NAAQS. Three of the states have sulfur oxide standards for averaging times without corresponding NAAQS.

Where Are Ambient Air Quality Standards Not Being Attained? Parts of the 11-state area have not yet attained the NAAQS. Figures 3.6-2 to 3.6-6 show these nonattainment areas except for lead and 1-hour ozone. (Montana had a lead nonattainment area, but the source causing the problem has closed, and the area is expected to be redesignated as an attainment area.) There are currently no nonattainment areas for the annual NO_2 NAAQS

TABLE 3.6-1 Temperature and Precipitation Summaries at Selected Meteorological Stations in and around the Section 368 Energy Corridors Area[a]

		Temperature (°F)			Precipitation (inches)	
Station	State	Lowest Minimum[b]	Highest Maximum[b]	Mean[c]	Water Equivalent	Snowfall
Phoenix	AZ	41.9	105.4	74.2	7.53	0.0
Tucson	AZ	38.7	99.6	68.7	11.39	1.2
Bakersfield	CA	38.5	98.6	65.0	6.23	0.1
Los Angeles	CA	47.9	78.2	63.3	13.46	0.0
Sacramento	CA	37.9	92.8	61.1	17.30	0.0
San Diego	CA	48.0	76.3	64.4	10.26	0.0
San Francisco	CA	42.4	73.4	57.3	20.25	0.0
Denver	CO	16.9	88.1	50.1	15.50	59.8
Grand Junction	CO	16.0	92.7	51.8	8.70	21.6
Pueblo	CO	13.9	92.8	51.7	11.82	29.8
Boise	ID	22.2	90.5	51.9	11.76	19.7
Pocatello	ID	15.1	88.4	46.5	11.53	40.4
Billings	MT	13.9	86.4	47.4	14.29	57.3
Helena	MT	11.2	82.8	44.0	11.91	50.7
Albuquerque	NM	23.4	91.7	56.8	8.68	9.7
Roswell	NM	26.5	94.3	60.8	13.01	11.8
Las Vegas	NV	34.3	104.5	68.1	4.27	0.9
Reno	NV	20.5	91.4	51.3	7.32	23.1
Medford	OR	30.6	90.1	54.4	19.08	6.9
Portland	OR	33.9	79.8	53.5	37.49	6.6
Salt Lake City	UT	20.4	92.6	52.0	15.71	60.3
St. George	UT	25.8	101.7	63.2	8.27	3.2
Seattle	WA	34.9	75.1	52.3	38.04	11.8
Spokane	WA	21.6	83.9	47.3	16.06	41.0
Casper	WY	12.8	87.6	44.9	11.88	77.3
Cheyenne	WY	15.6	82.6	44.9	15.17	55.2
Sheridan	WY	9.0	86.4	44.5	14.63	71.7

[a] Summary data presented in the table are based on the period of record from inception of the meteorological station to Dec. 31, 2005.

[b] "Lowest Minimum" denotes the lowest monthly average of daily minimum during the period of record, which normally occurs in January. "Highest Maximum" denotes the highest monthly average of daily maximum during the period of record, which normally occurs in July.

[c] National Climatic Data Center (NCDC) 1971 to 2000 monthly normals.

Source: WRCC (2006a).

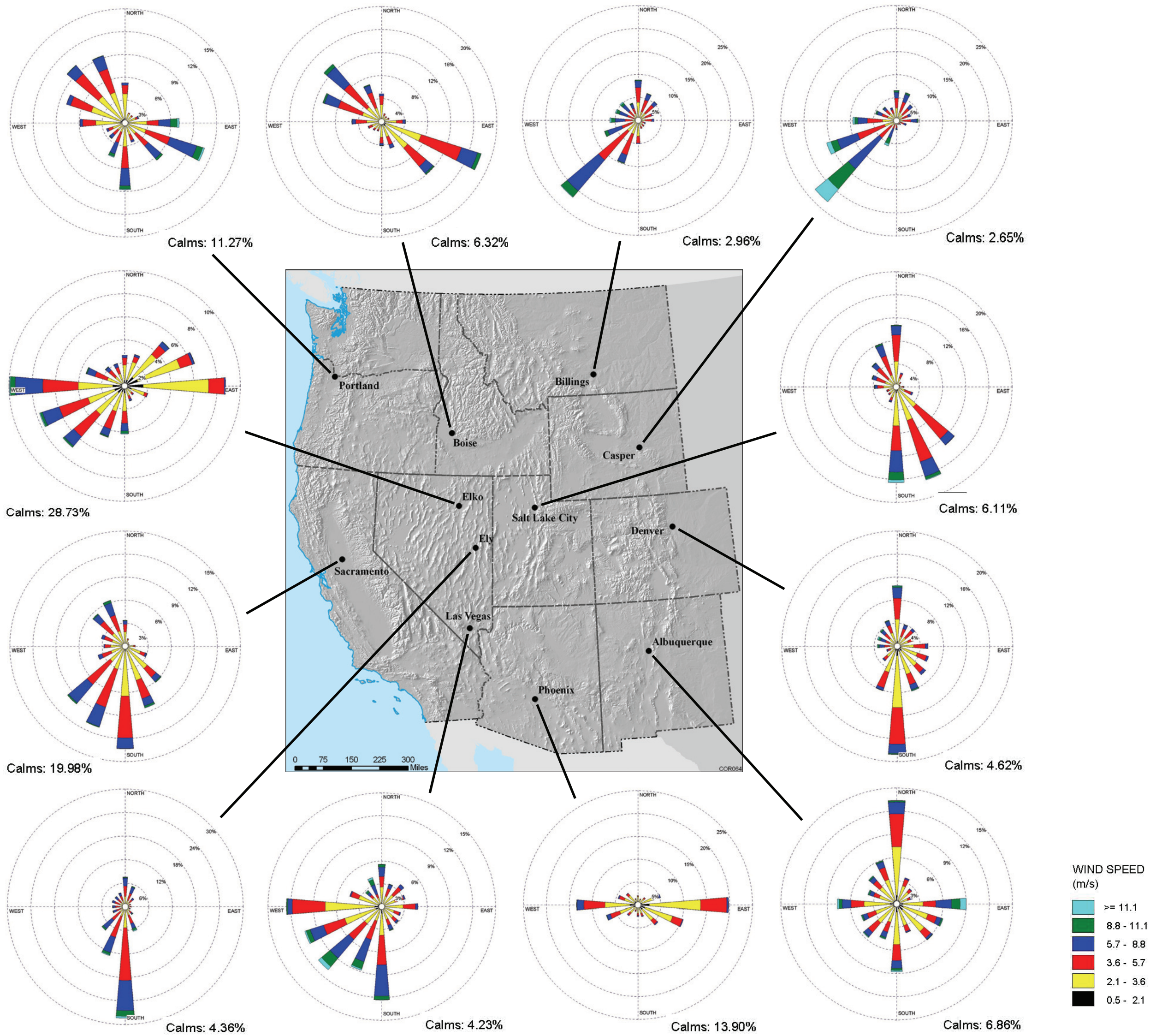

FIGURE 3.6-1 Wind Roses for Selected Meteorological Stations in and around the Section 368 Energy Corridors Area, 1990 to 1995 (Source: NCDC 1997)

TABLE 3.6-2 Statewide Criteria Pollutant and VOC Emissions

	Statewide Emissions (10^3 tons/year)[a]					
State	VOC	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO
Arizona	2,984	417	138	319	178	3,687
California	5,441	1,112	108	361	224	8,702
Colorado	1,619	412	118	349	173	3,474
Idaho	1,724	133	27	137	44	1,110
Montana	1,874	209	475	798	152	1,006
Nevada	1,445	151	66	97	28	878
New Mexico	1,928	375	84	166	60	1,287
Oregon	2,643	291	579	616	373	5,205
Utah	1,324	245	59	953	498	1,600
Washington	1,705	372	34	408	149	3,016
Wyoming	1,077	286	147	111	60	856

[a] NO_x = nitrogen oxides; SO_2 = sulfur dioxide; CO = carbon monoxide.

Source: WRAP (2006).

in the United States.[3] PM_{10} accounts for more nonattainment areas than any other criteria pollutant. Washington has no nonattainment areas, while Montana has nonattainment areas for four criteria pollutants (PM_{10}/$PM_{2.5}$, carbon monoxide [CO], sulfur dioxide [SO_2], and lead [Pb]).

What Is General Conformity? Federal departments and agencies are prohibited from taking actions in nonattainment and maintenance areas unless they first demonstrate that the actions would conform to the SIP as it applies to criteria pollutants. Transportation-related projects are subject to requirements for transportation conformity. Permitting, approving, and funding are among the covered actions and are subject to requirements for general conformity. A BLM grant of a lease and the conditioning of emissions-producing activities in a lease would require addressing conformity for sources located in nonattainment and maintenance areas. Conformity addresses only those criteria pollutants for which the area is nonattainment or maintenance (VOCs and nitrogen oxides [NO_x] for ozone). If annual source emissions[4] are below specified threshold levels, no conformity

3 Nitrogen oxides (NO_x), an ozone precursor, are primarily emitted from vehicles and fuel combustion. Ozone (O_3) is produced in the atmosphere as a result of chemical reactions involving NO_x and VOCs. Conditions conducive to high ozone concentrations include high temperatures, low wind speeds, intense sunlight, and an absence of precipitation. Urban centers tend to be NO_x-rich/VOC-limited (adding VOC may increase ozone whereas adding NO_x may not). Most other areas in the United States tend to be NO_x-limited/VOC-rich (adding NO_x may increase O_3 levels whereas adding VOC may not).

4 The annual emissions of the pollutant of interest must include both direct and indirect emissions such as worker traffic.

TABLE 3.6-3 National Ambient Air Quality Standards (NAAQS) and State Ambient Air Quality Standards (SAAQS) for Criteria Pollutants[a]

Pollutant	Averaging Time	NAAQS[b] Primary	NAAQS[b] Secondary	Arizona Primary	Arizona Secondary	California	Colorado	Idaho Primary	Idaho Secondary
CO	8-hour	9 ppm (10 mg/m^3)	–[c]	9 ppm (10 mg/m^3)	–[c]	9.0 ppm (10 mg/m^3) 6 ppm (7 mg/m^3)[d]	10 mg/m^3	9 ppm (10 mg/m^3)	–[c]
	1-hour	35 ppm (40 mg/m^3)	–	35 ppm (40 mg/m^3)	–	20 ppm (23 mg/m^3)	40 mg/m^3	35 ppm (40 mg/m^3)	–
NO_2	Annual	0.053 ppm (100 µg/m^3)	0.053 ppm (100 µg/m^3)	0.053 ppm (100 µg/m^3)	0.053 ppm (100 µg/m^3)	0.030 ppm (56 µg/m^3)	100 µg/m^3	0.053 ppm (100 µg/m^3)	0.053 ppm (100 µg/m^3)
	24-hour	–	–	–	–	–	–	–	–
	1-hour	–	–	–	–	0.18 ppm (338 µg/m^3)	–	–	–
PM_{10}	Annual	–	–	–	–	20 µg/m^3	50 µg/m^3	–	–
	24-hour	150 µg/m^3	150 µg/m^3	150 µg/m^3	150 µg/m^3	50 µg/m^3	150 µg/m^3	150 µg/m^3	150 µg/m^3
$PM_{2.5}$	Annual	15.0 µg/m^3	15.0 µg/m^3	15.0 µg/m^3	15.0 µg/m^3	12 µg/m^3	–	15.0 µg/m^3	15.0 µg/m^3
	24-hour	35 µg/m^3	35 µg/m^3	35 µg/m^3	35 µg/m^3	–	–	35 µg/m^3	35 µg/m^3
Ozone	8-hour	0.075 ppm	0.075 ppm	0.08 ppm (235 µg/m^3)	0.08 ppm (235 µg/m^3)	0.070 ppm (137 µg/m^3)	–	0.08 ppm (235 µg/m^3)	0.08 ppm (235 µg/m^3)
	1-hour	0.12 ppm (157 µg/m^3)	0.12 ppm (157 µg/m^3)	0.12 ppm (157 µg/m^3)	0.12 ppm (157 µg/m^3)	0.09 ppm (180 µg/m^3)	235 µg/m^3	0.12 ppm (157 µg/m^3)	0.12 ppm (157 µg/m^3)
Sulfur oxides	Annual	0.03 ppm (80 µg/m^3)	–	0.03 ppm (80 µg/m^3)	–	–	–[e]	0.03 ppm (80 µg/m^3)	–
	24-hour	0.14 ppm (365 µg/m^3)	–	0.14 ppm (365 µg/m^3)	–	0.04 ppm (105 µg/m^3)	–[e]	0.14 ppm (365 µg/m^3)	–
	3-hour	–	0.5 ppm (1,300 µg/m^3)	–	0.5 ppm (1,300 µg/m^3)	–	700 µg/m^3 [e]	–	0.5 ppm (1,300 µg/m^3)
	1-hour	–	–	–	–	0.25 ppm (655 µg/m^3)	–	–	–

TABLE 3.6-3 (Cont.)

Pollutant	Averaging Time	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
CO	8-hour	9 ppm	10,000 µg/m^3 (9 ppm)[f] 6,670 µg/m^3 (6 ppm)[g]	8.7 ppm	9 ppm	9 ppm	9 ppm	10 mg/m^3 (9 ppm)
	1-hour	23 ppm	40,000 µg/m^3 (35 ppm)	13.1 ppm	35 ppm	35 ppm	35 ppm	40 mg/m^3 (35 ppm)
NO_2	Annual	0.05 ppm	100 µg/m^3 (0.05 ppm)	0.05 ppm	0.053 ppm	0.053 ppm	0.05 ppm	100 µg/m^3 (0.05 ppm)
	24-hour	–	–	0.01 ppm	–	–	–	–
	1-hour	0.30 ppm	–	–	–	–	–	–
PM_{10}	Annual	50 µg/m^3	50 µg/m^3	–	–	50 µg/m^3	50 µg/m^3	50 µg/m^3
	24-hour	150 µg/m^3	150 µg/m^3	–	150 µg/m^3	150 µg/m^3	150 µg/m^3	150 µg/m^3
$PM_{2.5}$	Annual	–	–	–	–	15 µg/m^3	15 µg/m^3	15 µg/m^3
	24-hour	–	–	–	–	65 µg/m^3	65 µg/m^3	65 µg/m^3
Ozone	8-hour	–	–	–	–	0.08 ppm	–	0.08 ppm
	1-hour	0.10 ppm	235 µg/m^3 (0.12 ppm) 195 µg/m^3 (0.10 ppm)[h]	–	0.12 ppm	–	0.12 ppm	–
Sulfur oxides	Annual	0.02 ppm	80 µg/m^3 (0.03 ppm)	0.02 ppm[i]	0.02 ppm	0.03 ppm	0.02 ppm	60 µg/m^3 (0.02 ppm)
	24-hour	0.10 ppm	365 µg/m^3 (0.14 ppm)	0.10 ppm[i]	0.10 ppm	0.14 ppm	0.1 ppm	260 µg/m^3 (0.10 ppm)
	3-hour	–	1,300 µg/m^3 (0.5 ppm)	–[i]	0.50 ppm	0.5 ppm	–	1,300 µg/m^3 (0.50 ppm)
	1-hour	0.50 ppm	–	–	–	–	0.4 ppm	–

Footnotes on next page.

TABLE 3.6-3 (Cont.)

[a] Attainment determination criteria for each state are similar to those for the NAAQS. For simplicity, attainment determination criteria for NAAQS are presented only in footnote b. For detailed attainment determination criteria for a state of interest, refer to references below used in developing this table. Several of states have the standards for additional pollutants (e.g., H_2S for Wyoming), that have not been presented in this table; also refer to the references below for additional pollutants for each state of interest.

[b] Short-term (≤24-hour) standards for CO and SO_2 are not to be exceeded more than once per year, and annual averages for NO_2 and SO_2 are not to be exceeded in a calendar year. For PM_{10}, the 24-hour standard is attained when the expected number of exceedances is less than or equal to one per year on average over 3 years. For annual-average $PM_{2.5}$, the standard is attained when the 3-year average of the weighted annual mean concentrations from single or multiple community-oriented monitors does not exceed the standard. For 24-hour average $PM_{2.5}$, the standard is attained when the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area do not exceed the standard. For 8-hour O_3, the standard is attained when the 3-year average of the fourth-highest daily maximum 8-hour average concentrations measured at each monitor within an area over each year do not exceed the standard. Note that, effective December 17, 2006, the EPA revoked the annual-average PM_{10} standard of 50μg/m^3 and revised the 24-hour $PM_{2.5}$ standard from 65 μg/m^3 to 35 μg/m^3.

[c] Unless otherwise indicated, dash = no standard.

[d] Lake Tahoe.

[e] Colorado has also established increments limiting the allowable increase in ambient concentrations over an established baseline.

[f] Below 5,000 feet above sea level.

[g] Above 5,000 feet above sea level.

[h] Lake Tahoe Basin.

[i] Different standards apply within 3.5 miles of the Chino Mines Company smelter furnace stack at Hurley (0.03 ppm annual; 0.14 ppm 24-hour; 0.50 ppm 3-hour).

Sources: Arizona Department of Environmental Quality (2007); California Air Resources Board (2007); Colorado Department of Public Health and Environment (2007); EPA (2006a); Idaho Department of Environmental Quality (2007); Montana Department of Environmental Quality (2007); Nevada Division of Environmental Protection (2007); New Mexico Environmental Department (2007); Oregon Department of Environmental Quality (2007);Utah Department of Environmental Quality (2007); Washington Department of Ecology (2007); Wyoming Department of Environmental Quality (2007).

FIGURE 3.6-2 PM_{10} Nonattainment Areas in the 11 Western States

FIGURE 3.6-3 $PM_{2.5}$ Nonattainment Areas in the 11 Western States

FIGURE 3.6-4 8-hour Ozone Nonattainment Areas in the 11 Western States

FIGURE 3.6-5 Sulfur Dioxide (SO_2) Nonattainment Areas in the 11 Western States

FIGURE 3.6-6 Carbon Monoxide (CO) Nonattainment Areas in the 11 Western States

determination is required. If the emissions exceed the threshold, a conformity determination must be undertaken to demonstrate how the action will conform to the SIP. The demonstration process includes public notification and response and may require extensive analysis.

What Is Prevention of Significant Deterioration (PSD)? While the NAAQS (and SAAQS) place upper limits on the levels of air pollution, PSD regulations applying to attainment areas place limits on the total increase in ambient pollution levels above established baseline levels for SO_2, NO_2, and PM_{10}, thus preventing "polluting up to the standard" (see Table 3.6-4). These allowable increases are smallest in Class I areas such as national parks and wilderness areas. The rest of the country is subject to larger Class II increments. States can choose a less stringent set of Class III increments, but none have done so. Major (large) new and modified stationary sources must meet the requirements for the area in which they are locating and any areas they impact. Thus, a source locating in a Class II area near a Class I area would need to meet the more stringent Class I increment in the Class I area and the Class II increment elsewhere, as well as any other applicable requirements.

In addition to capping increases in criteria pollutant concentrations below the levels set by the NAAQS, the PSD program mandates stringent control technology requirements for new and modified major sources. In Class I areas, federal land managers (FLMs) are responsible for protecting the areas' air quality-related values (AQRVs), such as scenic, cultural, biological, and recreational resources. As stated in the Clean Air Act (CAA), the AQRVs test requires the FLM to evaluate whether the proposed project will have an adverse impact on the AQRVs, including visibility. Even if PSD increments are met, if the FLM determines that there is an impact to an AQRV, the permit may not be issued. Figure 3.6-7 shows the locations of Class I PSD areas in the 11 western states.

TABLE 3.6-4 Federal PSD Increments

		PSD Increment (μg/m³)	
Pollutant	Averaging Time	Class I	Class II
SO_2	3 hours	25	512
	24 hours	5	91
	Annual	2	20
NO_2	Annual	2.5	25
PM_{10}	24 hours	8	30
	Annual	4	17

Source: 40 CFR 52.21.

How Is Visibility Protected? Visibility was singled out for particular emphasis in the Clean Air Act Amendments (CAAA) of 1977. Visibility in a Class I area is protected under two sections of the CAA. Section 165 provides for the PSD program (described above) for new sources. Section 169(A), for older sources, describes requirements for both reasonably attributable single sources and regional haze requirements which address multiple sources. FLMs have a particular responsibility to protect visibility in Class I areas. Even sources locating outside a Class I area may need to obtain a permit that assures no adverse impact on visibility within the Class I area, and existing sources may need to retrofit controls.

In 1999, EPA issued the final Regional Haze Rule. This rule sets a national visibility goal for preventing future and remedying existing impairment to visibility in Class I areas. The rule is designed to reduce visibility impairment from existing sources and limit visibility impairment from new sources. States with Class I areas or states affecting visibility in Class I areas must revise their SIPs by 2007, prepare emission reduction strategies to reduce regional haze, and establish glide paths for each Class I area. States are required to periodically review where they fall within the glide path to determine whether

FIGURE 3.6-7 PSD Class I Areas in the 11 Western States

they are making reasonable progress toward meeting the goal of natural conditions by 2064.

The Interagency Monitoring of Protected Visual Environments (IMPROVE) program was established in 1985 to aid in the development of federal and state plans for protection of visibility in Class I areas. The IMPROVE data are also used to help determine the glide path, and will continue to be used to evaluate reasonable progress. Visibility in some of the Class I areas in the 11 western states is the best in the coterminous United States, with areas such as Bryce Canyon, Yellowstone, Crater Lake, and Canyonlands having mid-range visibilities reaching 100 miles. That this area enjoys some of the best visibility conditions in the country makes it more sensitive to changes in visibility than anywhere else.

3.6.2 How Were the Potential Impacts to Air Resources of Corridor Designation Evaluated?

Impacts would not be expected as a result of corridor designation and land use plan amendments. Rather, impacts would occur only with the construction, operation, and decommissioning of specific energy transport projects. Potential air resource impacts of specific projects need to be assessed on the basis of local air quality and the anticipated extent and duration of construction, operation, and decommissioning. Additionally, all project-specific activities need to be carried out in compliance with the applicable SIP, the leasing stipulations, and other applicable regulations.

Specific projects will be subject to air impact analyses under the NEPA and state regulations when they are proposed.

3.6.3 What Are the Potential Impacts to Air Resources of the Alternatives, and How Do They Compare?

Air resources in the western states are not expected to be impacted by the designation of energy corridors on federal lands or by amendment of land use plans. Air resources would be affected by the construction, operation, and decommissioning of specific energy transport projects. The following discussions address potential air resource impacts that could be incurred with the development of energy transport projects under each of the alternatives evaluated in this PEIS. Detailed air analyses would be conducted as part of project-specific environmental assessments, and are outside the scope of this PEIS.

3.6.3.1 What Are the Potential Impacts of the No Action Alternative?

The principal air impacts of concern are associated with the operation of natural gas compressor stations powered by gas turbines or reciprocating engines. Under No Action, impacts associated with compressor stations, as well as many of the other potential air impacts identified for the construction (such as fugitive dust) and operation of future energy transport systems, would occur for each individual project and along project-specific designated energy corridors and project-specific ROWs on both federal and nonfederal lands.

Under No Action, individual project proponents may be expected to independently identify preferred routes and project designs, and implementation of projects would likely not occur within a single energy corridor, but rather along multiple, widely spaced energy transport ROWs. Without colocation, individual project ROWs and associated infrastructure (such as compressor stations) may be expected to be more widely spaced from one another than if colocated within a single energy corridor. All other factors being equal, reducing the spacing between similar air emission sources would generally increase the maximum air quality impacts. Thus, the wider separation of the individually sited energy transport projects that could occur under No Action could result in lower air quality impacts (all other factors being equal) than the impacts of the projects colocated within a single energy corridor. Alternatively, the wider separation of individual projects that could occur under No Action could increase the total area impacted.

In the absence of dedicated Section 368 energy corridors and an associated expedited permitting process, there could be increased siting of energy transport ROWs on nonfederal lands and a concomitant shift of potential impacts to air quality associated with the ROWs on those lands. If increased use of nonfederal lands occurs, a greater number of compressor stations could be located on nonfederal lands with a corresponding shift in air quality impacts.

3.6.3.2 What Are the Potential Impacts of the Proposed Action?

Designation of Section 368 energy corridors and land use plan amendments under the Proposed Action are not expected to impact air resources within or adjacent to the designated energy corridors or ROWs on nonfederal or other federal lands. Air resources would only be affected with the construction, operation, and decommissioning of specific energy transport projects within designated corridors on federal lands and ROWs on other federal and nonfederal lands.

3.6.3.3 How Do the Potential Impacts Compare among the Alternatives?

The impacts to air resources under No Action would be the usual impacts associated with the construction, operation, and decommissioning of individual energy transport projects as described in Section 3.6.4.1.

Designating Section 368 energy corridors and land use plan amendments under the Proposed Action would result in no impacts to air resources.

3.6.3.4 What Mitigation Measures Might Be Applied to Reduce Impacts to Air Resources if Section 368 Corridors Are Designated?

The mitigation measures described in Section 3.6.4.2 would be available to reduce impacts to air resources caused by individual energy transport projects on federal and nonfederal lands as required to comply with applicable regulations or leasing requirements.

Since there are no impacts to air resources, no mitigation measures would be required for designating Section 368 energy corridors under the Proposed Action.

3.6.4 Following Corridor Designation, What Types of Impacts Could Result to Air Resources with Project Development, and How Could They Be Minimized, Avoided, or Compensated?

The construction, operation, and decommissioning of energy transport projects would affect air resources regardless of project location. The following sections discuss the types of project development activities that would affect air resources on both federal and nonfederal lands and the mitigation measures that might be applied to minimize, avoid, or compensate for potential air impacts from energy transport projects.

3.6.4.1 What Are the Usual Impacts to Air Resources of Building, Operating, and Decommissioning Energy Transport Projects?

The following sections describe the usual impacts to air resources of building, operating, and decommissioning energy transport projects. Discussions of potential impacts that could result from projects in designated corridors follow the discussions of the usual impacts.

How Can Construction of Energy Transport Projects Affect Air Resources? Before beginning a construction project, a construction permit from the state or local air agency is generally required. Most jurisdictions do not require modeling of air quality impacts, since the air impacts of construction projects are temporary and local. Instead, agencies condition the permit to require that certain mitigation practices be conducted. The cognizant agency should be contacted prior to beginning construction or any on-site activities, including testing and decommissioning. Agencies may also have special regulations for temporary, portable concrete batch plants that might be used during construction of tower footers or pads for compressors and pump stations.

Certain activities are common to most or all phases of the construction of transmission lines, liquid pipelines, and gas pipelines whether in designated corridors or ROWs. Table 3.6-5 identifies these generic activities and the pollutants they produce. Text Box 3.6-3 focuses on vehicle emissions.

Table 3.6-6 lists the principal tasks associated with the construction of an electricity transmission line and a liquid or gas pipeline. Many of the activities are similar, the differences being in scope and intensity. Excavation for transport towers and pipeline trenching are similar in that both involve earthmoving and can produce similar pollutants, primarily particulates. Tower assembly and pipe stringing, bending, and welding are unique to their associated energy transport systems. The following activities and emissions are associated with these activities (EPA 2004b):

- Vehicle traffic on access roads (tailpipe emissions and reentrained road dust);

Text Box 3.6-3
Vehicle Emissions

Vehicles include both light-duty vehicles, such as cars, vans, and pickups, and heavy-duty vehicles, such as trucks, and construction equipment, such as bulldozers. Vehicles can be powered by either gasoline or diesel engines. There are two sources of emissions associated with vehicles: tailpipe emissions and emissions from dust that becomes airborne as the vehicle passes, so-called fugitive dust or reentrained road dust. Tailpipe emissions include CO, NO_x, $PM_{10}/PM_{2.5}$, SO_2, and VOCs. The reentrained dust is primarily PM_{10}. On dirt roads, the reentrained dust exceeds the tailpipe emissions.

TABLE 3.6-5 Emissions from Typical Activities Associated with Construction

Activity	Pollutants
Vehicular traffic (from tailpipe)	CO, NO_x, particulates ($PM_{10}/PM_{2.5}$), SO_2, and VOCs
Vehicle fugitive dust from roads	Particulates
Construction fugitive dust from earthmoving activities	Particulates
Construction equipment exhaust	CO, NO_x, particulates, SO_2, and VOCs
Concrete batch plant[a]	Particulates
Emergency generators[a]	CO, NO_x, particulates, SO_2, and VOCs

[a] May not be present in all designated corridors or ROWs.

Source: EPA (2004b).

TABLE 3.6-6 Major Tasks Associated with Construction of an Energy Transport System

Electricity Transmission Line	Pipeline
Surveying	Surveying
Develop staging areas	Develop storage and staging areas
Material storage	Material storage
Develop access roads	Develop access roads
Clear sites for structures	Clearing and grading
Excavation for tower foundations	Trenching
Tower assembly	Pipe stringing, bending, and welding
String conductors	Lower assembled pipe and backfill
Construct substations	Construct pump or compressor stations

Sources: ANL (2007a,b).

- Removal of vegetative cover from corridors and ROWs, staging areas, and storage areas (primarily NO_x, CO, and VOCs from power equipment and mowers);

- Vehicle traffic for delivery of tower sections, pump station components, and compressor station components (diesel tailpipe emissions and fugitive road dust);

- Construction of access roads involving excavation, moving soils, and grading (primarily tailpipe emissions from diesel- and gasoline-powered construction equipment; fugitive dust from earthmoving);

- Excavation of soils (primarily tailpipe emissions from diesel-powered construction equipment; fugitive dust from earthmoving);

- Storage of removed topsoil, subsurface soil, required construction materials, and fuels in storage piles, yards, and tanks (primarily particulates from storage piles of loose, unconsolidated materials and VOCs from fuel storage);

- Grading within the corridor or ROW (primarily tailpipe emissions from diesel-powered construction equipment; fugitive dust from earthmoving);

- Operation of construction equipment including loaders, graders, trucks, dozers, cranes, and rippers (primarily tailpipe emissions from diesel- and gasoline-powered construction equipment; fugitive dust from earthmoving);

- Boring, and possibly pile driving, for foundations (primarily tailpipe emissions from diesel-powered construction equipment; fugitive dust from boring operations);

- Blasting, if required in rocky ground (small amounts of CO, NO_x, and particulates);

- Construction of laydown areas, staging areas, and storage areas (primarily tailpipe emissions from diesel- and gasoline-powered construction equipment; fugitive dust from earthmoving);

- Possible installation and operation of portable concrete batch plants and preparation of the associated storage areas for sand, cement, and aggregate (construction emissions as noted above and fugitive particulates from storage piles and concrete truck travel);

- Backfilling of tower bases and trenches with powered construction equipment (primarily tailpipe emissions from diesel- and gasoline-powered construction equipment; fugitive dust from earthmoving);

- Possible use of on-site generators (primarily CO, NO_x, $PM_{10}/PM_{2.5}$, VOC);

- Pouring concrete, including the operation of ancillary equipment such as mixers, vibrators, and concrete pumps by small, portable generating units (CO, NO_x, $PM_{10}/PM_{2.5}$, VOC); and

- Construction of ancillary facilities such as substations, compressor stations, and pump stations (all emissions associated with the foregoing construction activities).

The pollutant of greatest concern from construction is particulate from fugitive dust caused by soil handling and by soil disturbances by vehicular traffic and construction equipment on bare soil surfaces. Windblown dust is also a concern at construction sites. Most air pollution control requirements attached to construction permits call for measures to control particulate emissions, primarily fugitives from earthmoving activities. Diesel equipment is the greatest source of tailpipe emissions. On-site power from diesel- and gasoline-powered generators would result in emissions of the same pollutants as tailpipe emissions but in smaller quantities.

What Might Be the Potential Construction Impacts of Specific Projects under the Proposed Action? The usual air quality impacts just discussed would be incurred during potential construction in corridors designated under Section 368. Construction emissions and their impacts could occur anywhere along up to 6,112 miles of the proposed corridor segments and ROWs on other federal and nonfederal lands. At the level of this PEIS, total emissions could not be estimated. Construction emissions would depend upon the lengths of pipelines and transmission lines and the numbers of pump and compressor stations built. Impacts would depend on the timing of multiple projects colocated in the same corridor segment and the types of energy transport systems being built. Construction impacts on nonfederal and other federal lands would be similar.

How Can Operation of Energy Transport Projects Affect Air Resources? Two approaches were used to assess the air impacts of energy transport system operations: dispersion modeling and a determination of the proximity to special areas where air quality and AQRVs need to be protected. Since detailed site-specific data and specific locations were not available at the programmatic level for this PEIS, modeling was conducted for representative compressors using simplified assumptions. Proximity analyses were conducted for designated corridors to determine the lengths of corridors which run through or near nonattainment and PSD Class I areas, respectively.

Impacts were assessed for the gas compressors at the compressor stations on gaseous fuel pipelines. The pumps at liquid fuel pumping stations would be powered by electric motors that were not considered air emissions sources. Other sources at the stations could be neglected in a programmatic assessment but would be included in a detailed site-specific analysis or permit application. Transmission of electricity produces no emissions except for a small amount of ozone from corona discharge.

Air quality impact estimates that could be compared with standard concentration levels were calculated using the AERMOD model (EPA 2004a), which is currently EPA's preferred model for use in situations such as compressor stations (Appendix W – "Guideline on Air Quality Models," 40 CFR 51, Nov. 9, 2005). Two compressors generally operate simultaneously at a pump station and were assumed to operate continuously throughout the year. Flat terrain was assumed. Emissions and stack or release data were based on ANL (2007b). Meteorological data for Salt Lake City, Utah, were used (NCDC 1997; WebMET.com 2006).

The values specified in the NAAQS and the PSD increments represent impacts of potential concern, with the NAAQS representing potential human health and welfare impacts and the PSD increments representing pollution increases above existing levels. Concentrations from operating compressors were compared to the NAAQS and PSD levels to assess their air quality impacts.

Major sources[5] are subject to stringent PSD requirements and even more stringent requirements if located in areas where air quality is above national standards (nonattainment areas). Whether compressor stations would constitute major sources cannot be determined without specific information about their locations and configurations. In this PEIS, a proximity analysis was conducted to determine whether corridors pass close to or through nonattainment areas (NAAs) or PSD Class I areas. Proximity to these areas would indicate the need for special attention and perhaps additional mitigating requirements even if the stations were not major. (If a station was major, it would need to satisfy PSD requirements under existing permit programs.)

Potential impacts associated with NAAs were assessed using a GIS analysis to find the lengths of corridors on federal lands that pass through NAAs in each state. Stringent emission and offset requirements apply in NAAs and lead to additional siting constraints in these areas.

Potential impacts associated with PSD areas were assessed using a GIS analysis to find the lengths of corridors on federal lands that pass within 1.5 miles of any Class I area. Stringent limitations on increases in pollutant concentrations apply in PSD Class I areas and may lead to additional siting constraints for sources impacting these areas.

The 1.5-mile distance was chosen by modeling the distances from an uncontrolled operating compressor station at which the PSD Class I increments would be met. The greatest distance was somewhat less than 1.5 miles for the NO_2 increment. This estimate may be a worst case, as emission controls will probably be required on compressor engines. However, the full increment may not be available in a specific location, as other nearby sources may consume part of the increment and part of it may be reserved for future growth.

Table 3.6-7 compares the results of the air impact modeling with the values specified in the NAAQS and PSD Class I increments. None of the maximum concentrations exceed the

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5 Roughly speaking, a major source is one that "has the potential to" emit 250 tons/year (100 tons/year for specified sources) or more of regulated pollutants. An entire compressor station with three compressors and the associated equipment would probably be considered a source. Whether such a station would be major is a site-specific consideration depending upon many factors including the type of engines chosen to power the compressors, emission controls, if any, and the conditions under which the "potential to emit" is determined. The two compressor engines considered in this PEIS are close to, but below, the major source size for NO_x.

TABLE 3.6-7 Modeled Air Quality Impacts of Compressor Stations

Averaging Time	Maximum Concentration (μg/m³)[a]					Percentage of NAAQS[b]					Percentage of PSD Class I Increments[c,d]		
	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_2	PM_{10}
1 hour	–[e]	–	–	–	38.3	–	–	–	–	0.1	–	–	–
3 hours	–	1.0	–	–	–	–	0.08	–	–	–	–	4.2	–
8 hours	–	–	–	–	32.7	–	–	–	–	0.3	–	–	–
24 hours	–	0.74	4.8	4.8	–	–	0.2	3.2	13.7	–	–	14.8	60
Annual	10.3	0.07	–	0.90	–	10.3	0.09	–	6.0	–	412	3.5	11

a Modeled for two operating compressors, using meteorological data from Salt Lake City and assuming flat terrain and no building downwash.

b Table 3.6-3 presents the NAAQS.

c Table 3.6-4 presents the federal PSD increments.

d No modeled concentrations exceeded the federal PSD Class II increment values.

e – = no corresponding standard or increment value.

NAAQS values or the PSD Class II increment values. However, annual NO_x concentrations exceed the PSD Class I increment values. Examination of all calculated concentrations indicates that NO_x concentrations would fall below the increment value within 1.1 miles of the source. There is thus an indication that compressor stations might have difficulty locating within 1 to 2 miles of a PSD Class I area and that NO_x impacts deserve close scrutiny when compressor stations are within that distance of Class I areas. This estimate may be a worst case estimate, as emission controls will probably be required on compressor engines. However, the full increment may not be available in a specific location, as other nearby sources may consume part of the increment and part of it may be reserved for future growth.

A pipeline leak could occur during operation of pipelines in a corridor. Hydrogen and natural gas are not regulated as air pollutants and are of concern primarily as fire and explosion hazards, although hydrogen sulfide, which can be a contaminant in natural gas, is considered a hazardous air pollutant. Methane, the major component of natural gas is a greenhouse gas, and some of the volatile components of crudes and syncrudes are hazardous air pollutants, while most are VOCs that participate in ozone formation. The amounts of these gases emitted during a leak would be small and of short duration with negligible impact on greenhouse gas or ozone concentrations. The potential impacts of leaks on ambient air quality depend on many factors, which cannot be quantified at the programmatic level of analysis. These factors include surface area and thickness of the pool of spilled liquid, the composition of the spilled liquid and the properties of the constituents, as well as the weather conditions and topography. In general, emissions of highly volatile compounds from oil spills are generally negligible within 24 hours after the spill, although emissions of less volatile components may persist for a longer time (Vol. 3, Sec. 4.4.4 in BLM 2002). Any short-term concentrations of hazardous pollutants resulting from an oil spill would be of concern from the perspective of health. These issues are addressed by regulations requiring operators to implement standard practices and have mitigation plans, as discussed in Sec. 3.14.

What Might Be the Potential Operations Impacts of Specific Projects under the Proposed Action? Operational emissions would depend upon the mix of technologies deployed and on the proximity of the emission sources if multiple transport systems were deployed in the same corridor segment or ROW. Under the Proposed Action, these impacts could occur anywhere along up to 6,112 miles of designated corridor segments on federal lands and in ROWs on other federal and nonfederal lands.

Table 3.6-8 presents the results of the PSD and nonattainment analyses for the Proposed Action. No corridor segments in Colorado, Montana, New Mexico, Oregon, Washington, or Wyoming would cross nonattainment areas. Nevada would be the only state with more than a mile of corridor segments in SO_2 nonattainment areas. Five states would have corridor segments in PM_{10} nonattainment areas. Three states would have corridor segments in ozone nonattainment areas. NO_x emissions from a specific project (e.g., natural gas combustion) could contribute to O_3 formation, especially in remote areas characterized by VOC-rich/NO_x-limited environments. Depending on the VOC/NO_x ratio in the ambient air, a specific energy transport project could either impede a shift from nonattainment to attainment or, less probably, foster a shift from attainment to nonattainment.

No detailed information on specific projects is available at this PEIS level, and thus a quantitative analysis including regional-scale ozone modeling was not undertaken. However, when detailed information is available, O_3 impact analyses should be undertaken in conjunction with site-specific Environmental Impact Statements (EISs) for specific projects.

Six states would have corridor segments within 1.5 miles of a Class I PSD area under the Proposed Action.

TABLE 3.6-8 Length of Corridor Segments in Nonattainment Areas and near PSD Class I Areas under the Proposed Action

	Length of Corridor Segments in Nonattainment Areas (miles)				
	Pollutant				Length of Corridor Segments within 1.5 Miles of PSD Class I Areas (miles)
State	PM_{10}	SO_2	CO	8-hour O_3	
Arizona	51	0	0	50	3.4
California	426	0	39	280	32
Colorado	0	0	0	0	0
Idaho	4.2	0	0	0	16
Montana	0	0	0	0	0
Nevada	4	45	66	169	0
New Mexico	0	0	0	0	0
Oregon	0	0	0	0	2.6
Utah	23	0	0	0	10
Washington	0	0	0	0	10
Wyoming	0	0	0	0	0

Without specific proposed routes, a similar analysis could not be conducted for energy transport projects in ROWs on nonfederal and other federal lands.

How Can Decommissioning of Energy Transport Projects Affect Air Resources? Decommissioning is essentially the reverse of construction, and its impacts were addressed based on the construction results. However, no emission estimates were made, as emissions would be reduced and of shorter duration than emissions associated with construction.

What Might Be the Potential Air Resource Impacts of Decommissioning Specific Projects under the Proposed Action? Activities for decommissioning would be similar to those used for construction but on a more limited scale and duration (see discussion of potential construction impacts above). Impacts would be correspondingly less. Leaving buried pipelines in place would reduce the amount of trenching and soil disturbance required for decommissioning and contribute to reduced impacts relative to construction. Under the Proposed Action, these impacts could occur anywhere along up to 6,112 miles of designated corridor segments on federal lands and in ROWs on other federal and nonfederal lands.

3.6.4.2 What Mitigation Is Available to Minimize, Avoid, or Compensate for Potential Project Impacts to Air Resources?

What Mitigation Measures Might Be Applied during Project Construction? As already noted, generation of fugitive particulate emissions from vehicle traffic and earthmoving activities would be the greatest cause for concern with construction. These emissions would need to be controlled through lease stipulations and the permitting process. Specifying potential mitigation measures involved identifying measures applicable to the principal tasks and activities involved in the construction of electricity transmission lines and pipelines and their associated air emissions (see Section 3.6.4.1 for construction tasks and activities). Applying each of these measures could potentially mitigate the air impacts associated with construction projects under either the alternative.

Typical measures that can be implemented to control particulates and other emissions are given below (ABC Wind Company, LLC undated; BLM 2006a, 2007b; PBS&J 2002; DOI and USDA 2006; State of Nevada 2006).

General mitigation measures for fugitive dust:

- Install wind fences.

- Cease operations when winds make control of fugitive dust difficult.

Mitigation measures for areas subject to vehicle travel:

- Limit access to the construction site and staging areas to authorized vehicles;

- Establish antitracking stations of 2- to 4-inch rock base at egress points to control dirt carryout by trucks;

- Access roads and on-site roads should be surfaced with aggregate, wherever appropriate.

- Dust abatement techniques such a watering should be used on unpaved, unvegetated surfaces to minimize airborne dust.

- Speed limits (a maximum of 25 mph; 15 mph is preferred) should be posted and enforced to reduce airborne fugitive dust.

Mitigation measures for filling, compacting, and grading:

- A dedicated water truck should be available to moisten material before loading, unloading, compacting, filling, or grading.

- Operators at these operations should:

  – Lower bucket height before releasing loads,
  – Release loads slowly,
  – Keep vehicle speed under 15 mph, and
  – Minimize disturbed areas.

Mitigation measures for soil and material storage and handling:

- Prohibit outside mixing of construction materials such as sand and cement powder on days when the wind speed exceeds 15 mph.

- Train workers to handle unconsolidated construction materials so as to reduce fugitive emissions.

- Cover stockpiled materials with a tarpaulin or geotextiles, if they are sources of fugitive dust.

- Periodically spray storage piles of fill materials from other sites and stored material from the construction site to form a crust on the outside of the piles.

- Cover storage piles at concrete batch plants, if they are sources of fugitive dust.

Mitigation measures for clearing and disturbing the land:

- When practical, construction should be staged, to limit the area of land exposed at any time.

- Minimize disturbed area.

- Apply dust abatement techniques such as watering prior to clearing.

Mitigation measures for earthmoving:

- Use dust abatement techniques such as watering before earthmoving activities such as excavating, backfilling, compacting, and grading.
- Use dust abatement techniques such as watering as earthmoving activities proceed.
- Revegetate disturbed areas as soon as possible after disturbance.

Mitigation measures for material loading and transport:

- Soil should be moist while being loaded into dump trucks.
- Loads should be kept below the freeboard of the truck.
- Drop heights should be minimized when loaders dump materials into trucks.
- Gate seals should be tight on dump trucks.
- Dump trucks should be covered while traveling on public roads.

Mitigation measures for vehicles:

- Require routine maintenance of automobiles, trucks, construction equipment, on-site generators, and portable power units that are routinely on-site to ensure efficient combustion and minimum emissions.
- Limit idling of diesel equipment to no more than 15 minutes unless idle must be maintained for proper operation; for example, drilling, hoisting, and trenching.

Mitigation measure for blasting:

- Use dust abatement techniques such as coverage with blasting mats during blasting.

What Mitigation Measures Might Be Applied during Project Operation? Emissions of NO_x would provide the greatest potential concern during the operation of natural gas compressors on pipelines. NO_x emissions can vary widely depending on the choice of motive power, such as gas turbine or reciprocating engine, and the specific design parameters of the unit. A new compressor station, whether a major source or not, would require a permit from the state or local agency with jurisdiction over the proposed station location. In addition, gas compressor stations would need a FERC permit, which requires, in part, a demonstration that the proposed facility complies with applicable state and federal air quality requirements. These existing requirements should ensure adequate protection for air quality. Additional mitigation should not be needed. The following measures would ensure that the permitting process addresses the air issues of concern:

- Require that emissions from all compressors be properly quantified using procedures approved by the EPA or the state/local agency.
- Require that all appropriate permits for operation have been applied for and obtained prior to final lease approval. If federal approval is involved, require proof that approval has been obtained.
- If the source is locating near a Class I area, discuss relocation with the proponent to reduce impacts in that area.
- If compressor stations are located in close proximity, discuss relocation with the proponent to reduce air impacts.

What Mitigation Measures Might Be Applied during Project Decommissioning? The same mitigation measures could be applied to decommissioning as could be applied to construction. For pipelines, the scale and extent of decommissioning activities, and hence the associated mitigation measures, would be reduced in comparison to construction, particularly if underground sections of pipeline were left in place.

3.7 NOISE

3.7.1 What Are the Noise Levels Associated with Section 368 Energy Corridors in the 11 Western States?

This section briefly discusses basic sound concepts, outdoor sound propagation, noise standards and guidelines, and current background noise levels.

3.7.1.1 What Are the Fundamentals of Sound and Noise?

Any variation of air pressure detectable by the human ear may be considered as sound. Noise is defined as unwanted sound.

Sound pressure levels are measured in units of decibels (dB).[6] The perceived pitch of a sound, which is a psychological property characterized by the highness or lowness of the sound, is determined by its frequency, and the normal audible range of frequencies that a healthy young person can hear is approximately 20 cycles per second (Hz) to 20,000 Hz.

Various scales are used to measure sound, but only sounds in the range of human hearing are of interest. The A-weighted scale, denoted by dBA, approximates the range of human hearing and correlates well with subjective judgments as to the loudness of sounds. A-weighting gives greater emphasis to the sounds in the frequency bands of human speech (1,000 to 4,000 Hz with the greatest sensitivity at 3,000 Hz) and less emphasis to the lower and higher frequencies. A-weighting is widely used in noise standards, guidelines, and ordinances, and is almost universally accepted in analyzing noise and its effects on people.

Sound levels encountered in daily life vary over a wide range. Table 3.7-1 provides sound pressure levels associated with some familiar sources. In general, 0 dB is the quietest sound that can be heard by an average person, called the "threshold of hearing," and 130 dB is so loud as to cause pain, and is called the "threshold of pain."

TABLE 3.7-1 Sound Pressure Levels of Some Familiar Sound Sources

Source	Pressure Level (dBA)
Jet engine (at 82 feet)	140
Rock concert	120
Jointer/planer	100
Heavy truck traffic	80
Business office	70
Normal conversation	60
Library	50
Bedroom	40
Secluded woods	30
Whisper	20

Source: MPCA (1999).

6 The decibel scale is logarithmic, meaning that a 100-fold increase in sound energy corresponds to an increase of 20 dB, not 100 dB. A logarithmic scale uses the logarithm of a physical quantity instead of the quantity itself and is useful for representing quantities like sound levels that can vary over a large range. For example, two measurements of 10 units and 1,000,000,000 units might correspond to values of 1 and 9, respectively, on a logarithmic scale. Logarithmic units also add differently than linear units. For example, if one object is 6 feet long and a second is twice as long, the second object is 12 feet long. For sounds, however, if one sound level is 50 dB and a second is twice as loud, the second sound level is 60 dB, not 100 (2 × 50) dB.

Sound levels generally vary with time, and people's reactions to sounds or noise vary with the time of day. The equivalent continuous sound level (L_{eq}) is a sound level that if maintained continuously during a specific time period would contain the same total energy as sound that varied over that time. For example, L_{eq}(24 hour) is the 24-hour equivalent continuous sound level. The day-night average sound level (L_{dn} or DNL) is the average A-weighted sound level over a 24-hour period with a 10-dB penalty added for nighttime hours (10:00 p.m. to 7:00 a.m.) to account for the fact that people are engaged in more noise-sensitive activities such as sleep during this time. To describe the time-varying characteristics of environmental noise (e.g., traffic noises), statistical noise descriptors, such as L_{10}, L_{50}, and L_{90}, are most commonly used. They are A-weighted noise levels that are exceeded for specified fractions of a defined time period. For example, L_{10} is the sound level that is exceeded 10% of the time (e.g., 6 minutes out of 1 hour), and is considered as the intrusive noise level. L_{50} represents the median noise level, and L_{90} is commonly used as the background level. In addition, "C-weighting" (expressed as dBC) gives equal emphasis over the normal hearing range. It is used when evaluating very loud or very low frequency sounds such as impulsive noises.

Noise effects on people fall into three categories (NWCC 1998):

- Subjective effects such as annoyance, nuisance, and dissatisfaction;
- Interference with activities such as speech, sleep, and learning; and
- Physiological effects such as anxiety, tinnitus, or hearing loss.

Identifying a noise as objectionable depends upon several factors. Discrete tones (tonal noise) are more noticeable and annoying than broadband noise at the same loudness level because they stand out against ambient noises. Impulsive noises such as blasting also tend to be considered particularly objectionable. The circumstances and individual sensitivity of a hearer are also important. The more new noises that exceed the previously existing ambient noise level, the less acceptable they are generally deemed by hearers.

People's responses to changes in sound levels generally exhibit the following characteristics (NWCC 1998; MPCA 1999):

- Except under laboratory conditions, a 1-dB change in sound level is not perceptible,
- A 3-dB change in sound level is considered barely noticeable,
- A 5-dB change in sound level typically results in a noticeable community response, and
- A 10-dB change in sound level (considered a doubling in loudness) will almost certainly cause an adverse community response.

3.7.1.2 How Does Sound Propagate?

Text Box 3.7-1 provides some simple rules governing sound levels. In general, however, prediction of noise levels at a particular location depends on a complex combination of source characteristics and site-specific factors (Anderson and Kurze 1992):

- Source characteristics (geometry and type) such as sound power, directivity, and configuration;
- Geometric spreading (geometric divergence) as the sound moves away from the source, which does not depend on frequency; that is, all frequencies of sound are attenuated at the same rate;

- Absorption of the sound in the atmosphere (air absorption), which depends strongly on the sound frequency and relative humidity, less strongly on temperature, and slightly on pressure;

- Ground attenuation (ground effect) due to sound reflected by ground surfaces interfering with the sound propagating directly from the source to the receptor;

- The topography, structures, and other natural or man-made barriers between the source and the receptor (screening); and

- Meteorological factors (meteorological effects) such as turbulence and variations in vertical wind speed and temperature.

In many screening applications, only geometric spreading is considered when predicting noise levels. A refined analysis would employ a sound propagation model that integrates most of the sound attenuation mechanisms noted above. Such an analysis would generally require detailed source characteristics and site-specific data, such as ground cover, topography, meteorological data, etc. The following discussion considers the effects of vertical wind and temperature gradients (refraction).

At short distances less than 160 feet, the wind has a minor influence on the sound level. At longer distances, the wind effect becomes appreciably greater. Wind speed generally increases with height, and this variation "focuses" it in the downwind direction and creates a "shadow" in the upwind direction. As a result, upwind sound levels will be lower and downwind levels higher than if there were no wind.

Temperature changes with height also play a major role in sound propagation. During the day, air temperature usually decreases with height. In contrast, on a clear night, a "temperature inversion" often exists, in which the air temperature increases with height. In this case, the speed of sound increases with increasing air temperature and with height. During the day, sound bends (refracts) upward as it propagates; during the night, it bends downward under a temperature inversion. Thus, for a particular

Text Box 3.7-1
Sound-Related Rules of Thumb

1. A subjective doubling of loudness corresponds to a 10-dB increase in sound level. For example, 65 dB is perceived as being twice as loud as 55 dB.

2. When the distance from a point source (a source having small spatial extent) is doubled, the sound level drops 6 dB. For example, if the sound level is 65 dB at 50 feet, then it is 59 dB at 100 feet and 53 dB at 200 feet.

3. When the distance from a line source (along thin source like a road) is doubled, the sound level drops 3 dB. For example, if the sound level is 65 dB at 50 feet from a road, then it is 62 dB at 100 feet and 59 dB at 200 feet.

4. A doubling of sound energy increases the sound level by 3 dB. For example, if one source produces a noise level of 60 dB, the noise level from two identical sources would be 63 dB.

5. If the sound levels from two sources differ by 10 dB, the louder source will predominate. For example, if two sources are producing noise levels of 70 dB and 60 dB at a location, the noise level from both sources is 70.4 dB, largely due to the louder source.

The 6-dB and 3-dB rules (Items 2 and 3) are based on only the geometric spreading of sound energy as the sound propagates away form the source. If other attenuation mechanisms such as air absorption or ground effects contribute, more decreases of sound levels would occur.

source and receptor, sound levels would be lower during the day than at night. At night, the noise of distant trains can be heard that would otherwise be indiscernible at daytime. These refractive effects due to temperature are uniform in all directions and differ from those due to wind, which affect mostly the upwind-downwind direction.

3.7.1.3 What Regulations, Standards, and Guidelines Apply to Noise?

At the federal level, the Noise Control Act of 1972 and subsequent amendments (Quiet Communities Act of 1978, 42 USC 4901–4918) delegate the authority to regulate noise to the states and direct government agencies to comply with local noise regulations. Gas pipelines are subject to noise limitations under the FERC.

Of the 11 states in the study area, six states (California, Colorado, Montana, Nevada, Oregon, and Washington) have statutes dealing specifically with noise. Of these, California and Nevada do not have regulatory standards limiting noise levels from sources associated with energy corridor construction and operation.

Tables 3.7-2 to 3.7-4 list the noise limits for Colorado, Oregon, and Washington, respectively. Administrative Rule of Montana 17.20.1607(2)(a) limits noise from electric transmission facilities that average annual noise levels as L_{dn} will not exceed: (1) 50 dBA at the edge of a ROW in residential and subdivided areas unless the affected landowner waives this condition, and (2) 55 dBA at the edge of the property boundaries of substations in residential and subdivided areas. Many local governments have enacted noise ordinances to manage community noise levels. These noise limits typically define noise sources and specify maximum permissible noise levels. They are commonly enforced by police, but may also be enforced by the agency issuing development permits.

EPA guidelines recommend an L_{dn} of 55 dBA as sufficient to protect the public from the effects of broadband environmental noise in quiet outdoor settings and residential neighborhoods (EPA 1974). The guideline recommends an L_{eq} of 70 dBA or less over a 40-year period to protect the general population against hearing loss from nonimpulsive noise. The FAA and the Federal Interagency Committee on Urban Noise have issued land use compatibility guidelines indicating that a yearly L_{dn} of less than 65 dBA is compatible with residential land uses and that, if a community determines it is necessary, levels up to 75 dBA may be compatible with residential uses and transient lodgings (but not mobile homes), if such structures incorporate noise-reduction features (14 CFR 150, Appendix A).

FERC requires natural gas pipelines to demonstrate that stations with compressors will not exceed an L_{dn} of 55 dBA in noise-sensitive areas such as schools, hospitals, and residences (18 CFR 380.12(k)(4)(v)(A)).

3.7.1.4 What Is the Existing Acoustic Environment?

Background noise is noise from all sources other than the source of interest. The background noise level can vary considerably depending on the location, season, and time of day. Background noise levels in a noisy urban setting can be as high as 75 dBA during the day. In isolated outdoor locations with no wind, animals, or running water, background noise may be under 10 dBA. Typical noise levels in rural settings are about 40 dBA during the day and 30 dBA during the night, and in wilderness areas, they are on the order of 20 dBA (Bishop and Schomer 1991). In areas of low population density, DNLs for noise are generally at 35-40 dBA (Miller 2002).

TABLE 3.7-2 Colorado Limits on Maximum Permissible Noise Levels

	Maximum Permissible Noise Level (dBA)[a]	
Zone	7 a.m. to 7 p.m.[b]	7 p.m. to 7 a.m.
Residential	55	50
Commercial	60	55
Light industrial	70	65
Industrial	80	75

[a] At a distance of 25 feet or more from the property line. Periodic, impulsive, or shrill noises are considered a public nuisance at a level 5 dBA less than those tabulated.

[b] The tabulated noise levels may be exceeded by 10 dBA for a period not to exceed 15 minutes in any 1-hour period.

Source: Colorado Revised Statutes, Title 25 "Health: Environmental Control," Article 12 "Noise Abatement." Available at http://198.187.128.12/colorado/lpext.dll?f=templates&fn=fs-main.htm&2.0.

While no information is available providing existing noise levels on federally administered land in areas of potential energy corridor designation, these areas are largely undeveloped, sparsely populated, and remote and would be expected to have background noise DNLs of about 35 dBA or less. In addition to natural background, noise sources could include agricultural activities, oil and gas development, coal mining, trains, low-density traffic on rural roads, recreational activities, and aircraft overflights. The identification of specific noise sources, noise levels, and sensitive receptors such as residences, schools, and hospitals must be accomplished during site-specific analyses.

Text Box 3.7-2
Sensitive Receptors for Noise

There is no standard definition of sensitive noise receptors. Typically included among sensitive receptors are schools, churches, hospitals, libraries, residences, transient lodgings, and/or sleeping areas. In remote or rural areas, Tribal cultural properties and sacred sites and special and sensitive wildlife areas should be considered among noise-sensitive locations at which noise impacts should be assessed.

3.7.2 How Were Potential Noise Impacts of Corridor Designation Evaluated?

Noise impacts would not be expected to occur as a result of corridor designation or land use plan amendments. Rather, impacts would occur only with the construction, operation, and decommissioning of specific energy transport projects. Potential noise impacts of specific projects need to be assessed on the basis of existing noise levels and the anticipated extent and duration of project activities. Additionally, all project-specific activities need to be carried out in compliance with applicable laws, regulations, and leasing stipulations.

Specific projects will be subject to noise impact analyses under the NEPA and state regulations when they are proposed.

TABLE 3.7-3 Oregon Limits on Maximum Permissible Noise Levels from Industrial and Commercial Noise Sources[a,b]

		Allowable Statistical Noise Level[c]	
Source	Descriptor	7 a.m. to 10 p.m.	10 p.m. to 7 a.m.
All[d]	L_{50}	55 dBA	50 dBA
	L_{10}	60 dBA	55 dBA
	L_1	75 dBA	60 dBA
In quiet areas[e]	L_{50}	50 dBA	45 dBA
	L_{10}	55 dBA	50 dBA
	L_1	60 dBA	55 dBA
Impulsive: blasting[f]	Slow response	98 dBC	93 dBC
Impulsive: other[f]	Peak response	100 dB	80 dB

[a] All standards are applied to noise-sensitive properties: schools, churches, hospitals, libraries, or properties normally used for sleeping. They are to be measured 25 feet from the sensitive building or at the sensitive property line, whichever is farther from the noise source.

[b] The environmental director may require that sources meet octave-band and discrete-tone regulations, if these tabulated standards do not provide sufficient protection.

[c] The statistical noise level specifies the noise level that may be exceeded a stated percentage of the time in any hour. For example, L_{10} = 65 dBA means that in any 1 hour, the noise level can equal or exceed 65 dBA up to 10% of the time, or for 6 minutes.

[d] In addition, new sources locating on previously unused sites cannot increase the ambient L_{10} or L_{50} level by more than 10 dBA.

[e] Quiet areas correspond to land or facilities designated as areas where quiet is of extraordinary significance.

[f] The limits for impulsive noise are specified in the C-weighted scale, which is used for loud sounds. Other specifications also apply to impulsive sounds.

Source: Oregon Department of Environmental Quality, Oregon Administrative Rules, Chapter 340, Division 35 “Noise Control Regulations.” Available at http://www.deq.state.or.us/about/rules.htm.

3.7.3 What Are the Potential Noise Impacts of the Alternatives, and How Do They Compare?

Noise levels in the western states are not expected to be impacted by the designation of energy corridors on federal lands or by amendment of land use plans. Noise levels would be affected by the construction, operation, and decommissioning of specific energy transport projects. The following discussions address potential noise impacts that could be incurred with the development of energy transport projects under each of the alternatives evaluated in this PEIS. Detailed noise analyses would be conducted as part of project-specific environmental assessments, and are outside the scope of this PEIS.

TABLE 3.7-4 Washington Maximum Permissible Environmental Noise Levels (dBA)[a]

EDNA of Noise Source	EDNA of Receptor Property[b]		
	Class A[c]	Class B	Class C
Class A	55	57	60
Class B	57	60	65
Class C	60	65	70

[a] These standards may be exceeded by no more than:
5 dBA for 15 minutes,
10 dBA for 5 minutes, or
15 dBA for 1.5 minutes in any 1-hour period.

[b] Environmental Designation for Noise Abatement (EDNA):
Class A: lands where humans reside and sleep,
Class B: lands requiring protection against noise interference with speech, and
Class C: lands involving economic activity where higher noise levels would normally be expected.

[c] Between the hours of 10 p.m. and 7 a.m., the noise limitations in the table shall be reduced by 10 dBA for receiving properties within Class A EDNAs.

Source: Washington Administrative Code, Chapter 173-60 "Maximum Environmental Noise Levels." Available at http://usgovinfo.about.com/gi/dynamic/offsite.htm?site=http://www.leg.wa.gov/.

3.7.3.1 What Are the Potential Noise Impacts of the No Action Alternative?

Under No Action, there would be no designation of Section 368 energy corridors on federal lands. Should energy transport projects be proposed to cross federal lands, they would not be expected to be colocated within a single energy corridor, but rather along several widely spaced and project-specific ROWs. Multiple ROWs could have a greater potential of passing near and impacting a greater number of sensitive receptors than might be affected by a single corridor with colocated energy transport projects.

On the other hand, the wider separation of the individually sited energy transport projects that could occur under No Action could result in less noise impacts than the impacts of developing multiple projects within a single energy corridor because, all other factors being equal, reducing the spacing between similar noise sources would generally increase the maximum noise impacts, while increasing the spacing between noise sources would decrease noise impacts.

Under No Action, individually sited projects would likely have minimal buffer zones between nearby sensitive receptors and the noise sources of an energy transport system and its associated facilities (such as substations, pump stations, and compressor stations). Wider buffer zones, which could occur in a single energy corridor on federal or nonfederal lands with colocated projects, would reduce noise impacts on nearby sensitive receptors. In the absence of wider buffer zones, sensitive receptors would be at greater risk of being affected by noise generated during the construction and operation of colocated projects.

In the absence of dedicated Section 368 energy corridors and an associated expedited permitting process, there could be increased siting of energy transport system ROWs (or portions thereof) on nonfederal lands, with a concomitant shift of potential noise impacts to those lands.

3.7.3.2 What Are the Potential Impacts of the Proposed Action?

Designation of Section 368 energy corridors and land use plan amendments under the Proposed Action is not expected to impact ambient noise within or adjacent to the designated corridors. Ambient noise levels would only be affected with the construction, operation, and decommissioning of specific energy transport projects within designated corridors on ROWs on other federal and nonfederal lands.

3.7.3.3 How Do the Potential Noise Impacts Compare between the Alternatives?

The noise impacts under No Action would be those associated with the construction, operation, and decommissioning of individual energy transport projects, as described in Section 3.7.4.1.

Designating Section 368 energy corridors and land use plan amendments under the Proposed Action would result in no noise impacts.

3.7.3.4 What Mitigation Measures Might Be Applied to Reduce Noise Impacts if Section 368 Energy Corridors Are Designated?

The mitigation measures described in Section 3.7.4.2 would be available to reduce noise impacts caused by individual energy transport projects on federal and nonfederal lands as required to comply with applicable regulations or leasing requirements.

Since there are no noise impacts, no mitigation measures would be required for designating Section 368 energy corridors under the Proposed Action.

3.7.4 Following Corridor Designation, What Types of Noise Impacts Could Result with Project Development, and How Could They Be Minimized, Avoided, or Compensated?

The construction, operation, and decommissioning of energy transport projects would affect ambient noise levels regardless of project location. The following sections discuss the types of project development activities that would affect ambient noise levels on both federal and nonfederal lands and mitigation measures that might be applied to minimize, avoid, or compensate for potential noise impacts from energy transport projects.

3.7.4.1 What Are the Usual Noise Impacts of Building, Operating, and Decommissioning Energy Transport Projects?

Noise impacts involved in construction, operation, and decommissioning of actual energy transport systems would vary from location to location. However, no detailed information on actual energy transport systems was available at the programmatic level for this PEIS. For this analysis, source noise levels for equipment typically associated with activities of interest were taken from standard reference sources (e.g., Hanson et al. 2006) or the open literature.

Factors such as topography, land use, vegetation, and meteorology determine noise propagation and would vary from site to site. Furthermore, a refined analysis would employ an outdoor sound propagation model that integrates most of the sound attenuation mechanisms discussed in Section 3.7.1.2. Such an analysis would require detailed noise source characteristics and site-specific data, which are not available at this time.

Geometric spreading and ground effects due to vegetation and land use over flat terrain and acoustically soft grounds were taken into account in predicting noise levels. Due to geometric spreading, noise levels decrease about 6 dB and 3 dB per doubling of distance from a point and line noise source, respectively. Sound levels can also change because of the character of the ground between the source and receiver. This “ground effect” is a relatively complex acoustic phenomenon, which is a function of ground characteristics, source-to-receiver geometry, and the spectral characteristics of the source. A commonly used rule of thumb for propagation over soft ground (e.g., grass) is that ground effects account for about a 1.5 dB decrease per doubling of distance.

Noise-generating activities for the construction, operation, and decommissioning of the gas/liquid pipelines and electricity transmission lines were identified. Noise levels from these activities were estimated using the source noise level at a reference distance from a noise source and simple sound attenuation formulas that consider geometric spreading and ground effects (Hanson et al. 2006). These estimated noise levels were then compared with applicable noise standards or guidelines.

The following sections describe the usual noise impacts of building, operating, and decommissioning energy transport projects. Discussions of potential impacts that could result from projects in designated corridors and ROWs follow the discussions of the usual impacts.

How Can Construction of Energy Transport Projects Affect Noise Levels? The noise levels created by construction equipment depend on factors such as the type of equipment used, including the specific model; the operation being performed; and the condition of the equipment. This PEIS adopted a simplified approach to estimating construction noise. It assumed that the two noisiest pieces of equipment would operate simultaneously in estimating noise levels at sensitive receptors (Hanson et al. 2006).

At a construction site, the dominant noise sources are generally diesel engines (especially unmuffled engines) operating near a fixed location or with limited movement. In addition, vehicular traffic generates intermittent noise around a construction site and on nearby roads. However, the noise contribution from such intermittent sources is limited to the immediate vicinity of the traffic route and is minor in comparison with the contribution from continuous noise sources, unless it results from heavy traffic.

In areas where mechanical equipment could not break up or loosen the bedrock (e.g., tower foundations or pipeline trenches), explosive blasting would be required. Blasting creates shock waves and ground vibration. If helicopter operation were opted for in remote areas, helicopter noise would be a major source for tower transport and erection. However, these activities are expected to occur infrequently and would mostly occur in uninhabited areas, so no analysis for these activities was made.

Different phases of pipeline construction (e.g., trenching at one location and welding at the other location) would occur simultaneously, and noise sources would be spaced along the segment under construction, so that their impacts would be much lower at nearby receptor locations than if all sources were colocated. At more distant receptor locations, potential impacts from each source would be more nearly equal, but the cumulative noise levels from all activities would be considerably attenuated.

What Might Be the Usual Construction Impacts? In general, construction procedures for gas and liquid pipelines are almost the same. Standard pipeline construction is composed of specific activities including survey and staking of the ROW; site preparation (including clearing, grading, and compacting); trenching; pipe stringing, bending, welding, and lowering-in; backfilling; hydrostatic testing; and cleanup. In addition, construction of the compressor/ pump stations would involve site preparation for concrete foundations for buildings and concrete supports for skid-mounted equipment, followed by erection of compressor enclosures. Construction of meter and regulator stations, mainline valves, and pig launcher/receiver facilities not colocated with the compressor stations would generally be similar to the construction of compressor station sites described above, and would entail site preparation, installation and erection of facilities, hydrostatic pressure testing, cleanup and stabilization, and installation of security fencing around the facilities.

The general sequence of construction activities for electricity transmission lines involves surveying; construction of access roads; ROW clearing; and support structure installation, framing, and stringing. After site preparation, the support structures would be assembled on the ground and erected by a crane. Modification of existing substations or construction of new substations would also be included. As in construction of gas/liquid pipelines, the major noise sources would be heavy equipment such as dozers or graders to level the foundation area and vehicular traffic such as heavy trucks. Helicopters are typically used in rugged, mountainous terrain to transport sections of steel lattice towers and/or poles. If helicopter operation were used, then helicopter noise would occur during tower transport and erection.

For gas/liquid pipelines and electricity transmission lines, some blasting might be required if bedrock occurred at structure locations or, more rarely, to break up or move large boulders that restricted access by construction equipment.

During site preparation, the noisiest activities would involve the use of heavy earthmoving equipment during the first phase of construction. For this analysis, potential noise impacts were estimated for the site preparation phase of compressor/pump stations, which were assumed to occupy 20 acres.

Average noise levels for typical construction equipment range from 74 dBA for a roller to 101 dBA for a pile driver at a distance of 50 feet (Hanson et al. 2006). Most construction equipment used for site preparation (such as dozers, graders, compactors, shovels, and trucks) have noise levels within the range of 80 to 90 dBA at 50 feet. In the analysis, a dozer and a heavy truck producing noise levels of 85 and 88 dBA at 50 feet, respectively, were assumed to operate continuously near a single location, giving a combined noise level of about 90 dBA at a distance of 50 feet.

Activities during site preparation of a pump or compressor station would produce estimated noise levels of about 49–53 dBA at ¼ mile and 43–45 dBA at ½ mile from the construction site boundary. Assuming a construction period of 10 hours per day and rural background noise levels, DNLs would be about 46–49 dBA and 43–44 dBA at ¼ mile and ½ mile, respectively, from the construction site boundary. These levels are well below the EPA guideline of 55 dBA for residential zones (EPA 1974). The 55-dBA limit is estimated to occur about 800 feet from the construction site boundary.

Most construction activities would occur during the day, when noise is better tolerated than at night, because of the masking effects of background noise. In addition, potential noise impacts from construction activities are expected to be temporary and local in nature (up to 120 days or less for the site preparation phase) for compressor and pump stations. No unusual or significant noise impact such as impulsive noise (except for the possibility of blasting, as discussed below) is anticipated from construction activities.

Environmental issues (e.g., disruption of sensitive areas) and rugged terrain may make helicopter use in tower placement cost-effective compared to conventional methods. If helicopters were used for electricity transmission tower construction, noise from these sources operated on a regular basis would be audible at staging areas, tower construction sites, and along flight paths. The helicopters would pick up the towers from the staging areas and place them at each location. With helicopters, tower placement would be performed in a relatively short time, with an average flying time of 4 to 6 minutes between two sites. For example, 24 towers for 230-kV transmission lines were constructed over a 6-mile span in a 2- to 3-day period (DOE and DOI 2004).

Helicopter noise levels range from 77 to 84 dBA during takeoff and from 72 to 77 dBA during landing (distance not provided) (Golden 1979). Sound pressure levels for a helicopter in level flight and traveling at an altitude 500 feet with an airspeed of about 60 knots would range from about 77 to 94 dBA during 4 seconds before and after passing directly overhead (Raney and Cawthorn 1991). Exposure to increased noise intensity, frequency, and duration from helicopter overflights results in increased annoyance. Since helicopters would be used only in relatively remote undeveloped areas, the potential for disturbance to large numbers of residences is small. Because helicopter operations would be infrequent and of short duration, impacts would be limited to staging areas, construction sites, and along flight paths, and would be temporary in nature.

If used, blasting would create a compressional wave in the air, the audible portion of which would be manifested as noise. Blasting activities between the hours of 7 a.m. and 10 p.m. are specifically exempt from noise regulation in some states (for example, Washington). Potential impacts to the closest sensitive receptors could be determined; however, most sensitive receptors probably would be located a considerable distance from the site, given the remote nature of most potential development locations on federal lands.

What Might Be the Potential Construction Impacts of Specific Projects under the Proposed Action? The usual noise impacts just discussed would be incurred during potential construction in corridors designated under Section 368. Under the Proposed Action, construction noise would be generated along 6,112 miles of designated corridor segments on federal lands and ROWs on other federal and nonfederal lands in which gas and liquid pipelines and electricity transmission lines could be constructed. Additional impacts would be caused by the construction of ancillary compressor stations, pump stations, and electric substations and would be associated with similar construction activities on nonfederal and other federal lands. Construction impacts would be similar on both federal and nonfederal lands.

How Can Operation of Energy Transport Projects Affect Noise Levels? Noise impacts were analyzed for continuous and/or widespread operational impacts: compressor/pump station noise for pipelines and corona discharge and substation transformer noise for transmission lines.

Noise sources associated with operation of the energy transport systems would include repair and maintenance activities involving vehicular traffic and/or heavy equipment. Surveillance activities would involve conventional vehicles on established access roads. Often, fixed-wing aircraft or helicopters would provide year-round aerial surveillance, and their noise impacts would be audible in the immediate vicinity of flight paths. Potential noise impacts from these activities would be temporary and limited to areas near the activities.

What Might Be the Usual Operations Impacts? The primary noise sources in a corridor would come from compressor/pump operations. Noise sources associated with operation of transmission lines would be corona effects and substations. Repair and maintenance activities would involve light- or medium-duty vehicular traffic and heavy equipment. The anticipated level of noise from these activities would be far lower and of shorter duration than that from construction. More noisy activities (e.g., mowing, grading, use of chainsaws) for vegetation management within the corridor, whether on federal or nonfederal land, would be infrequent, localized, and of short duration. Traditionally, gas/oil pipelines have been inspected visually by personnel walking along the line or patrolling the pipeline route via light truck or aircraft.

A natural gas compressor station generates noise on a continuous basis during operation. Data were not available for pump station noise, so pump stations were assumed to generate the same level of noise as compressor stations. Internal combustion engines would be the loudest sources at compressor stations. The electric motors driving pumps are expected to be quieter, so this assumption should be conservative.

A typical noise level from compressor stations associated with coal-bed methane development in Colorado was found to be about 50 dBA at 375 feet from the property boundary (La Plata County 2002). Measured noise levels are available for compressor stations located along natural gas pipelines in the State of Washington (FERC 2005). Measured L_{eq}(24 hour)[7] noise levels at locations ranging from 1,250 to 1,800 feet away from one existing compressor station ranged between 42.5 and 44.6 dBA, while those at a 450- to 800-foot distance from another existing compressor were between 38.1 and 47.0 dBA. The noise level at a distance of 50 feet from gas compressor facilities related to federal fluid minerals (oil, gas, and geothermal) leasing in south-central New Mexico was 89 dBA (BLM 2000), which is the highest noise level among available noise levels, and thus is used for this analysis.

Estimated noise levels from a single pump/compressor at ¼ mile and ½ mile from the property boundary would be about 50 and 44 dBA, respectively. Assuming continuous operation, the corresponding DNLs would be about 57 dBA and 51 dBA, respectively. The DNL increases from the estimated sound level due to a nighttime 10-dBA penalty added for the nighttime hours (10 p.m. to 7 a.m.) to account for the fact that people are engaged in more noise-sensitive activities such as sleep during this time (see Section 3.7.1.1). Receptor locations within approximately 1,700 feet (0.3 miles) could experience noise levels in excess of the EPA's 55-dBA guideline for residential zones (EPA 1974).

Noises from compressor stations could become an issue. Accordingly, the compressor equipment (e.g., air intake, exhaust stack) and buildings must be designed to keep noise to a minimum. As noted in ANL (2007b), this noise can be mitigated to meet EPA guideline with appropriate acoustical design. For example, noise mitigation may include construction of noise barriers and/or berms around the facilities or planting of vegetation screens.

If fixed-wing aircraft or helicopters were used for surveillance and monitoring of electricity transmission lines or pipelines, noise from these sources operated on a regular basis would be audible at locations close to the pipeline. Some disturbances of wildlife have been observed as a result of air traffic, particularly helicopters, during pipeline surveillance overflights (BLM 2002).

Noise levels from fixed-wing aircraft during takeoff and landing would be similar to those from helicopters, as discussed previously (Golden 1979).

There is a potential for noise impacts from corona discharge associated with the operation of transmission lines, which relates to the electrical breakdown of air into charged particles caused by the electrical field at the surface of electrical conductors. Corona-generated audible noise from transmission lines is generally characterized as having a crackling or hissing sound. Modern transmission lines are designed, constructed, and maintained so that they operate below the corona-inception voltage during dry conditions, meaning that the lines generate a minimum of corona-related noise. During dry weather conditions, noise from transmission lines is generally indistinguishable from background noise at locations beyond the edge of the ROW (Lee et al. 1996). During rainfall events, the noise level at 100 feet from the center of a 500-kV transmission line tower

7 In general, compressor stations are operated around the clock, so L_{eq}(24 hour) is almost the same as the instantaneous sound level.

would be less than 47 dBA (Lee et al. 1996), which is typical of the noise level in a library. And the noise level at a distance of 300 feet is about 42 dBA, which is typical of the noise level in a bedroom.

If a transmission line were located next to the edge of the ROW corridor, whether on federal or nonfederal land, the sound level at the edge of the ROW (200 feet from the transmission line) would be about 44 dBA and would fall to 35 dBA at ¼ mile from the edge. If a transmission line were located in the center of a 3,500-foot designated energy corridor on federal land, the sound level would be about 35 dBA at the edge of the corridor and 32 dBA at ¼ mile from the edge.

A preliminary study by Pearsons et al. (1979) indicated that corona noise needed to be 10 dBA lower in intensity than other environmental noises to be judged equally as annoying, due to its high-frequency components. Thus, 44 dBA at the edge of a corridor would correspond to the same level of annoyance as 54 dBA for other noise sources. However, at large distances, noise attenuation by air absorption would be significant, especially at high frequencies, so corona noise would tend to decrease faster than other environmental noise. Accordingly, corona noise is easily lost in background noise within short distances from transmission lines.

In arid regions of the 11 western states, corona-generated audible noise would occur infrequently, as most of the areas adjacent to the proposed corridors on federal lands are undeveloped and sparsely populated. Whether occurring on federal or nonfederal land, corona noise would be scarcely discernible within ¼ mile or less from the center of the nearest transmission tower.

There are basically two sources of noise associated with substations: transformer noise and switchgear noise. Each has a characteristic noise spectrum and pattern of occurrence. A transformer produces a constant low-frequency humming noise, primarily because of the vibration of its core. The core's tonal noise would be continuous and uniform in all directions. The average A-weighted core sound level at a distance of 492 feet from a transformer would be about 49 dBA for a 500-million volt-ampere (MVA) transformer (corresponding to about 400 MW, assuming a power factor of 80%) (Wood 1992). For a 500-MVA transformer (assumed to occupy a 10-acre substation), noise levels at distances of ¼ mile and ½ mile from the site boundary would be about 35 and 29 dBA, respectively, ranging between typical daytime and nighttime background levels in a rural environment (Section 3.7.1.4).

Assuming a rural environment and 24-hour operation of a transformer leads to estimated DNLs of about 44 and 41 dBA at ¼ mile and ½ mile, respectively. These values are well below the EPA guideline of 55 dBA for residential zones. Current transformer designs have shown decreases in noise levels. The cooling fans and oil pumps at large transformers produce broadband noise only when additional cooling is required; in general, this noise is less noticeable than tonal noise.

Switchgear noise is generated by the operation of circuit breakers used to break high-voltage connections at 132 kV and above. An arc formed between the separating contacts must be "blown out" using a blast of high-pressure gas. The resultant noise is impulsive in character (that is, loud and of very short duration). The industry is moving toward more modern circuit breakers that use a dielectric gas to extinguish the arc and generate significantly less noise. The frequency of switchgear activities, such as regular testing, maintenance, and rerouting, is governed by the operational practices of the utility companies. During an electrical fault due to line overloads, the switch would open to isolate the fault and thereby protect the equipment. However, these operations would occur infrequently, and, accordingly, potential impacts of switchgear noise would be temporary and minor in nature.

What Might Be the Potential Operations Impacts of Specific Projects under the Proposed Action? The usual noise impacts just discussed would be incurred during potential operations in corridors designated under Section 368. Under the Proposed Action, these impacts would be associated primarily with the operation of compressor stations, pump stations, and electric substations along the 6,112 miles of designated energy corridors as well as transport ROWs on nonfederal and other federal lands.

How Can Decommissioning of Energy Transport Projects Affect Noise Levels? Decommissioning is construction in reverse, but potential noise impacts from decommissioning activities may be lower than those from construction activities. For example, a buried pipeline that has reached the end of its service life might be cleaned and sealed without being removed. Accordingly, potential noise impacts associated with decommissioning activities are expected to be lower than or equal to those associated with construction activities, and thus were not explicitly analyzed.

What Might Be the Usual Decommissioning Impacts? Decommissioning activities would be similar to those used for construction but would be of more limited scale and of shorter duration. Potential noise impacts from decommissioning would thus be correspondingly less than those from construction. The above-ground pipeline at compressor and meter stations would be completely removed, including all related above-ground equipment and foundations, and the station sites restored to as near original condition as possible. However, leaving buried pipelines in place would reduce the amount of trenching and soil disturbance required for decommissioning and contribute to reduced impacts relative to construction. In sum, potential noise impacts from decommissioning activities would be less than or equal to those from construction.

What Might Be the Potential Noise Impacts of Decommissioning Projects under the Proposed Action? As discussed above, the usual impacts of decommissioning an energy transport project would be similar to but less than the impacts during construction of the project. Similarly, the noise impacts of potential decommissioning activities of a specific project in corridors designated under the Proposed Action would be similar to but less than those during construction of the project and could occur anywhere along up to 6,112 miles of designated corridors on federal lands and ROWs on other federal and nonfederal lands.

3.7.4.2 What Mitigation Is Available to Minimize, Avoid, or Compensate for Noise Impacts of Potential Energy Transport Projects?

The following mitigation measures are recommended as ways to reduce potential noise impacts, should development and operation of energy transport projects occur either on federal or nonfederal lands.

For construction-related noise impacts:

- Schedule construction activities and route construction traffic to minimize disruption to nearby residents and existing operations surrounding the project areas.

- Noisy construction activities (including blasting) should be limited to the least noise-sensitive times of day (daytime only between 7 a.m. and 10 p.m.) and to weekdays. In sensitive wildlife areas, they should be limited to between 1.5 hours after sunrise and 1.5 hours before sunset.

- Erect temporary wooden noise barriers around areas where construction equipment would disturb sensitive receptors.

- To the extent possible, locate noisy equipment away from sensitive receptors.

- Whenever feasible, schedule noisy activities to occur at the same time, since additional sources of noise generally do not add noise. That is, less-frequent noisy activities would be less annoying than frequent less-noisy activities.

- If blasting or other noisy activities are required during the construction period, notify nearby residents in advance.

For operations-related noise impacts:

- If possible, minimize trips for surveillance and monitoring of pipelines and/or transmission lines by the energy transport system operating companies.

- Design compressor equipment (including the air intake and exhaust stack) and the enclosing building to incorporate noise attenuation measures or features, such as being lined with sound-absorptive material.

- Require compressor stations, pump stations, and electric substations to demonstrate compliance with applicable state and local noise regulations and ordinances (including EPA's 55-dBA guideline) at the nearest human sensitive receptors. Sensitive wildlife receptors should also be considered. In special areas where quiet or solitude has been identified as a value of concern, require a demonstration that a lower noise level would be met.

For both construction- and operations-related impacts:

- Install suitable mufflers on all internal combustion engines and certain compressor components (DOI and USDA 2006).

- Site compressors/pump stations and/or electric substations as far as practically possible from sensitive human receptors and/or wildlife areas.

- Noise-reduction measures to consider include siting compressors/pump stations and roads to take advantage of topography and distance and constructing engineered sound barriers and/or berms or sound-insulated buildings, if needed, to reduce potential noise impacts at nearby sensitive receptors (DOI and USDA 2006).

3.8 ECOLOGICAL RESOURCES

3.8.1 What Are the Ecological Resources Associated with Section 368 Energy Corridors in the 11 Western States?

This section provides general descriptions of ecological resources in the 11-state area through which the West-wide federal energy corridors would be designated under the Proposed Action.

3.8.1.1 Vegetation and Wetlands in the Affected Area

Vegetative communities occurring within the 11 states of the study area span a great variety of ecosystems, from arid deserts to coastal coniferous forests. Each vegetative community is unique in species composition, richness, diversity, and structure. A wide range of environmental factors, including climate, elevation, aspect, precipitation, and soil type, influence the presence and development of various types of vegetation throughout the region comprising the 11 western states. Because of the great variety and the complexity of vegetation occurring within this area, the area can best be represented by ecoregions.

An ecoregion is an area having general similarity in ecosystems and is characterized by the spatial patterning and composition of biotic and abiotic features, including vegetation, wildlife, geology, physiography, climate, soils, land use, and hydrology, such that within an ecoregion, there is a similarity in the type, quality, and quantity of environmental resources present (EPA 2006b). Ecoregions of North America have been mapped in a hierarchy of four levels, with Level I being the coarsest. Each level consists of subdivisions of the previous (next highest) level. Level IV ecoregions have not been developed for all of the 11 western states. The Level III ecoregion classification includes 34 ecoregions covering the 11-state area (Figure 3.8-1). Ecoregion descriptions and maps that overlay the energy corridor segments with the ecosystems in each state are presented in Appendix Q.

Wetlands occurring within these ecoregions are also extremely varied, and include a number of wetland types such as marshes, bogs, vernal pools, and forested wetlands. Wetland areas are typically inundated or have saturated soils for a portion of the growing season, and support plant communities that are adapted to saturated soil conditions. Streambeds, mudflats, gravel beaches, and rocky shores are wetland areas that may not be vegetated (Cowardin et al. 1979).

Over much of the 11-state area, riparian habitats are important features on the landscape. Riparian vegetation communities occur along rivers, perennial and intermittent streams, lakes, reservoirs, and at springs. These communities generally form a vegetation zone along the margin, which is distinct from the adjacent upland area in species composition and density. Riparian communities are dependent on the stream flows or reservoir levels and are strongly influenced by the hydrologic regime, which affects the frequency, depth, and duration of flooding or soil saturation. Riparian communities may include wetlands; however, the upper margins of riparian zones may be only infrequently inundated. Wetlands are often associated with perennial water sources, such as springs, perennial segments of streams, or lakes and ponds. Riparian areas and wetlands are valued because of the important services they provide within the landscape, such as providing fish and wildlife habitats and maintaining water quality and flood control. The total wetland areas present within each of the 11 western states, based on estimates from the 1980s, range from about 236,350 acres in Nevada to 1,393,900 acres in Oregon (Table 3.8-1). These estimates represent less than 2.5% of the total surface area of any of the 11 states, and less than 1% of the total state surface area for six of the states.

The FS identifies and selects plant and animal species whose population changes are believed to reflect the effects of management activities. These species are referred to as management indicator species, and are identified in the Land and Resource Management Plans of each national forest. They are considered to represent a broader group of species or habitats that occur within the national forest and are considered sensitive to FS management activities. Impacts to these species would be considered in project-specific assessments prepared prior to project development.

TABLE 3.8-1 Wetland Areas in the 11 Western States, 1980s Estimates

State	Wetland Area (acres)	Percent of Surface Area
Arizona	600,000	0.8
California	454,000	0.4
Colorado	1,000,000	1.5
Idaho	385,700	0.7
Montana	840,300	0.9
Nevada	236,350	0.3
New Mexico	481,900	0.6
Oregon	1,393,900	2.2
Utah	558,000	1.0
Washington	938,000	2.1
Wyoming	1,250,000	2.0

Source: Dahl (1990).

FIGURE 3.8-1 Level III Ecoregions in the 11 Western States (Source: EPA 2006b)

3.8.1.2 Aquatic Biota in the Affected Area

Within the 11 western states considered in this PEIS, BLM, FS, and DOE administer lands containing or adjacent to more than 100,000 miles of fish-bearing streams and millions of acres of reservoirs and natural lakes. Aquatic habitats on these lands range from isolated desert springs of the arid Southwest to large interior rivers and their numerous tributaries. This section provides a general description of freshwater aquatic organisms and habitats in the major USGS water resource regions that coincide with the 11-state area where West-wide federal energy corridors could be designated (Figure 3.5-2).

The plant and animal species whose population changes are believed to reflect the effects of management activities are referred to as the management indicator species of each national forest. They are considered to represent a broader group of species or habitats that occur within the national forest and are considered sensitive to FS management activities. Impacts to these species would be considered in project-specific assessments prepared prior to project development.

Pacific Northwest Hydrologic Region. The Pacific Northwest hydrologic region encompasses the states of Washington, Oregon, Idaho, and portions of Montana. In terms of ecological, cultural, and commercial importance, fishes in the family Salmonidae make up the most important group of native fishes found in this hydrologic region. This group of fishes, which includes salmon (e.g., *Oncorhynchus* and *Salmo* spp.), trout (e.g., *Oncorhynchus*, *Salvelinus*, and *Salmo* spp.), Arctic grayling (*Thymallus arcticus*), and whitefish (*Prosopium* spp.), require relatively clear and cold freshwater habitats during part or all of their life cycles, and as such depend greatly on the conditions of surrounding forests and rangelands to ensure their survival (Meehan 1991). General factors that determine the suitability of aquatic habitat for salmonids include flow regime, water quality, habitat structure, food (energy) source, and biotic interactions.

Some species of salmon within this hydrologic region are anadromous (i.e., they spawn in fresh water but spend part of their life cycle at sea). These species require large stream and river systems with direct ocean access. In the Pacific Northwest, streams that support important stocks of anadromous salmon within public lands include those within the Columbia and Snake River basins, as well as a large number of small coastal streams. Because of their need to migrate between ocean and freshwater environments in order to reproduce and become adults, one of the major factors that have affected the distribution and survival of salmon stocks in recent decades is the construction of obstacles to migration (such as dams) in streams and rivers used by these species. Anadromous salmon in the Pacific Northwest Hydrologic Region are managed, in part, under a federal fishery management plan (Pacific Fishery Management Council 2003). Essential fish habitat (EFH; see Text Box 3.8-1) for anadromous salmon in the Pacific Northwest hydrologic region has been identified in more than 100 freshwater stream and river systems within Washington, Oregon, and Idaho (Pacific Fishery Management Council 2000).

Various fish species have been introduced into aquatic systems throughout the Pacific Northwest. Most of these non-native species have been introduced to promote sportfishing opportunities. Introduced salmonids (such as brook [*Salvelinus fontinalis*], brown [*Salmo trutta*], lake [*Salvelinus namaycush*], and rainbow [*Oncorhynchus mykiss*] trout), sunfishes and basses (family Centrachidae), and walleye (*Sander vitreus*) now support much, if not most, of the non-native sportfishing opportunities within the Pacific Northwest and other western hydrologic regions (Mills 1994).

A variety of aquatic invertebrates occur in aquatic habitats of the Pacific Northwest. These

Text Box 3.8-1
Essential Fish Habitat and the Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a federal fisheries management plan. Under the Act, EFH is defined as those waters and substrates necessary for spawning, breeding, feeding, or growth to maturity of managed species. For the purpose of interpreting the definition of EFH, "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110). The MSA requires federal agencies to consult with NOAA fisheries on actions or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (MSA 305(b) (2)). Under the Act, adverse effects on EFH can include any impact that reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption); indirect (e.g., loss of prey or reduction in species fecundity); or site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

The mandate for federal agencies to evaluate potential effects on EFH applies to all species managed under a federal fishery management plan (FMP). The FMP for commercial and recreational salmon fisheries off the coasts of Washington, Oregon, and California (Pacific Fishery Management Council 2003) is the only FMP applicable to the areas that would be traversed by the Section 368 energy corridors that are considered in this PEIS. Amendment 14 of the Pacific Coast Salmon Plan (Pacific Fishery Management Council 2000) contains a complete identification and description of Pacific coast salmon fishery EFH, along with an assessment of actions that could result in adverse impacts and actions to encourage conservation and enhancement of EFH. The Pacific coast salmon fishery EFH includes those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. In estuarine and marine areas, salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (200 nautical miles) offshore of Washington, Oregon, and California north of Point Conception. In freshwater, EFH for anadromous salmon includes all those streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon (except above certain impassable natural barriers) in Washington, Oregon, Idaho, and California.

species can be affected by instream activity (e.g., removal of large woody debris) or disturbances in riparian zones. The diversity of aquatic insects is naturally low in glacier-fed streams, whereas streams flowing through coniferous forests typically support a diverse aquatic invertebrate fauna, including many types of mayflies, stoneflies, and caddisflies (Whittier et al. 1988). The diversity of freshwater mollusks is usually highest in montane spring-fed streams and pools (Forest Ecosystem Management Assessment Team 1993).

Upper Colorado River Hydrologic Region. The Colorado River Basin falls within two hydrologic basins: the Upper and Lower Colorado River hydrologic basins, with a dividing line near Lee's Ferry, Arizona. The Upper Colorado River hydrologic basin is predominantly within a subarid to arid region that includes portions of Wyoming, Colorado, Utah, Arizona, and New Mexico. Falling primarily between the Wasatch Mountains in Utah and the Rocky Mountains in Colorado, this hydrologic region is composed of three major subbasins: the Green River subbasin, the Upper

Colorado River subbasin, and the San Juan-Colorado River subbasin.

Three distinct aquatic zones have been identified in the Upper Colorado River Basin (Joseph et al. 1977). The upper (headwater) zone is characterized by cold and clear water, a high gradient, and a rocky or gravel substrate. An intermediate zone occurs as the streams flow out of the upper zone. Within the intermediate zone, water discharge rates and summer water temperatures increase, and water is turbid during spring runoff and after heavy rainfall. The substrate is generally rocky with occasional expanses of sand. The lower (large-river) zone has warm water, meandering sections, and a low gradient in flat terrain.

Coldwater assemblages in the Upper Colorado River hydrologic region typically include salmonids, such as mountain whitefish (*Prosopium willliamsoni*) or trout. Conditions that support such species are usually found in ponds, lakes, or reservoirs at higher elevations and in the headwaters of selected rivers and streams. Because hypolimnetic releases from dams on some large, deep reservoirs can introduce cold clear waters into rivers, coldwater assemblages have also become established in historically warmwater sections of some rivers, such as the portions of the Green River located immediately downstream of Fontenelle and Flaming Gorge Dams (i.e., tailwaters). Warmwater assemblages typically occur at lower elevations, where waters tend to be warmer and more turbid. Warmwater fish communities within the Upper Colorado River Basin normally include species such as minnows (family Cyprinidae), suckers (family Catostomidae), sunfishes and basses, and catfishes (family Ictaluridae).

Historically, only 12 species of fish were native to the Upper Colorado River Basin, including five minnow species, four sucker species, two salmonids, and the mottled sculpin (*Cottus bairdii*). Four of these native species (humpback chub [*Gila cypha*], bonytail [*Gila elegans*], Colorado pikeminnow [*Ptychocheilus lucius*], and razorback sucker [*Xyrauchen texanus*]) are now federally listed as endangered, and critical habitat for these species has been designated within the Upper Colorado River Basin (Section 3.8.1.4). Water depletions from any portion of the Upper Colorado River drainage basin upstream of Lake Powell are considered to jeopardize the four resident endangered fish species and must be evaluated with regard to the criteria described in the Upper Colorado River Endangered Fish Recovery Program.

In addition to native fish species, more than 25 non-native fish species are present in the basin, often as a result of intentional introductions (e.g., for establishment of sport fisheries). While most of the trout species found within the Upper Colorado River Basin are introduced non-natives (e.g., rainbow, brown, and some strains of cutthroat trout [*Oncorhynchus clarkii*]), mountain whitefish and Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) are native to the basin. Although it was once common within the Upper Green River and Upper Colorado River watersheds, the Colorado River cutthroat trout is now found only in isolated subdrainages in Colorado, Utah, and Wyoming (Behnke 1992; Hirsch et al. 2006).

Lower Colorado, Rio Grande, and Great Basin Hydrologic Regions. The Lower Colorado River, Rio Grande, and Great Basin hydrologic regions include arid areas in most of New Mexico, Arizona, Nevada, and western Utah, and small sections of the eastern edge of California, southeastern Oregon, southeastern Idaho, southern Colorado, and southwestern Wyoming (Figure 3.5-2). The natural hydrologies of southwestern desert rivers and streams are highly variable and episodic, with hydrologic inputs typically occurring in pulses of short duration (Rinne and Stefferud 1997). These natural flow regimes have been considered optimum for sustaining the existing native fish populations (Poff et al. 1997).

Springs occur throughout the desert ecosystem within these hydrologic regions, ranging from quiet pools or seeps to active aquifers. Many larger springs discharge warm water, with temperatures above the mean annual air temperature, and range from fresh to highly mineralized, carrying large amounts of dissolved materials or extremely low dissolved oxygen levels (Naiman 1981). Although there may be relatively few species occurring within these springs and pools, many of the native species that occur are specially adapted to such conditions and are endemic (i.e., native to only a single locality). Some endemic species in springs may not be known, due to a lack of detailed studies within some of these habitats.

Numerous fish species have been introduced, intentionally and accidentally, into these hydrologic regions. Overall, non-native fish species in these hydrologic regions now outnumber natives in terms of numbers of species, population densities, and often biomass at many localities (Griffith and Tiersch 1989; Douglas et al. 1994; Starnes 1995).

Grasses and shrubs cover large expanses of these hydrologic regions, and this vegetation helps to reduce runoff and erosion during the rainy season. Livestock grazing in the region has reduced the quality of vegetative communities in some areas, resulting in increased runoff into some streams during heavy rainfall and localized lowering of water tables (Naiman 1981; Rinne and Minckley 1991).

The native fish community within the Lower Colorado River hydrologic region is dominated by fishes within the minnow and sucker families. The Lower Colorado River itself was historically a warm, turbid, and swift river. Construction of dams and reservoirs within the region has now altered habitat conditions and changed flow regimes by creating a series of cold, clear impoundments. These changes, along with the introduction of non-native fishes and a variety of other anthropogenic influences, have resulted in declines in native fish populations throughout much of the Lower Colorado River Basin. A variety of sensitive native fish species occur within the basin, including the endangered humpback chub and razorback sucker (Section 3.8.1.4).

The Rio Grande River originates in the Rocky Mountains of southwestern Colorado and meanders approximately 1,900 miles across Colorado, New Mexico, and Texas before terminating at the Gulf of Mexico. Public lands within the Rio Grande hydrologic region are limited to the upper and middle reaches of this drainage. Most precipitation in the basin falls as snow near its headwaters or as rain near its mouth, while little water is contributed to the system along the middle reaches of this river. Historically, riparian woodlands in the Rio Grande River Valley were a mosaic of various-aged stands dominated by cottonwood and willow (Cassell 1999). However, conversion of much of this land to residential and agricultural uses has modified this floodplain area, significantly reducing the quantity and quality of wetland and riparian habitats (Levings et al. 1998; Cassell 1999).

Prior to the construction of dams such as the Cochiti Dam, the Rio Grande River had characteristics similar to the Colorado River, with warm water and a high sediment load (Scurlock 1998). Dams, and the resulting reservoirs, have resulted in slower, clearer, and colder water. Modifications of stream habitats within the Rio Grande River Basin due to impoundments, water diversion for agriculture, stream channelization, and the introduction of non-native fishes have affected the abundance and distribution of the Rio Grande silvery minnow (*Hybognathus amarus*), a species that was once widely distributed in the Pecos River, but is now federally listed as endangered. Currently, 157 miles of the Rio Grande River is designated as critical habitat for this species by the USFWS (Section 3.8.1.4).

The Great Basin hydrologic region covers an arid expanse of approximately 190,000 square miles and provides internal drainage between the Wasatch Mountains of Utah and the Sierra

Nevada Range in California and Nevada. Streams in this area never reach the ocean, but instead drain toward the interior of the basin, resulting in terminal lakes such as Mono Lake and the Great Salt Lake, marshes, or sinks that are warm and saline (Moyle 1976).

Many Great Basin fish are adapted to extreme conditions. Trout are predominantly found in lakes and streams at higher elevations within the basin (Behnke 1992). Bonneville cutthroat trout (*Oncorhynchus clarki utah*) have persisted in the isolated, cool mountain streams of the eastern Great Basin, while Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) populations occupy small, isolated habitats throughout the basin. These trout species can tolerate high temperatures (greater than 80°F) for short periods of time and can tolerate daily fluctuations in temperatures of 25 to 35°F. They are also quite tolerant of high alkalinity and dissolved solids (Behnke 1992; Coffin and Cowan 1995).

Water diversions, subsistence harvest, and stocking with non-native fish have caused the extirpation of the Bonneville cutthroat trout from most of its range within the Great Basin. Lahontan cutthroat trout, which were once common in desert lakes and large rivers, such as Humboldt River, Truckee River, and Walker River, have declined in numbers overall and have disappeared in many areas (USFWS 1994). Various native and non-native minnows are common throughout streams and lakes of the Great Basin. Native pupfish (family Cyprinodontidae) species, which are tolerant of high-temperature ranges compared to many other fish species, occur in thermal artesian springs and some streams in portions of Nevada (Feldmeth 1981).

California Hydrologic Region. Primarily composed of areas within the state of California, the California hydrologic region can be divided into distinct northern and southern freshwater fish habitat regions. The northern region extends from the Oregon border south to Sacramento (the southernmost extent of anadromous salmon distribution in North America). This region includes rain-fed coastal streams, snow-fed streams of western Sierra Nevada, and the Central and San Joaquin Valleys. Habitat characteristics and the associated fish assemblages are relatively similar to those observed in the western portion of the Pacific Northwest hydrologic region. The northern portion of the California hydrologic region also contains EFH for anadromous Pacific salmon (Text Box 3.8-1).

Freshwater fish habitats within the southern portion of the California hydrologic region are located predominantly within the arid southeastern portion of the state and include numerous rivers and lakes. As described above for the Lower Colorado River and Great Basin hydrologic regions, native fish communities, including pupfish and minnow species, occur in the lower elevations, and cutthroat trout populations occur in the mountainous regions.

Missouri River Basin Hydrologic Region. Within the 11-state area considered in this PEIS, the Missouri River Basin hydrologic region includes portions of Montana, Wyoming, and Colorado. Historically, the Missouri River carried a heavy silt load, collected from tributaries in the northern part of its drainage. Its wide and diverging channel created shifting sandy islands, spits, and pools, resulting in fish species suited to its turbid and dynamic conditions. Many of the fish communities within the upper reaches of the Missouri River are considered benthic fishes, and include sturgeon (family Acipenseridae) and minnows (Duffy et al. 1996; Pegg and Pierce 2002).

Public lands in Montana occur predominantly in the northeastern portion of the state in the Milk River Basin subsection of the Missouri River Basin. This area has relatively high densities of depressional wetlands, often called prairie potholes, as they are dominated by shortgrass prairies. The upper reaches of the Missouri River and its major tributaries maintain the healthiest fish populations in the basin (White and Bramblett 1993). However, dams built along the mainstem of the Missouri River in Montana, such as the Fort Peck Dam, have altered flows and sediment transport and impede fish migration patterns. These changes have contributed to the decline of many native mainstem species, including paddlefish (*Polyodon spathula*), sturgeon, and several species of chub (family Cyprinidae).

Introduced species, such as rainbow trout, have been stocked throughout Montana. Rainbow trout have adapted well to the wide range of habitats available within the basin. The species has successfully integrated into this aquatic system, and has caused a severe reduction in the range of native cutthroat trout through hybridization and competition. Other introduced species that have adapted well to the modifications of the Missouri River drainage in Montana include smallmouth bass (*Micropterus dolomieu*), walleye, and white crappie (*Pomoxis annularis*).

Portions of Wyoming east of the Continental Divide are drained by the Missouri River Basin, while southwest portions of the state drain into the Upper Colorado River Basin. Native and introduced salmonids such as rainbow, brook, and cutthroat trout dominate fish communities within these areas. Streams flowing through the arid desert plains of Wyoming are characterized by low gradients and meandering or braided channels with sand and gravel substrates. Riparian vegetation in this area is dominated by cottonwoods, willows, shrubs, and grasses. Central and northern Wyoming are considered high cold desert. Native and non-native minnows and suckers dominate fish communities in these areas.

3.8.1.3 Wildlife in the Affected Area

As discussed in Section 3.8.1.1, the various ecoregions encompassed in the 11-state region include a diversity of plant communities and species that provide a wide range of habitats that support diverse assemblages of terrestrial wildlife (including wild horses [*Equus caballus*] and burros [*E. asinus*]).[8] Table 3.8-2 lists the number of wildlife species that occur within the 11 western states. Due to the spatial extent of the Section 368 energy corridor segments within the western states, many of the ecosystems occurring in these states would contain one or more segment. (See Appendix Q for maps that overlay the energy corridor segments with the ecosystems in each state.) Therefore, many of the wildlife species that occur within these states may be expected to occur within or near a corridor segment or associated ancillary facilities. The wildlife species that may be associated with any particular segment would depend on the plant communities and habitats present within the corridor segment.

The BLM and FS have active wildlife management programs within each of their field or district offices. Wildlife management programs are largely aimed at habitat protection and improvement. The general objectives of wildlife management are to (1) maintain, improve, or enhance wildlife species diversity while ensuring healthy ecosystems; and (2) restore disturbed or altered habitat with the objective of obtaining desired native plant communities, while providing for wildlife needs and soil stability. The FS and BLM are primarily responsible for managing habitats, while state agencies (e.g., Colorado Department of Natural Resources, Utah Department of Wildlife Resources, and Wyoming Game and Fish Department) have the responsibility for managing the big game, small game, and

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[8] Wild horses and burros are not considered to be, nor are they managed as, "wildlife" on BLM-administered lands. They are managed as a separate resource management category under the Wild Free-Roaming Horses and Burros Act (16 USC 1331 et seq.). However, as wild horses and burros would be impacted by construction, operation, and decommissioning of ROWs in a similar manner to other large mammals, they are addressed within the wildlife sections for ease of discussion.

TABLE 3.8-2 Number of Wildlife Species in the 11 Western States[a]

State	Amphibians	Reptiles	Mammals[b]	Birds
Arizona	29	112	169	533
California	68	90	182	626
Colorado	18	56	131	478
Idaho	15	24	111	402
Montana	18	17	110	417
Nevada	15	54	125	472
New Mexico	25	96	156	510
Oregon	31	29	137	492
Utah	17	57	136	428
Washington	27	22	116	468
Wyoming	12	27	121	420

[a] Excludes marine species, native species that have been extirpated and not subsequently reintroduced into the wild, and feral domestic species.

[b] Includes wild horses and burros.

Sources: AGFD (2006); American Society of Mammalogists (1999); Burke Museum of Natural History and Culture (2006); CDFG (2006); CDW (2006); Colorado Herpetological Society (2006); Hole (2005); Idaho Fish and Game (2006a,b); Lepage (2006); McLaren (2001); Montana Fish, Wildlife & Parks (undated); NNHP (2002); Titus (undated); UDWR (2006); WGFD (2006).

nongame wildlife species in cooperation with BLM and FS. The USFWS has oversight of migratory bird species and of all federal threatened, endangered, proposed, or candidate species. BLM and FS guidelines for the management of threatened and endangered species are provided in Section 3.8.1.4.

The FS identifies and selects plant and animal species whose population changes are believed to reflect the effects of management activities. These species are referred to as management indicator species, and are identified in the Land and Resource Management Plans of each national forest. They are considered to represent a broader group of species or habitats that occur within each national forest and are considered sensitive to FS management activities. Impacts to these species would be considered in project-specific assessments prepared prior to project development.

The Wild Free-Roaming Horses and Burros Act (16 USC 1331 et seq.) passed by Congress in 1971 gave BLM the responsibility to protect, manage, and control wild horses and burros. The general management objectives for wild horses are to (1) protect, maintain, and control viable, healthy herds with diverse age structures while retaining their free-roaming nature; (2) provide adequate habitat for wild horses through the principles of multiple use and environmental protection; (3) maintain a thriving natural ecological balance with other resources; (4) provide opportunities for the public to view wild horses; and (5) protect wild horses from unauthorized capture, branding, harassment, or death (BLM 1997, 2005d).

Consumptive and nonconsumptive recreational uses are associated with wildlife within BLM- and FS-administered lands. These include hunting of big game, small game, upland game birds, and waterfowl; fur trapping; wildlife viewing; and antler hunting.

The following discussions present general descriptions of the wildlife species and wild horses and burros that may occur on BLM- and FS-administered lands where energy corridors may be designated.

Amphibians and Reptiles. The 11 western states in which designation of federal energy corridors may occur on BLM- and FS-administered lands support a wide variety of amphibians and reptiles, many of which may occur at or in the vicinity of individual corridor segments. The number of amphibian species reported from these states ranges from as few as 12 species reported from Wyoming to 68 species reported from California. The number of reptile species reported from these states ranges from 17 species in Montana to 112 species in Arizona (Table 3.8-2). The amphibians reported from these states include frogs, toads, and salamanders that occupy a variety of habitats that include forested headwater streams in mountain regions, marshes, and wetlands, and xeric habitats in the desert areas of the Southwest. The reptile species include a wide variety of turtles, snakes, and lizards. Amphibian and reptile species that are threatened or endangered are listed in Table 3.8-5 (Section 3.8.1.4).

Birds. Several hundred species of birds have been reported from the 11 western states where federal energy corridor designation may occur (Table 3.8-2). The number of bird species ranges from 402 in Idaho to 626 in California (Lepage 2006). The coastal states (California, Oregon, and Washington) include oceanic species such as boobies, gannets, frigatebirds, fulmars, and albatrosses that would not be expected to occur in areas where energy corridor designation may occur. Bird species that are threatened or endangered are listed in Table 3.8-5 (Section 3.8.1.4).

Within the 11 western states, a number of important bird areas (IBAs) have been identified by the National Audubon Society. IBAs are locations that provide essential habitats for breeding, wintering, or migrating birds. While these sites can vary in size, they are discrete areas that stand out from the surrounding landscapes. IBAs must support one or more of the following:

- Species of conservation concern (e.g., threatened or endangered species);
- Species with restricted ranges;
- Species that are vulnerable because their populations are concentrated into one general habitat type or ecosystem; or
- Species or groups of similar species (e.g., waterfowl or shorebirds) that are vulnerable because they congregate in high densities.

The IBA program has become a key component of many bird conservation efforts (National Audubon Society 2005). Information on the IBA program and a list of IBAs for each state can be found at: http://www.audubon.org/bird/iba/index.html.

Migratory Routes. Many of the bird species occurring in the 11 western states are seasonal residents within individual states and exhibit seasonal migrations. These birds include waterfowl, shorebirds, raptors, and neotropical songbirds. The 11 western states where energy corridor designation may occur fall within two of the four major North American migration flyways (Lincoln et al. 1998), the Central Flyway and the Pacific Flyway (Figure 3.8-2). These pathways are used in spring by birds migrating north from wintering areas to breeding areas, and in fall by birds migrating southward to wintering areas.

The Central Flyway includes the Great Plains–Rocky Mountain routes (Lincoln et al. 1998). These routes extend from the northwest Arctic coast southward between the Mississippi River and the eastern base of the Rocky Mountains and encompass all or most of the states of Wyoming, Colorado, and New Mexico, and portions of Montana, Idaho, and Utah (Figure 3.8-2). In western Montana, this flyway crosses the Continental Divide and passes through the Great Salt Lake Valley before turning eastward. This flyway is relatively simple, with the majority of birds making relatively direct north and south migrations between northern breeding grounds and southern wintering areas.

The Pacific Flyway includes the Pacific Coast Route, which occurs between the eastern base of the Rocky Mountains and the Pacific coast of the United States. This flyway encompasses the states of California, Nevada, Oregon, and Washington, and portions of Montana, Idaho, Utah, Wyoming, and Arizona (Figure 3.8-2). Birds migrating from the Alaskan Peninsula follow the coastline to near the mouth of the Columbia River, then travel inland to the Willamette River Valley before continuing southward through interior California (Lincoln et al. 1998). Birds migrating south from Canada pass through portions of Montana and Idaho and then migrate either eastward to enter the Central Flyway, or turn southwest along the Snake and Columbia River valleys and then continue south across central Oregon and the interior valleys of California (Birdnature.com 2006). This route is not as heavily used as some

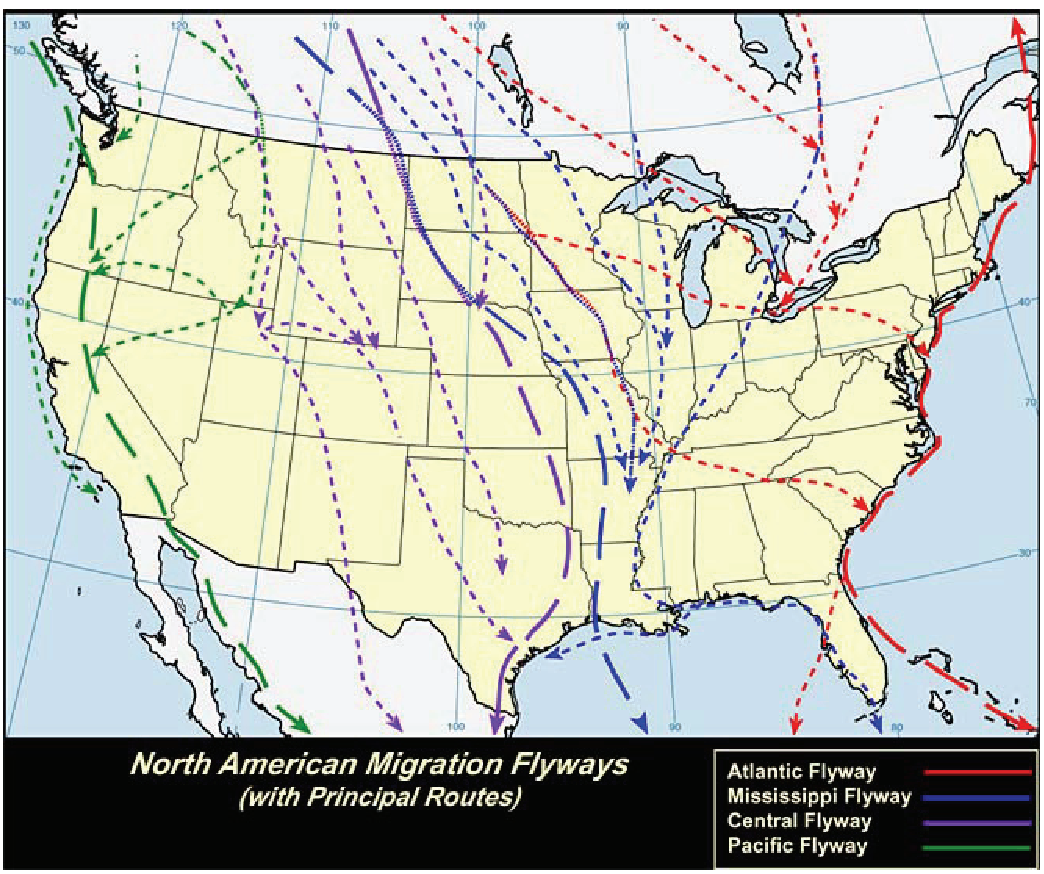

FIGURE 3.8-2 North American Migration Flyways (Source: Birdnature.com [2006], used with permission)

of the other migratory routes in North America (Lincoln et al. 1998).

Waterfowl, Wading Birds, and Shorebirds. Waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (plovers, sandpipers, and similar birds) are among the more abundant groups of birds from the 11 western states. Many of these species exhibit extensive migrations from breeding areas in Alaska and Canada to wintering grounds in Mexico and southward (Lincoln et al. 1998). While many of these species nest in Canada and Alaska, a number of species such as the American avocet (*Recurvirostra americana*), willet (*Catoptrophorus semipalmatus*), spotted sandpiper (*Actitis macularia*), gadwall (*Anas strepera*), and blue-winged teal (*A. discors*) also nest in suitable habitats in many of the western states (National Geographic Society 1999). Most are ground-level nesters, and many sometimes forage in relatively large flocks on the ground or water. Within the region, migration routes for these birds are often associated with riparian corridors and wetland or lake stopover areas (BLM 2005a).

Major waterfowl species hunted in the 11 western states include the mallard (*Anas platyrhynchos*) and Canada goose (*Branta canadensis*). Other species commonly hunted include gadwall, American widgeon (*A. americana*), teal (*A.* spp.), northern pintail (*A. acuta*), northern shoveler (*A. clypeata*), and snow goose (*Chen caerulescens*) (USFWS 2003). A hunting season also occurs for sandhill cranes (*Grus canadensis*) in some of the states. Various conservation and management plans exist for waterfowl, shorebirds, and waterbirds.

Neotropical Migrants. Songbirds of the order Passeriformes represent the most diverse category of birds, with the warblers and sparrows representing the two most diverse groups of passerines. The passerines exhibit a wide range of seasonal movements, with some species remaining as year-round residents in some areas and migratory in others, and still other species undergoing migrations of hundreds of miles or more (Lincoln et al. 1998). Nesting occurs in vegetation from near ground level to the upper canopy of trees. Some species, such as the thrushes and chickadees, are relatively solitary throughout the year, while others, such as swallows and blackbirds, may occur in small to large flocks at various times of year. Foraging may occur in flight (i.e., swallows and swifts) or on vegetation or the ground (i.e., warblers, finches, and thrushes). Various conservation and management plans exist for neotropical migrants, including the Partners in Flight North American Landbird Conservation Plan (Rich et al. 2004).

The regulatory framework organized to protect the neotropical migrants includes:

- *Migratory Bird Treaty Act.* The Migratory Bird Treaty Act implements a variety of treaties and conventions between the United States, Canada, Mexico, Japan, and Russia. This treaty makes it unlawful to take, kill, or possess migratory birds, as well as their eggs or nests. Most of the bird species reported from the 11 western states are classified as migratory under this act.

- *Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds*. Under this Executive Order, each federal agency that is taking an action that could have, or is likely to have, negative impacts on migratory bird populations must work with the USFWS to develop a Memorandum of Understanding (MOU) to conserve those birds. The MOUs developed by this consultation are intended to guide future agency regulatory actions and policy decisions.

Birds of Prey. The birds of prey include the raptors (hawks, falcons, eagles, kites, and osprey), owls, and vultures, and many of these species represent the top avian predators in many ecosystems. Common raptor and owl species include the red-tailed hawk (*Buteo jamaicensis*), sharp-shinned hawk (*Accipiter striatus*), northern harrier (*Circus cyaneus*), Swainson's hawk (*B. swainsoni*), American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), short-eared owl (*Asio flammeus*), and burrowing owl (*Athene cunicularia*). The raptors and owls vary considerably among species with regard to their seasonal migrations, with some species being nonmigratory (year-round residents), others being migratory in the northern portions of their ranges and nonmigratory in the southern portions of their ranges, and still other species being migratory throughout their ranges.

The raptors forage on a variety of prey, including small mammals, reptiles, other birds, fish, invertebrates, and, at times, carrion. They typically perch on trees, utility support structures, highway signs, and other high structures that provide a broad view of the surrounding topography, and may soar for extended periods of time at relatively high altitudes. The raptors forage from either a perch or on the wing (depending on the species), and all forage during the day. The owls also perch on elevated structures and forage on a variety of prey, including mammals, birds, and insects. Forest-dwelling species typically forage by diving on a prey item from a perch, while open country species hunt on the wing while flying low over the ground. While generally nocturnal, some owl species may be active during the day (Owl Research Institute 2004).

The vultures are represented by three species: the turkey vulture (*Cathartes aura*), which occurs in each of the western states; the black vulture (*Coragyps atratus*), which is reported from Arizona, California, and New Mexico; and the endangered California condor (*Gymnogyps californianus*), reported from Arizona and California. These birds are large soaring scavengers that feed on carrion.

The bald eagle (*Haliaeetus leucocephalus*) and golden eagle are protected under the Bald and Golden Eagle Protection Act (16 USC 668–668d, 54 Stat. 250, as amended), which prohibits the taking or possession of, or commerce in, bald and golden eagles, with limited exceptions for permitted scientific research and Native American religious purposes. The 1978 amendment authorizes the Secretary of the Interior to permit the taking of golden eagle nests that interfere with resource development or recovery operations. The BLM and FS field or district offices also have specific management guidelines for raptors, including golden eagles.

Upland Game Birds. Upland game birds that are native to the 11 western states include blue grouse (*Dendragapus obscurus*), ruffed grouse (*Bonasa umbellus*), greater sage-grouse (*Centrocercus urophasianus*), Gunnison sage-grouse (*C. minimus*), lesser prairie chicken (*Tympanuchus pallidicinctus*), Gambel's quail (*Callipepla gambelii*), California quail (*C. californica*), scaled quail (*C. squamata*), mountain quail (*Oreortyx pictus*), and mourning dove (*Zenaida macroura*); introduced species include ring-necked pheasant (*Phasianus colchicus*), chukar (*Alectoris chukar*), gray partridge (*Perdix perdix*), and wild turkey (*Meleagris gallopavo*). All of the upland game bird species within the states are year-round residents. Ring-necked pheasants and greater sage-grouse have experienced long-term declines due to the degradation and loss of important sagebrush-steppe and grassland habitats (BLM 2005d).

Most concerns about upland game birds in the 11 western states have focused on the greater sage-grouse. Greater sage-grouse require contiguous, undisturbed areas of high-quality habitat during their four distinct seasonal periods: (1) breeding, (2) summer-late brooding and rearing, (3) fall, and (4) winter (Connelly et al. 2000). Sagebrush is important to the greater sage-grouse for forage and for roosting cover, and the greater sage-grouse cannot survive where sagebrush does not exist (USFWS 2004). The distance between leks (strutting grounds) and nesting sites can exceed 12.4 miles (Connelly et al. 2000; Bird and Schenk 2005). The annual movements of migratory populations can exceed 60 miles, and these populations can have home ranges that exceed 580 square miles (Bird and Schenk 2005). However, the greater sage-grouse has a high fidelity to a seasonal range. They also return to the same nesting areas annually (Connelly et al. 2000, 2004).

Leks are generally areas supported by low, sparse vegetation or open areas surrounded by sagebrush that provide escape, feeding, and cover. They can range in size from small areas of 0.1 to 10 acres to areas of 100 acres or more (Connelly et al. 2000). Nesting generally occurs 1 to 4 miles from lek sites, although it may range up to 11 miles (BLM 2004a). Suitable winter habitat requires sagebrush 10 to 14 inches above snow level with a canopy cover ranging from 10 to 30%. Wintering grounds are potentially the most limiting seasonal habitat for greater sage-grouse (BLM 2004a).

While no single or combination of factors has been proven to have caused the decline in greater sage-grouse numbers over the past half-century, the decline in greater sage-grouse populations is believed to be the result of a number of factors, including oil and gas wells and their associated infrastructure, traffic, power lines, urbanization, recreation, predators, and a decline in the quality and quantity of sagebrush habitat (due to alteration of historical fire regimes, water developments, drought, use of herbicides and pesticides, livestock and wild horse grazing, and establishment of invasive species) (see Connelly et al. 2000; Lyon and Anderson 2003; WDGF 2003; Crawford et al. 2004; Holloran 2005; Holloran et al. 2005; Rowland 2004; Schroeder et al. 2004; Bird and Schenk 2005; Braun 2006; Uinta Basin Adaptive Resource Management Local Working Group 2006; Aldridge and Boyce 2007; Bohne et al. 2007; Southwest Wyoming Local Sage-grouse Working Group 2007; Walker et al. 2007; Colorado Greater Sage-grouse Steering Committee 2008; Doherty et al. 2008 and references cited therein). West Nile virus is also a significant stressor of greater sage-grouse (Naugle et al. 2004).

The BLM manages more habitats for greater sage-grouse than any other entity; therefore, it has developed a National Sage-Grouse Habitat Conservation Strategy for BLM-administered public lands to manage public lands in a manner that will maintain, enhance, and restore greater sage-grouse habitat while providing for multiple uses of BLM-administered public lands (BLM 2004e). The strategy is consistent with the individual state sage grouse conservation planning efforts. The purpose of this strategy is to set goals and objectives, assemble guidance and resource materials, and provide more uniform management directions for the BLM's contributions to the multistate sage grouse conservation effort being led by state wildlife agencies (BLM 2004e).

Text Box 3.8-2 (Section 3.8.4.1) addresses the sage grouse in more detail.

Mammals. A variety of mammal species have been reported from each of the 11 western states (Table 3.8-2), ranging from 110 species in Montana to 182 species in California. These totals include wild horses that occur in all states except Washington and wild burros that occur in Arizona, California, Nevada, Oregon, and Utah (NatureServe 2006). Feral cats (*Felis catus*) and dogs (*Canis familiaris*) also occur in the region. The following discussion emphasizes big game and small mammal species that (1) have key habitats within or near the areas that could be developed for energy transport, (2) are important to humans (e.g., big and small game and furbearer species), and/or (3) are representative of other species that share important habitats. Wild horses and burros are discussed at the end of this section. Threatened and endangered mammal species are discussed in Section 3.8.1.4.

The primary big game species within the region include elk (*Cervis canadensis*), mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), moose (*Alces americanus*), American bison (*Bos bison*), American black bear (*Ursus americanus*), and cougar (*Puma concolor*). Several other big game species occur within a few states. These include the African oryx (*Oryx gazella*), ibex (*Capra ibex*), and barbary sheep (*Ammotragus lervia*) in New Mexico; javelina (*Pecari tajacu*) in Arizona and New Mexico; and the wild pig (*Sus scrofa*) in California.

A number of the big game species make migrations when seasonal changes reduce food availability, when movement within an area becomes difficult (e.g., due to snow pack), or where local conditions are not suitable for calving or fawning. Established migration corridors for these species provide an important transition habitat between seasonal ranges and provide food for the animals during migration (Feeney et al. 2004). Maintaining genetic interchange through landscape linkages among subpopulations is also essential for long-term survival of species. Maintaining migration corridors and landscape linkages, especially when seasonal ranges or subpopulations are far removed from each other, can be difficult due to the various land ownership mixes that often need to be traversed (Sawyer et al. 2005).

The following presents a generalized overview of the primary big games species. Table 3.8-3 presents the conservation status (i.e., whether a species is thriving or is rare or declining) these species within the 11 western states.

Elk. Elk are generally migratory between their summer and winter ranges (BLM 2004b), although some herds do not migrate (i.e., occur within the same area year-round) (UDWR 2005). Their summer range occurs at higher elevations. Aspen and conifer woodlands provide security and thermal cover, while upland meadows, sagebrush/mixed grass, and mountain shrub habitats are used for forage. Their winter range occurs at mid-to-lower elevations where they forage in sagebrush/mixed grass, big sagebrush/rabbitbrush, and mountain shrub habitats (BLM 2004c). They are highly mobile within both summer and winter ranges in order to find the best forage conditions. In winter, they congregate into large herds of 50 to more than 200 individuals (BLM 2004b). The crucial winter range is considered to be the part of the local elk range where about 90% of the local population is located during an average of five winters out of ten from the first heavy snowfall to spring green-up (BLM 2005d). Elk calving generally occurs in aspen-sagebrush parkland vegetation and habitat zones during late spring and early summer (BLM 2004b). Calving areas are mostly located where cover, forage, and water are in close proximity (BLM 2005d). They may migrate up to 60 miles annually (NatureServe 2006). Elk are susceptible to chronic wasting disease (BLM 2004b).

Mule Deer. Mule deer occur within most ecosystems within the region, but attain their highest densities in shrublands characterized by rough, broken terrain with abundant browse and cover (BLM 2005d). Home range size can vary from 74 to 593 acres or more, depending on the availability of food, water, and cover (NatureServe 2006). Some populations of mule deer are resident (particularly those that inhabit plains), but those in mountainous areas are generally migratory between their summer and winter ranges (BLM 2004c; NatureServe 2006). In arid regions, they may migrate in response to rainfall patterns (NatureServe 2006). In mountainous regions, they may migrate more than 62 miles between high summer and lower winter ranges (NatureServe 2006). In western Wyoming, mule deer migrate 12.4 to 98.2 miles (Sawyer et al. 2005). Their summer range occurs at higher elevations that contain aspen and conifers and mountain browse vegetation. Fawning occurs during the spring while they are

TABLE 3.8-3 State Conservation Status Ranks for the Big Game Species in the 11 Western States

Species	State Conservation Status Rank[a]										
	AZ	CA	CO	ID	MT	NM	NV	OR	UT	WA	WY
Elk (*Cervis canadensis*)	U	AS	S	S	S	V	S	S	AS	S	S
Mule deer (*Odocoileus hemionus*)	S	S	S	S	S	S	S	AS	S	S	S
White-tailed deer (*Odocoileus virginianus*)	S	–	S	S	S	AS	–	U	CI	S	S
Pronghorn (*Antilocapra americana*)	S	AS	AS	S	S	S	S	AS	AS	PE	S
Bighorn sheep (*Ovis canadensis*)	AS	V	AS	V	AS	CI	V	I	V	V	V
Moose (*Alces americanus*)	–	–	E	S	S	–	–	–	V	I	S
American bison (*Bos bison*)	E	U	PE	CI	I	U	PE	PE	I	PE	CI
American black bear (*Ursus americanus*)	S	S	S	S	S	AS	AS	AS	V	S	S
Cougar (*Puma concolor*)	AS	S	AS	S	AS	V	S	AS	AS	AS	AS

[a] U (unranked) – conservation status not yet assessed.

AS (apparently secure) – uncommon but not rare, some cause for long-term concern due to declines or other factors.

S (secure) – common, widespread, and abundant.

V (vulnerable) – vulnerable due to a restricted range, relatively few populations (often 80 or fewer), recent or widespread declines, or other factors making it vulnerable to extirpation.

– = the state is not within the species' range.

CI (critically imperiled) – critically imperiled because of extreme rarity (often 5 or fewer occurrences) or because some factors such as very steep declines make it especially vulnerable to extirpation.

PE (presumed extirpated) – assumed that a wild population no longer occurs.

I (imperiled) – imperiled because of rarity due to a very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation.

E (exotic) – non-native, present due to direct or indirect human interaction.

Source: NatureServe (2006).

migrating to their summer range. This normally occurs in aspen-mountain browse intermixed vegetation (BLM 2004b).

Mule deer have a high fidelity to specific winter ranges where they congregate within a small area at a high density. Their winter range occurs at lower elevations within sagebrush and pinyon-juniper vegetation. Winter forage is primarily sagebrush, with true mountain mahogany, fourwing saltbush, and antelope bitterbrush also being important. Pinyon-juniper provides emergency forage during severe winters (BLM 2004b). Overall, mule deer habitat is characterized by areas of thick brush or trees (used for cover) interspersed with small openings (for forage and feeding areas); they do best in habitats that are in the early stage of succession (UDWR 2003). Prolonged drought and other factors can limit mule deer populations. Several years of drought can limit forage production, which can substantially reduce animal condition and fawn production and survival. Severe drought conditions were responsible for declines in the population size of mule deer in the 1980s and early 1990s (BLM 2004b). In arid regions, they are seldom found more than 1.0 to 1.5 miles from water (BLM 2004a). Mule deer are also susceptible to chronic wasting disease. When present, up to 3% of a herd's population can be affected by this disease. Some deer herds in Colorado and Wyoming have experienced significant outbreaks of chronic wasting disease (BLM 2004b).

White-tailed Deer. White-tailed deer inhabit a variety of habitats, but are often associated with woodlands and agricultural lands (CDW 2006). Within arid areas, they are mostly associated with riparian zones and montane woodlands that have more mesic conditions. They can also occur within suburban areas. Urban areas and very rugged mountain terrain are unsuitable habitats (NatureServe 2006). White-tailed deer occur in two social groups: (1) adult females and young and (2) adult and occasionally yearling males, although adult males are generally solitary during the breeding season except when with females (NatureServe 2006). The annual home range of sedentary populations can average as high as 1,285 acres, while some populations can undergo annual migrations of up to 31 miles. In some areas, the density of white-tailed deer may exceed 129 per square mile (NatureServe 2006). Snow accumulation can have a major controlling effect on populations (NatureServe 2006). They mostly feed upon agricultural crops, browse, grasses, and forbs, but also consume mushrooms, acorns, fruits, and nuts (CDW 2006; UDWR 2006). They often cause damage when browsing in winter on ornamental plants around homes (NatureServe 2006).

Pronghorn. Pronghorn inhabit non-forested areas such as desert, grassland, and sagebrush habitats (BLM 2005d). Herd size can commonly exceed 100 individuals, especially during winter (BLM 2004b). They consume a variety of forbs, shrubs, and grasses, with shrubs being of most importance in winter (BLM 2004b). Some pronghorn are year-long residents and do not have seasonal ranges. Fawning occurs throughout the species range. However, some seasonal movement within their range occurs in response to factors such as extreme winter conditions and water or forage availability (BLM 2004b,c). Other pronghorn are migratory. Most herds range within an area 5 miles or more in diameter, although the separation between summer and winter ranges has been reported to be as much as 99 miles or more (NatureServe 2006). For example, in western Wyoming, pronghorn migrate 72 to 160.3 miles between seasonal ranges (Sawyer et al. 2005). Pronghorn populations have been adversely impacted in some areas by historic range degradation and habitat loss and by periodic drought conditions (BLM 2005d).

Bighorn Sheep. Rocky Mountain bighorn sheep (*Ovis c. canadensis*) and desert bighorn sheep (*O. canadensis nelsoni*) are considered to be year-long residents within their ranges; they do not make seasonal migrations like elk and mule deer (BLM 2004b). However, they do make vertical migrations in response to an increasing abundance of vegetative growth at higher elevations in the spring and summer and when snow accumulation occurs in high-elevation summer ranges (NatureServe 2006). Also, ewes move to reliable watercourses or water sources during the lambing season, with lambing occurring on steep talus slopes within 1 to 2 miles of water (BLM 2004b). Bighorn sheep prefer open vegetation such as low shrub, grassland, and other treeless areas with steep talus and rubble slopes (BLM 2004c). Unsuitable habitats include open water, wetlands, dense forests, and other areas without grass understory (NatureServe 2006).

The distribution of the bighorn sheep within the 11 western states is mostly within the central north-to-south band of states. Their diet consists of shrubs, forbs, and grasses (BLM 2004b). In the early 1900s, bighorn sheep experienced significant declines due to disease, habitat degradation, and hunting (BLM 2005d). Threats to bighorn sheep include habitat changes due to fire suppression, interactions with feral and domestic animals, and human encroachment (NatureServe 2006). Bighorn sheep are very vulnerable to viral and bacterial diseases carried by livestock, particularly domestic sheep. Therefore, BLM has adopted specific guidelines regarding domestic sheep grazing in or near bighorn sheep habitat (BLM 2004b). In appropriate habitats, reintroduction efforts, coupled with water and vegetation improvements, have been conducted to restore bighorn sheep to their native habitat (BLM 2005d).

Moose. Although moose range widely among habitat types, they prefer forest habitats where there is a mixture of wooded and open areas near wetlands and lakes (UDWR 2006). They are primarily browsers upon trees and shrubs such as willow, fir, and quaking aspen, although grasses, forbs, and aquatic vegetation are also consumed during spring, summer, and fall (BLM 2005d; CDW 2006). They generally occur singly or in small groups. Moose are active throughout day and night, but the peak periods of activity are near dawn and dusk (UDWR 2006). Some moose make short elevational or horizontal migrations between summer and winter habitats (NatureServe 2006). They breed in late summer to early fall, with calving occurring in late spring (UDWR 2006). Moose habitat is thought to be improved by annual flooding and habitat management techniques such as prescribed burning (BLM 2005d). In addition to predation by wolves and bears, snow accumulation may have a controlling effect on moose populations. Habitat degradation due to high numbers of moose can lead to population crashes (NatureServe 2006).

American Bison. The American bison inhabits grasslands, semidesert shrublands, pinyon-juniper woodlands, and alpine tundra (CDW 2006). They are grazers, with grasses, sedges, and rushes comprising most of their diet (CDW 2006). American bison are diurnal, being especially active during early morning and late afternoon. They have several grazing periods that are interspersed with periods of loafing and ruminating (NatureServe 2006). Within the 11 western states, American bison are often found in managed herds that are often closely confined (CDW 2006). Only a few remnant wild populations occur in U.S. and Canadian national parks (NatureServe 2006). Pre-1900 herds migrated up to several hundred miles between summer and winter ranges, but herds that currently exist either make short migrations or do not migrate (UDWR 2006).

Cougar. Cougars (also known as mountain lions or puma) inhabit most ecosystems in the 11 western states, but are most common in the rough, broken terrain of foothills and canyons, often in association with montane forests, shrublands, and pinyon-juniper woodlands (CDW 2006). They mostly occur in remote and inaccessible areas (NatureServe 2006). Their annual home range can be more than 560 square miles, while densities are usually not more than 10 adults per 100 square miles (NatureServe 2006). The cougar is generally found where its prey species (especially mule deer) are located. In addition to deer, they prey upon most other mammals (which sometimes include domestic livestock) and some insects, birds, fishes, and berries (CDW 2006). They are active year-round. Their peak periods of activity are within 2 hours of sunset and sunrise, although their activity peaks after sunset when they are near humans (NatureServe 2006; UDWR 2006). They are hunted on a limited and closely monitored basis in some states (BLM 2004b; NatureServe 2006).

American Black Bear. American black bears are found mostly within forested or brushy mountain environments and woody riparian corridors (BLM 2005d; UDWR 2006). They are omnivorous. Depending upon seasonal availability, they will feed on forbs and grasses, fruits and acorns, insects, small vertebrates, and carrion (CDW 2006). Breeding occurs in June or July, with young born in January or February (UDWR 2006). American black bears are generally nocturnal, and have a period of winter dormancy (BLM 2005a; UDWR 2006). They are locally threatened by habitat loss and disturbance by humans (NatureServe 2006). The home range size of American black bears varies depending on area and gender and has been reported to be from about 1,250 to nearly 32,200 acres (NatureServe 2006).

Small Mammals. Small mammals include small game, furbearers, and nongame species. Small game species that occur within the 11 western states include black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), mountain cottontail (*S. nuttallii*), squirrels (*Sciurus* spp.), snowshoe hare (*L. americanus*), white-tailed jackrabbit (*L. townsendii*), and yellow-bellied marmot (*Marmota flaviventris*). Common furbearers include American badger (*Taxidea taxus*), American marten (*Martes americana*), American beaver (*Castor canadensis*), bobcat (*Lynx rufus*), common muskrat (*Ondatra zibethicus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), long-tailed weasel (*Mustela frenata*), and least weasel (*M. nivalis*). Nongame species includes bats, shrews, mice, voles, chipmunks, and many of the other rodent species.

Wild Horses and Burros. The BLM, in conjunction with the FS, manages wild horses and burros on BLM- and FS-administered lands through the Wild Free Roaming Horse and Burro Act of 1971. Animals are managed within 199 herd management areas (HMAs) with the goal of maintaining the natural ecological balance of public lands as well as the ability to support multiple herds (BLM 2006b). Herd population management is important for balancing herd numbers with forage resources and with other uses of the public and adjacent private lands (BLM 2004a,b). Wild horses that are found outside of HMAs are considered excess and are subject to annual removal (BLM 2004a). On average, a herd of 10 wild horses or burros uses about 3,600 acres, with most herd management areas occupying 10,000 to 100,000 acres or more (BLM 2006b). Annual home range is less than 6,178 acres but may be as large as 74,132 acres (NatureServe 2006).

As wild horse numbers within a herd can increase up to 25% annually, they can affect the condition of their range and increase competitive pressure among wild horses, livestock, and wildlife. Therefore, wild horse and burro herd size is maintained through gathers that are preformed every 3 to 5 years. A gather is a roundup of wild horses and burros, usually conducted by helicopter. Once gathered, a specialist loads the animals onto trucks for transport to a holding area at the gather site where determinations are made about which animals will be returned to the range and which will be sent to a BLM preparation facility.

Gathered horses and burros sent to the BLM preparation facility are placed for adoption through the Wild Horse and Burro Adoption Program or otherwise placed in long-term holding facilities. The BLM is currently researching the use of immuno-contraceptives to slow the reproductive rate of wild horses and burros (BLM 2004b).

Issues that make wild horse and burro management difficult include:

- Competition between elk and horses,
- Herd management areas located within areas where critical soils (i.e., soils that pose salinity problems and/or are very susceptible to erosion) make up more than 50% of the area,
- Competition with livestock, and
- Illegal chasing, capturing, and harassment (BLM 2004b).

Wild horses generally occur in common social groups of several females that are led by a dominant male. Young males are expelled from the social group when they are 1 to 3 years old and form bachelor groups (NatureServe 2006). They feed on grass and grass-like plants, and also browse on shrubs in winter. They visit watering holes daily, and may dig to water in dry river beds (NatureServe 2006). Wild horses also tend to dominate water sources, driving wildlife away (BLM 2004c). They can foul water, compete with livestock, or displace native ungulates such as pronghorn and bighorn sheep (NatureServe 2006).

Table 3.8-4 summarizes the wild horse and burro statistics for the 11 western states for fiscal year 2006. Ten of the 11 western states (there are no herds in Washington) have a total of 31,201 wild horses and burros, although the appropriate management level (i.e., the maximum number of animals sustainable on a year-long basis) is just 27,512 animals (BLM 2006b).

3.8.1.4 Threatened, Endangered, and Other Special Status Species in the Affected Area

Table 3.8-5 presents species listed under the ESA that occur in counties of in the 11 western states where energy corridors would be designated under the Proposed Action. Species that are proposed for listing or candidates for listing under the ESA are also included in the table. The large area within which corridors would be designated, and the large number of species that could be present in the vicinity of project areas, preclude detailed species-specific evaluations. Project-specific assessments and consultations with the USFWS and NMFS would be conducted to comply with Section 7 of the ESA prior to approval of project development and subsequent ground-disturbing activities.

The following definitions are applicable to the species listing categories under the ESA:

- *Endangered*: any species that is in danger of extinction throughout all or a significant portion of its range.
- *Threatened*: any species that is likely to become endangered within the foreseeable future throughout all or a significant part of its range.
- *Proposed for listing*: species that have been formally proposed for listing by the USFWS or NMFS by notice in the *Federal Register*.[9]

[9] Within one year of a listing proposal, the USFWS or NMFS must take one of three possible courses of action: (1) finalize the listing rule (as proposed or revised); (2) withdraw the proposal if the biological information on hand does not support the listing; or (3) extend the proposal for up to an additional 6 months because, at the end of 1 year, there is substantial disagreement within the scientific community concerning the biological appropriateness of the listing. After the extension, the USFWS or NMFS must make a decision on whether to list the species on the basis of the best scientific information available.

TABLE 3.8-4 Wild Horse and Burro Statistics for the Western United States, FY2006

	Herd Area[b]			Herd Management Area[c]				Populations			
State[a]	BLM Acres	Other[b,d] Acres	Total Acres	No. HMAs	BLM Acres	Other[d] Acres	Total Acres	Horses	Burros	Total	Total[e] AML
Arizona	2,019,932	1,617,998	3,637,930	7	1,756,086	1,327,777	3,083,863	230	1,542	1,772	1,570
California	5,112,778	1,851,661	6,964,439	22	1,946,590	471,855	2,418,445	3,166	889	4,055	2,199
Colorado	658,119	76,572	734,691	4	366,098	38,656	404,754	884	0	884	812
Idaho	428,421	49,235	477,656	6	377,907	40,287	418,194	594	0	594	617
Montana	104,361	119,242	223,603	1	28,282	8,865	37,147	159	0	159	105
Nevada	19,593,299	3,088,027	22,681,326	102	15,778,284	1,695,925	17,474,209	13,384	834	14,218	13,535
New Mexico	88,653	37,874	126,527	2	24,505	4,107	28,612	62	0	62	83
Oregon	3,559,935	785,250	4,345,185	18	2,703,409	259,726	2,963,135	2,113	15	2,128	2,715
Utah	3,236,178	689,176	3,925,354	21	2,462,726	374,614	2,837,340	2,545	169	2,714	2,151
Wyoming	7,297,778	3,030,010	10,327,788	16	3,638,330	1,137,121	4,775,451	4,615	0	4,615	3,725
Total	42,099,454	11,345,045	53,444,499	199	29,082,217	5,358,933	34,441,150	27,752	3,449	31,201	27,512

[a] No herds or herd management areas in Washington.

[b] Herd area is the geographic area identified as having been used by wild horse or burro herds as their habitat in 1971.

[c] Herd management area is the herd area or portion of the herd area that has been designated for special management emphasizing the maintenance of an established wild horse or burro herd.

[d] Other acres include other federally administered lands (e.g., FS, DOD, NPS) and private lands.

[e] AML = appropriate management level. Number listed is the maximum number of animals sustainable on a year-long basis.

Source: BLM (2006b).

TABLE 3.8-5 Species Listed, Proposed for Listing, or Candidates for Listing under the Endangered Species Act That Occur in Counties Where Section 368 Energy Corridors Would Be Designated under the Proposed Action

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants						
Acanthomintha ilicifolia	San Diego thornmint	T	N	N	CA (San Diego)	None
Allium munzii	Munz's onion	E	N	N	CA (Riverside)	None
Ambrosia pumila	San Diego ambrosia	E	N	N	CA (Riverside, San Diego)	None
Arabis mcdonaldiana	McDonald's rock-cress	E	N	Y	CA (Siskiyou, Trinity)	None
Arctomecon humilis	Dwarf bear-poppy	E	N	Y	UT (Washington)	None
Arctostaphylos glandulosa crassifolia	Del Mar manzanita	E	N	N	CA (San Diego)	None
Arenaria paludicola	Marsh sandwort	E	N	Y	CA (Los Angeles, San Bernardino)	None
Arenaria ursina	Bear Valley sandwort	T	N	N	CA (San Bernardino)	None
Artemisia campestris var. wormskioldii	Northern wormwood	C	N	N	OR (Hood River, Multnomah, Wasco)	None
Asclepias welshii	Welsh's milkweed	T	Y	Y	UT (Kane)	UT (Kane)
Astragalus albens	Cushenbury milk-vetch	E	Y	Y	CA (San Bernardino)	CA (San Bernardino)
Astragalus ampullarioides	Shivwits milk-vetch	E	Y	Y	UT (Washington)	UT (Washington)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Astragalus applegatei	Applegate's milk-vetch	E	N	Y	OR (Klamath)	None
Astragalus brauntonii	Braunton's milk-vetch	E	Y	Y	CA (Los Angeles, Orange)	CA (Los Angeles, Orange)
Astragalus cremnophylax var. *cremnophylax*	Sentry milk-vetch	E	N	Y	AZ (Coconino)	None
Astragalus desereticus	Deseret milk-vetch	T	N	N	UT (Utah)	None
Astragalus holmgreniorum	Holmgren milk-vetch	E	Y	Y	AZ (Mohave); UT (Washington)	AZ (Mohave); UT (Washington)
Astragalus humillimus	Mancos milk-vetch	E	N	Y	CO (Montezuma); NM (San Juan)	None
Astragalus jaegerianus	Lane Mountain milk-vetch	E	Y	N	CA (San Bernardino)	CA (San Bernardino)
Astragalus lentiginosus var. *coachellae*	Coachella valley milk-vetch	E	Y	N	CA (Riverside)	None
Astragalus lentiginosus var. *piscinensis*	Fish Slough milk-vetch	T	N	Y	CA (Inyo, Mono)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Astragalus magdalenae var. *peirsonii*	Peirson's milk-vetch	T	Y	N	CA (Imperial)	CA (Imperial)
Astragalus montii	Heliotrope milk-vetch	T	N	Y	UT (Sanpete, Sevier)	None
Astragalus osterhoutii	Osterhout milk-vetch	E	N	Y	CO (Grand)	None
Astragalus phoenix	Ash Meadows milk-vetch	T	Y	Y	NV (Nye)	NV (Nye)
Astragalus pycnostachyus var. *lanosissimus*	Ventura Marsh milk-vetch	E	Y	N	CA (Los Angeles, Orange)	None
Astragalus tener var. *titi*	Coastal dunes milk-vetch	E	N	Y	CA (Los Angeles, San Diego)	None
Astragalus tortipes	Sleeping Ute milk-vetch	C	N	N	CO (Montezuma)	None
Astragalus tricarinatus	Triple-ribbed milk-vetch	E	N	N	CA (Riverside, San Bernardino)	None
Atriplex coronata var. *notatior*	San Jacinto Valley crownscale	E	N	N	CA (Kern, Riverside)	None
Baccharis vanessae	Encinitas baccharis	T	N	N	CA (San Diego)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Berberis nevinii	Nevin's barberry	E	N	N	CA (Los Angeles, Riverside, San Bernardino)	None
Brodiaea filifolia	Thread-leaved brodiaea	T	Y	Y	CA (Los Angeles, Orange, Riverside, San Diego)	CA (Los Angeles, Orange, Riverside, San Diego)
Calochortus persistens	Siskiyou mariposa lily	C	N	N	CA (Siskiyou)	None
Calystegia stebbinsii	Stebbins' morning-glory	E	N	Y	CA (Nevada)	None
Carex specuicola	Navajo sedge	T	Y	Y	AZ (Coconino); UT (Kane, San Juan)	AZ (Coconino)
Castilleja christii	Christ's paintbrush	C	N	N	ID (Cassia)	None
Castilleja cinerea	Ash-grey paintbrush	T	N	N	CA (San Bernardino)	None
Caulanthus californicus	California jewelflower	E	N	Y	CA (Kern)	None
Ceanothus ophiochilus	Vail Lake ceanothus	T	N	N	CA (Riverside)	None
Centaurium namophilum	Spring-loving centaury	T	Y	Y	CA (Inyo); NV (Nye)	NV (Nye)
Chorizanthe orcuttiana	Orcutt's spineflower	E	N	N	CA (San Diego)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Chorizanthe parryi var. *fernandina*	San Fernando Valley spineflower	C	N	N	CA (Los Angeles, Orange)	None
Cordylanthus maritimus maritimus	Salt marsh bird's-beak	E	N	Y	CA (Los Angeles, Orange, San Bernardino, San Diego)	None
Coryphantha robbinsorum	Cochise pincushion cactus	T	N	Y	AZ (Cochise)	None
Coryphantha scheeri var. *robustispina*	Pima pineapple cactus	E	N	N	AZ (Santa Cruz)	None
Coryphantha sneedii var. *leei*	Lee pincushion cactus	T	N	Y	NM (Eddy)	None
Coryphantha sneedii var. *sneedii*	Sneed pincushion cactus	E	N	Y	NM (Eddy)	None
Cycladenia jonesii	Jones cycladenia	T	N	Y	AZ (Coconino); UT (Emery, Grand, Kane)	None
Deinandra conjugens	Otay tarplant	T	Y	Y	CA (San Diego)	CA (San Diego)
Dodecahema leptoceras	Slender-horned spineflower	E	N	N	CA (Los Angeles, Riverside, San Bernardino)	None
Dudleya cymosa marcescens	Marcescent dudleya	T	N	Y	CA (Los Angeles)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Dudleya cymosa ovatifolia	Santa Monica Mountains dudleyea	T	N	Y	CA (Los Angeles, Orange)	None
Dudleya stolonifera	Laguna Beach liveforever	T	N	N	CA (Orange)	None
Echinocactus horizonthalonius var. *nicholii*	Nichol's Turk's head cactus	E	N	Y	AZ (Pinal)	None
Echinocereus fendleri var. *kuenzleri*	Kuenzler hedgehog cactus	E	N	Y	NM (Chaves, Eddy, Lincoln)	None
Echinocereus triglochidiatus var. *arizonicus*	Arizona hedgehog cactus	E	N	Y	AZ (Gila, Pinal)	None
Echinomastus erectocentrus var. *acunensis*	Acuna cactus	C	N	N	AZ (Maricopa, Pinal)	None
Enceliopsis nudicaulis var. *corrugata*	Ash Meadows sunray	T	Y	N	NV (Nye)	NV (Nye)
Eremalche kernensis	Kern mallow	E	N	Y	CA (Kern)	None
Eriastrum densifolium sanctorum	Santa Ana river woolly-star	E	N	N	CA (Orange, Riverside, San Bernardino)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Erigeron decumbens var. *decumbens*	Willamette daisy	E	N	N	OR (Clackamas, Linn, Washington)	None
Erigeron lemmonii	Lemmon fleabane	C	N	N	AZ (Cochise)	None
Erigeron maguirei	Maguire daisy	T	N	Y	UT (Emery, Garfield)	None
Erigeron parishii	Parish's daisy	T	Y	Y	CA (San Bernardino)	CA (San Bernardino)
Erigeron rhizomatus	Zuni fleabane	T	N	Y	NM (McKinley)	None
Eriogonum diatomaceum	Churchill Narrows buckwheat	C	N	N	NV (Lyon)	None
Eriogonum gypsophilum	Gypsum wild-buckwheat	T	Y	Y	NM (Eddy)	NM (Eddy)
Eriogonum kennedyi var. *austromontanum*	Southern mountain wild-buckwheat	T	N	N	CA (San Bernardino)	None
Eriogonum ovalifolium var. *vineum*	Cushenbury buckwheat	E	Y	Y	CA (San Bernardino)	CA (San Bernardino)
Eriogonum ovalifolium var. *williamsiae*	Steamboat buckwheat	E	N	Y	NV (Washoe)	None
Eriogonum pelinophilum	Clay-loving wild-buckwheat	E	Y	Y	CO (Delta, Montrose)	CO (Delta)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Eryngium aristulatum var. *parishii*	San Diego button-celery	E	N	Y	CA (Riverside, San Diego)	None
Fremontodendron californicum decumbens	Pine Hill flannelbush	E	N	Y	CA (Nevada)	None
Fremontodendron mexicanum	Mexican flannelbush	E	N	N	CA (San Diego)	None
Fritillaria gentneri	Gentner's fritillary	E	N	Y	OR (Jackson)	None
Grindelia fraxino-pratensis	Ash Meadows gumplant	T	Y	Y	CA (Inyo); NV (Nye)	CA (Inyo); NV (Nye)
Hackelia venusta	Showy stickseed	E	N	Y	WA (Chelan)	None
Hazardia orcuttii	Orcutt's hazardia	C	N	N	CA (San Diego)	None
Hedeoma todsenii	Todsen's pennyroyal	E	Y	Y	NM (Sierra)	NM (Sierra)
Helianthus paradoxus	Pecos sunflower	T	N	Y	NM (Chaves, Guadalupe, Socorro)	None
Howellia aquatilis	Water howellia	T	N	Y	CA (Trinity); MT (Missoula); OR (Clackamas, Multnomah)	None
Ivesia kingii var. *eremica*	Ash Meadows ivesia	T	Y	Y	NV (Nye)	NV (Nye)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Ivesia webberi	Webber ivesia	C	N	N	CA (Lassen, Sierra, Nevada); NV (Washoe)	None
Layia carnosa	Beach layia	E	N	Y	CA (Humboldt)	None
Lesquerella congesta	Dudley Bluffs bladderpod	T	N	N	CO (Rio Blanco)	None
Lesquerella kingii bernardina	San Bernardino Mountains bladderpod	E	Y	Y	CA (San Bernardino)	CA (San Bernardino)
Lesquerella tumulosa	Kodachrome bladderpod	E	N	Y	UT (Kane)	None
Lilaeopsis schaffneriana var. *recurva*	Huachuca water-umbel	E	Y	N	AZ (Cochise, Santa Cruz)	AZ (Cochise, Santa Cruz)
Lilium occidentale	Western lily	E	N	Y	CA (Humboldt)	None
Limnanthes floccosa grandiflora	Large-flowered woolly meadowfoam	E	N	Y	OR (Jackson)	None
Lomatium bradshawii	Bradshaw's desert-parsley	E	N	Y	OR (Linn)	None
Lomatium cookii	Cook's lomatium	E	N	Y	OR (Jackson)	None
Lupinus sulphureus kincaidii	Kincaid's lupine	T	N	N	OR (Douglas, Linn, Washington)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Mentzelia leucophylla	Ash Meadows blazingstar	T	Y	Y	NV (Nye)	NV (Nye)
Monardella linoides viminea	Willowy monardella	E	N	N	CA (San Diego)	None
Monolopia congdonii	San Joaquin wooly-threads	E	N	Y	CA (Kern)	None
Navarretia fossalis	Spreading navarretia	T	N	Y	CA (Los Angeles, Riverside, San Diego)	None
Nitrophila mohavensis	Amargosa niterwort	E	Y	Y	CA (Inyo); NV (Nye)	CA (Inyo)
Oenothera avita eurekensis	Eureka Valley evening-primrose	E	N	Y	CA (Inyo)	None
Opuntia treleasei	Bakersfield cactus	E	N	Y	CA (Kern)	None
Orcuttia californica	California orcutt grass	E	N	Y	CA (Los Angeles, Riverside, San Diego)	None
Orcuttia tenuis	Slender orcutt grass	T	Y	Y	CA (Lassen, Modoc, Siskiyou, Shasta)	CA (Lassen, Modoc, Siskiyou, Shasta)
Oxytheca parishii var. *goodmaniana*	Cushenbury oxytheca	E	Y	Y	CA (San Bernardino)	CA (San Bernardino)
Pediocactus bradyi	Brady pincushion cactus	E	N	Y	AZ (Coconino)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Pediocactus despainii	San Rafael cactus	E	N	Y	UT (Emery)	None
Pediocactus knowltonii	Knowlton cactus	E	N	Y	NM (San Juan)	None
Pediocactus peeblesianus fickeiseniae	Fickeisen plains cactus	C	N	N	AZ (Coconino, Mohave, Navajo)	None
Pediocactus peeblesianus peeblesianus	Peebles Navajo cactus	E	N	Y	AZ (Navajo)	None
Pediocactus sileri	Siler pincushion cactus	T	N	Y	AZ (Coconino, Mohave); UT (Kane, Washington)	None
Pediocactus winkleri	Winkler cactus	T	N	Y	UT (Emery)	None
Penstemon debilis	Parachute beardtongue	C	N	N	CO (Garfield)	None
Penstemon penlandii	Penland beardtongue	E	N	Y	CO (Grand)	None
Penstemon scariosus albifluvis	White River beardtongue	C	N	N	CO (Rio Blanco); UT (Uintah)	None
Pentachaeta lyonii	Lyon's pentachaeta	E	Y	Y	CA (Los Angeles)	CA (Los Angeles)
Phacelia argillacea	Clay phacelia	E	N	Y	UT (Emery)	None
Phacelia stellaris	Brand's phacelia	C	N	N	CA (Los Angeles, San Diego)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Phacelia submutica	Debeque phacelia	C	N	N	CO (Garfield, Mesa)	None
Phlox hirsuta	Yreka phlox	E	N	Y	CA (Siskiyou)	None
Physaria obcordata	Dudley Bluffs twinpod	T	N	Y	CO (Rio Blanco)	None
Plagiobothrys hirtus	Rough popcornflower	E	N	Y	OR (Douglas)	None
Poa atropurpurea	San Bernardino bluegrass	E	N	N	CA (San Bernardino, San Diego)	None
Pogogyne abramsii	San Diego mesa-mint	E	N	Y	CA (San Diego)	None
Pogogyne nudiuscula	Otay mesa-mint	E	N	Y	CA (San Diego)	None
Potentilla basaltica	Soldier Meadows cinquefoil	C	N	N	NV (Humboldt)	None
Pseudobahia peirsonii	San Joaquin adobe sunburst	T	N	N	CA (Kern)	None
Purshia subintegra	Arizona cliff-rose	E	N	Y	AZ (Maricopa, Mohave, Yavapai)	None
Ranunculus aestivalis	Autumn buttercup	E	N	Y	UT (Garfield)	None
Rorippa gambellii	Gambel's watercress	E	N	Y	CA (Los Angeles, Orange, San Bernardino, San Diego)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Rorippa subumbellata	Tahoe yellow cress	C	N	N	CA (Nevada, Placer); NV (Washoe)	None
Schoenocrambe argillacea	Clay reed-mustard	T	N	Y	UT (Uintah)	None
Schoenocrambe barnebyi	Barneby reed-mustard	E	N	Y	UT (Emery)	None
Schoenocrambe suffrutescens	Shrubby reed-mustard	E	N	Y	UT (Uintah)	None
Sclerocactus glaucus	Uinta Basin hookless cactus	T	N	Y	CO (Delta, Garfield, Mesa, Montrose); UT (Carbon, Uintah)	None
Sclerocactus mesae-verdae	Mesa Verde cactus	T	N	Y	CO (Montezuma); NM (San Juan)	None
Sclerocactus wrightiae	Wright fishhook cactus	E	N	Y	UT (Emery, Sevier)	None
Senecio franciscanus	San Francisco Peaks groundsel	T	Y	Y	AZ (Coconino)	AZ (Coconino)
Sidalcea nelsoniana	Nelson's checker-mallow	T	N	Y	OR (Columbia, Linn, Washington)	None
Sidalcea oregana var. *calva*	Wenatchee Mountains checker-mallow	E	Y	Y	WA (Chelan)	WA (Chelan)
Sidalcea pedata	Pedate checker-mallow	E	N	Y	CA (San Bernardino)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Spiranthes delitescens	Canelo Hills ladies'-tresses	E	N	N	AZ (Cochise, Santa Cruz)	None
Spiranthes diluvialis	Ute ladies'-tresses	T	N	Y	CO (Moffat); ID (Bonneville, Jefferson); MT (Beaverhead, Broadwater, Jefferson, Madison); NV (Lincoln); UT (Daggett, Garfield, Tooele, Uintah, Utah, Wasatch); WY (Converse)	None
Stephanomeria malheurensis	Malheur wire-lettuce	E	Y	Y	OR (Harney)	OR (Harney)
Swallenia alexandrae	Eureka dune grass	E	N	Y	CA (Inyo)	None
Taraxacum californicum	California taraxacum	E	N	N	CA (San Bernardino)	None
Thelypodium howellii spectabilis	Howell's spectacular thelypody	T	N	Y	OR (Crook, Deschutes, Harney, Klamath, Lake)	None
Thelypodium stenopetalum	Slender-petaled mustard	E	N	Y	CA (San Bernardino)	None
Thlaspi californicum	Kneeland Prairie penny-cress	E	Y	Y	CA (Humboldt)	CA (Humboldt)
Townsendia aprica	Last chance townsendia	T	N	Y	UT (Emery, Sevier)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Plants (Cont.)						
Trichostema austromontanum compactum	Hidden Lake bluecurls	T	N	N	CA (Riverside)	None
Tuctoria greenei	Greene's tuctoria	E	Y	Y	CA (Shasta)	CA (Shasta)
Verbesina dissita	Big-leaved crownbeard	T	N	N	CA (Orange)	None
Yermo xanthocephalus	Desert yellowhead	T	Y	N	WY (Fremont)	WY (Fremont)
Mollusks						
Assiminea pecos	Pecos assiminea snail	E	Y	N	NM (Chaves)	None
Juturnia kosteri	Koster's springsnail	E	N	N	NM (Chaves)	None
Lanx sp.	Banbury springs limpet	E	N	Y	ID (Gooding)	None
Oreohelix peripherica wasatchensis	Ogden mountainsnail	C	N	N	UT (Weber)	None
Oxyloma haydeni kanabensis	Kanab ambersnail	E	N	Y	AZ (Coconino); UT (Kane)	None
Physa natricina	Snake River physa snail	E	N	Y	ID (Elmore, Gooding, Minidoka, Owyhee)	None
Popenaias popei	Texas hornshell	C	N	N	NM (Eddy)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Mollusks (Cont.)						
Pyrgulopsis bruneauensis	Bruneau hot springsnail	E	N	Y	ID (Owyhee)	None
Pyrgulopsis chupaderae	Chupadera springsnail	C	N	N	NM (Socorro)	None
Pyrgulopsis gilae	Gila springsnail	C	N	N	NM (Grant)	None
Pyrgulopsis morrisoni	Page springsnail	C	N	N	AZ (Yavapai)	None
Pyrgulopsis neomexicana	Socorro springsnail	E	N	Y	NM (Socorro)	None
Pyrgulopsis roswellensis	Roswell springsnail	E	N	N	NM (Chaves)	None
Pyrgulopsis thermalis	New Mexico springsnail	C	N	N	NM (Grant)	None
Pyrgulopsis thompsoni	Huachuca springsnail	C	N	N	AZ (Cochise, Santa Cruz)	None
Taylorconcha serpenticola	Bliss rapids snail	T	N	Y	ID (Bingham, Elmore, Gooding, Twin Falls)	None
Tryonia alamosae	Alamosa springsnail	E	N	Y	NM (Socorro)	None
Valvata utahensis	Utah valvata snail	E	N	Y	ID (Cassia, Gooding, Minidoka, Power, Twin Falls)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Arthropods						
Ambrysus amargosus	Ash Meadows naucorid	T	Y	Y	NV (Nye)	NV (Nye)
Ambrysus funebris	Nevares Spring naucorid bug	C	N	N	CA (Inyo)	None
Branchinecta lynchi	Vernal pool fairy shrimp	T	Y	Y	CA (Placer, Shasta); OR (Jackson)	CA (Placer, Shasta) ; OR (Jackson)
Branchinecta sandiegonensis	San Diego fairy shrimp	E	Y	Y	CA (Orange, San Diego)	CA (Orange, San Diego)
Cicindela albissima	Coral pink sand dunes tiger beetle	C	N	N	UT (Kane)	None
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	T	Y	Y	CA (Kern, Shasta)	None
Euphilotes battoides allyni	El Segundo blue butterfly	E	N	Y	CA (Los Angeles)	None
Euphydryas editha quino	Quino checkerspot butterfly	E	Y	Y	CA (Riverside, San Diego)	CA (Riverside, San Diego)
Euproserpinus euterpe	Kern primrose sphinx moth	T	N	Y	CA (Kern)	None
Gammarus desperatus	Noel's amphipod	E	N	N	NM (Chaves)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Arthropods (Cont.)						
Glaucopsyche lygdamus palosverdesensis	Palos Verdes blue butterfly	E	Y	Y	CA (Los Angeles)	CA (Los Angeles)
Heterelmis stephani	Stephan's riffle beetle	C	N	N	AZ (Santa Cruz)	None
Icaricia icarioides fenderi	Fender's blue butterfly	E	N	N	OR (Linn)	None
Lepidurus packardi	Vernal pool tadpole shrimp	E	Y	Y	CA (Shasta)	CA (Shasta)
Pacifastacus fortis	Shasta crayfish	E	N	Y	CA (Shasta)	None
Polites mardon	Mardon skipper	C	N	N	OR (Jackson)	None
Pseudocopaeodes eunus obscurus	Carson wandering skipper	E	N	Y	NV (Washoe)	None
Pyrgus ruralis lagunae	Laguna Mountains skipper	E	Y	N	CA (San Diego)	CA (San Diego)
Rhaphiomidas terminatus	Delhi sands flower-loving fly	E	N	Y	CA (Riverside, San Bernardino)	None
Speyeria zerene behrensii	Behren's silverspot butterfly	E	N	Y	CA (Humboldt)	None
Streptocephalus woottoni	Riverside fairy shrimp	E	Y	Y	CA (Orange, Riverside, San Diego)	CA (Orange, San Diego)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Arthropods (Cont.)						
Thermosphaeroma thermophilus	Socorro isopod	E	N	Y	NM (Socorro)	None
Fishes						
Catostomus discobolus yarrowi	Zuni bluehead sucker	C	N	N	NM (McKinley)	None
Catostomus microps	Modoc sucker	E	Y	Y	CA (Lassen, Modoc)	CA (Lassen, Modoc)
Catostomus santaanae	Santa Ana sucker	T	Y	N	CA (Los Angeles, Orange, Riverside, San Bernardino)	CA (Los Angeles, Orange, Riverside, San Bernardino)
Catostomus warnerensis	Warner sucker	T	Y	Y	NV (Washoe); OR (Lake)	NV (Washoe): OR (Lake)
Chasmistes brevirostris	Shortnose sucker	E	N	Y	CA (Modoc, Siskiyou); OR (Klamath, Lake)	None
Chasmistes cujus	Cui-ui	E	N	Y	NV (Washoe)	None
Chasmistes liorus	June sucker	E	Y	Y	UT (Utah, Weber)	UT (Utah)
Crenichthys baileyi baileyi	White River springfish	E	Y	Y	NV (Lincoln)	NV (Lincoln)
Crenichthys baileyi grandis	Hiko White River springfish	E	Y	Y	NV (Lincoln, Mineral)	NV (Lincoln)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Fishes (Cont.)						
Crenichthys nevadae	Railroad Valley springfish	T	Y	Y	NV (Mineral, Nye)	NV (Nye)
Cyprinella formosa	Beautiful shiner	T	Y	Y	AZ (Cochise)	AZ (Cochise)
Cyprinodon diabolis	Devils Hole pupfish	E	N	Y	NV (Clark, Nye)	None
Cyprinodon macularius	Desert pupfish	E	Y	Y	CA (Imperial)	CA (Imperial)
Cyprinodon nevadensis mionectes	Ash Meadows amargosa pupfish	E	Y	Y	NV (Nye)	NV (Nye)
Cyprinodon nevadensis pectoralis	Warm Springs pupfish	E	N	Y	NV (Nye)	None
Cyprinodon radiosus	Owens pupfish	E	N	Y	CA (Inyo, Mono)	None
Deltistes luxatus	Lost River sucker	E	N	Y	CA (Modoc, Siskiyou); OR (Klamath)	None
Empetrichthys latos	Pahrump poolfish	E	N	Y	NV (Clark, Nye, White Pine)	None
Eremichthys acros	Desert dace	T	Y	Y	NV (Humboldt)	NV (Humboldt)
Eucyclogobius newberryi	Tidewater goby	E	Y	Y	CA (Humboldt, Los Angeles)	CA (Humboldt, Los Angeles)
Gambusia nobilis	Pecos gambusia	E	N	Y	NM (Chaves, Eddy)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Fishes (Cont.)						
Gasterosteus aculeatus williamsoni	Unarmored threespine stickleback	E	N	Y	CA (Los Angeles, San Bernardino, San Diego)	None
Gila bicolor mohavensis	Mohave tui chub	E	N	Y	CA (Kern, Los Angeles, San Bernardino)	None
Gila bicolor snyderi	Owens tui chub	E	Y	Y	CA (Inyo, Mono)	CA (Mono)
Gila bicolor ssp.	Hutton tui chub	T	N	Y	OR (Lake)	None
Gila boraxobius	Borax Lake chub	E	Y	Y	OR (Harney)	OR (Harney)
Gila cypha	Humpback chub	E	Y	Y	AZ (Coconino, Mohave); CO (Mesa, Moffat); UT (Carbon, Daggett, Emery, Garfield, Grand, Kane, San Juan, Uintah); WY (Sweetwater)	AZ (Coconino, Mohave); CO (Mesa, Moffat); UT (Carbon, Emery, Garfield, Grand, San Juan, Uintah)
Gila ditaenia	Sonora chub	T	Y	Y	AZ (Santa Cruz)	AZ (Santa Cruz)
Gila elegans	Bonytail chub	E	Y	Y	AZ (La Paz, Mohave); CA (San Bernardino); CO (Mesa, Moffat); NV (Clark); UT (Carbon, Garfield, Grand, San Juan, Uintah)	AZ (La Paz, Mohave); CA (San Bernardino); CO (Mesa, Moffat); NV (Clark); UT (Carbon, Garfield, Grand, San Juan, Uintah, Wayne)
Gila intermedia	Gila chub	E	Y	N	AZ (Cochise, Coconino, Gila, Santa Cruz, Yavapai); NM (Grant)	AZ (Cochise, Gila, Santa Cruz, Yavapai); NM (Grant)
Gila nigra	Headwater chub	C	N	N	AZ (Gila, Yavapai)	None
Gila nigrescens	Chihuahua chub	T	N	Y	NM (Grant)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Fishes (Cont.)						
Gila purpurea	Yaqui chub	E	Y	Y	AZ (Cochise)	AZ (Cochise)
Gila robusta jordani	Pahranagat roundtail chub	E	N	Y	NV (Lincoln)	None
Gila seminuda	Virgin River chub	E	Y	Y	AZ (Mohave); NV (Clark); UT (Washington)	AZ (Mohave); NV (Clark); UT (Washington)
Hybognathus amarus	Rio Grande silvery minnow	E	Y	Y	NM (Sandoval, Socorro)	NM (Sandoval, Socorro)
Ictalurus pricei	Yaqui catfish	T	Y	Y	AZ (Cochise)	AZ (Cochise)
Lepidomeda albivallis	White River spinedace	E	Y	Y	NV (Nye, White Pine)	NV (Nye, White Pine)
Lepidomeda mollispinis pratensis	Big Spring spinedace	T	Y	Y	NV (Lincoln)	NV (Lincoln)
Lepidomeda vittata	Little Colorado spinedace	T	Y	Y	AZ (Coconino, Navajo)	AZ (Coconino, Navajo)
Meda fulgida	Spikedace	T	Y	Y	AZ (Gila, Pinal, Yavapai); NM (Grant, Hidalgo)	AZ (Gila, Graham, Pinal, Yavapai); NM (Grant, Hidalgo)
Moapa coriacea	Moapa dace	E	N	Y	NV (Clark, Nye, White Pine)	None
Notropis girardi	Arkansas River shiner	T	Y	N	NM (Chaves, De Baca, Eddy)	None
Notropis simus pecosensis	Pecos bluntnose shiner	T	Y	Y	NM (Chaves, De Baca, Eddy, Guadalupe)	NM (Chaves, De Baca, Eddy)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Fishes (Cont.)						
Oncorhynchus apache	Apache trout	T	N	Y	AZ (Coconino)	None
Oncorhynchus clarkii henshawi	Lahontan cutthroat trout	T	N	Y	CA (Mono, Nevada, Placer); NV (Churchill, Elko, Eureka, Humboldt, Lander, Mineral, Nye, Washoe); OR (Harney, Malheur)	None
Oncorhynchus clarkii seleniris	Paiute cutthroat trout	T	N	Y	CA (Inyo, Mono)	None
Oncorhynchus clarkii stomias	Greenback cutthroat trout	T	N	Y	CO (Chaffee, Clear Creek, Grand)	None
Oncorhynchus gilae	Gila trout	T	N	Y	NM (Grant, Sierra)	None
Oncorhynchus keta	Chum salmon[d]	T	Y	N	OR (Columbia, Hood River, Multnomah, Washington)	OR (Columbia, Hood River, Multnomah)
Oncorhynchus kisutch	Coho salmon[d]	PT, T, E[e]	Y	N	CA (Humboldt, Siskiyou, Trinity); OR (Clackamas, Columbia, Douglas, Hood River, Jackson, Lane, Linn, Multnomah, Wasco, Washington)	CA (Humboldt, Siskiyou, Trinity); OR (Clackamas, Columbia, Douglas, Hood River, Jackson, Lane, Linn, Multnomah, Wasco, Washington)
Oncorhynchus mykiss	Steelhead[d]	T, E[e]	Y	N	CA (Kern, Los Angeles, Nevada, Orange, Placer, Riverside, San Diego, Shasta); ID (Blaine); OR (Clackamas, Columbia, Crook, Harney, Hood River, Jackson, Jefferson, Linn, Multnomah, Wasco, Washington); WA (Chelan, King, Kittitas, Snohomish)	CA (Los Angeles, Nevada, Orange, Placer, San Diego, Shasta); ID (Blaine); OR (Clackamas, Columbia, Crook, Hood River, Jefferson, Linn, Multnomah, Wasco, Washington); WA (Chelan, Kittitas)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Fishes (Cont.)						
Oncorhynchus nerka	Sockeye salmon[d]	E	Y	N	ID (Blaine); WA (Chelan, King, Kittitas, Snohomish)	None
Oncorhynchus tshawytscha	Chinook salmon[d]	T, E[e]	Y	N	CA (Humboldt, Nevada, Shasta, Trinity); OR (Clackamas, Columbia, Hood River, Lane, Linn, Multnomah, Wasco, Washington); WA (Chelan, King, Kittitas, Snohomish)	CA (Humboldt, Nevada, Shasta, Trinity); OR (Clackamas, Columbia, Hood River, Lane, Linn, Multnomah); WA (Chelan, Kittitas, Snohomish)
Oregonichthys crameri	Oregon chub	E	N	Y	OR (Linn)	None
Plagopterus argentissimus	Woundfin	E	Y	Y	AZ (Mohave); NV (Clark); UT (Washington)	AZ (Mohave); NV (Clark); UT (Washington)
Poeciliopsis occidentalis	Gila topminnow	E	N	Y	AZ (Gila, La Paz, Maricopa, Pinal, Santa Cruz, Yavapai); NM (Hidalgo)	None
Ptychocheilus lucius	Colorado pikeminnow	E	Y	Y	CO (Delta, Garfield, Mesa, Moffat, Rio Blanco); UT (Emery, Grand, Uintah)	CO (Delta, Garfield, Mesa, Moffat, Rio Blanco); UT (Emery, Uintah)
Rhinichthys osculus lethoporus	Independence Valley speckled dace	E	N	Y	NV (Elko)	None
Rhinichthys osculus nevadensis	Ash Meadows speckled dace	E	Y	Y	NV (Nye)	NV (Nye)
Rhinichthys osculus oligoporus	Clover Valley speckled dace	E	N	Y	NV (Elko)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Fishes (Cont.)						
Rhinichthys osculus ssp.	Foskett speckled dace	T	N	Y	OR (Lake)	None
Salvelinus confluentus	Bull trout	T	Y	Y	CA (Shasta, Siskiyou); ID (Kootenai, Shoshone); MT (Granite, Mineral, Missoula, Powell); NV (Elko); OR (Baker, Clackamas, Crook, Deschutes, Douglas, Harney, Hood River, Klamath, Lake, Lane, Linn, Malheur, Wasco); WA (King, Kittitas, Snohomish)	ID (Kootenai, Shoshone); MT (Granite, Mineral, Missoula, Powell); OR (Baker, Deschutes, Harney, Hood River, Klamath, Lake, Lane, Wasco); WA (King, Kittitas Snohomish)
Tiaroga cobitis	Loach minnow	T	Y	Y	AZ (Gila, Yavapai); NM (Grant, Hidalgo)	NM (Grant, Hidalgo)
Xyrauchen texanus	Razorback sucker	E	Y	Y	AZ (Coconino, Gila, La Paz, Maricopa, Mohave, Yavapai); CA (Imperial, Riverside, San Bernardino); CO (Delta, Garfield, Mesa, Moffat, Rio Blanco); NM (Hidalgo, San Juan); UT (Carbon, Emery, Grand, San Juan, Uintah, Wayne); WY (Sweetwater)	AZ (Coconino, Gila, Maricopa, Mohave, Yavapai); CO (Delta, Garfield, Mesa, Moffat); NM (Hidalgo, San Juan); UT (Emery, Grand, San Juan, Uintah)
Amphibians						
Ambystoma tigrinum stebbinsi	Sonora tiger salamander	E	Y	Y	AZ (Cochise, Santa Cruz)	None
Batrachoseps aridus	Desert slender salamander	E	N	Y	CA (Riverside)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Amphibians (Cont.)						
Bufo baxteri	Wyoming toad	E	N	Y	WY (Albany)	None
Bufo californicus	Arroyo toad	E	Y	Y	CA (Los Angeles, Orange, Riverside, San Bernardino, San Diego)	CA (Los Angeles, Orange, Riverside, San Bernardino, San Diego)
Bufo canorus	Yosemite toad	C	N	N	CA (Inyo, Mono)	None
Rana aurora draytonii	California red-legged frog	T	Y	Y	CA (Los Angeles, Nevada)	CA (Los Angeles, Nevada)
Rana chiricahuensis	Chiricahua leopard frog	T	N	Y	AZ (Cochise, Coconino, Gila, Navajo, Santa Cruz, Yavapai); NM (Grant, Hidalgo, Sierra, Socorro)	None
Rana luteiventris	Columbia Spotted frog	C	N	N	NV (Elko, Eureka, Nye, White Pine)	None
Rana muscosa	Mountain yellow-legged frog	E, C[e]	Y	N	CA (Riverside, San Bernardino)	CA (Riverside, San Bernardino)
Rana onca	Relict leopard frog	C	N	N	AZ (Mohave); NV (Clark); UT (Washington)	None
Rana pretiosa	Oregon spotted frog	C	N	N	CA (Modoc, Shasta, Siskiyou); OR (Clackamas, Deschutes, Jackson, Klamath, Linn, Multnomah, Wasco)	None
Reptiles						
Crotalus willardi obscurus	New Mexican ridge-nosed rattlesnake	T	Y	Y	AZ (Cochise); NM (Hidalgo)	NM (Hidalgo)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Reptiles (Cont.)						
Gambelia silus	Blunt-nosed leopard lizard	E	N	Y	CA (Kern)	None
Gopherus agassizii	Desert tortoise	T	Y	Y	AZ (Mohave); CA (Imperial, Kern, Los Angeles, Riverside, San Bernardino); NV (Clark, Esmeralda, Lincoln); UT (Washington)	AZ (Mohave); CA (Imperial, Kern, Los Angeles, Riverside, San Bernardino); NV (Clark, Lincoln); UT (Washington)
Sceloporus arenicolus	Sand dune lizard	C	N	N	NM (Chaves, Eddy, Lea)	None
Uma inornata	Coachella Valley fringe-toed lizard	T	Y	Y	CA (Riverside)	CA (Riverside)
Birds						
Brachyramphus marmoratus	Marbled murrelet	T	Y	Y	CA (Humboldt, Siskiyou, Trinity); OR (Columbia, Douglas, Lane, Washington); WA (King, Kittitas, Snohomish)	CA (Humboldt, Siskiyou, Trinity); OR (Columbia, Douglas, Lane, Washington); WA (King, Kittitas, Snohomish)
Centrocercus urophasianus	Greater sage-grouse	C	N	N	OR (Baker, Crook, Deschutes, Harney, Klamath, Lake, Malheur); WA (Kittitas)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Birds (Cont.)						
Charadrius alexandrinus nivosus	Western snowy plover	T	Y	Y	CA (Kern, Humboldt, Los Angeles, Modoc, Orange, Riverside, San Diego, Siskiyou); NM (Chaves, Eddy, Socorro); NV (Churchill, Elko, Eureka, Humboldt, Lyon, Mineral, Nye, Pershing, Washoe, White Pine); OR (Douglas, Harney, Lane); WA (King, Snohomish)	CA (Humboldt, Los Angeles, Orange, San Diego,); OR (Douglas, Lane)
Coccyzus americanus	Western yellow-billed cuckoo	C	N	N	AZ (Cochise, Gila, La Paz, Maricopa, Mohave, Pinal, Santa Cruz, Yavapai, Yuma); CA (Inyo, Kern, San Bernardino); CO (Montezuma); ID (Ada, Bingham, Blaine, Jefferson, Owyhee); MT (Missoula); NV (Churchill, Clark, Elko, Eureka, Humboldt, Lincoln, Lyon, Nye); OR (Baker, Clackamas, Deschutes, Grant, Harney, Lake, Linn, Malheur, Multnomah); UT (Emery, Garfield, Grand, Iron, Juab, Kane, San Juan, Tooele, Uintah, Utah, Wasatch, Washington, Weber)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Birds (Cont.)						
Empidonax traillii extimus	Southwestern willow flycatcher	E	Y	Y	AZ (Cochise, Coconino, Gila, La Paz, Maricopa, Mohave, Pinal, Santa Cruz, Yavapai, Yuma); CA (Imperial, Inyo, Kern, Los Angeles, Riverside, San Bernardino, San Diego); CO (Dolores, Gunnison); NM (Hidalgo, Grant, McKinley, San Juan, Socorro); UT (Beaver, Carbon, Emery, Garfield, Grand, Iron, Kane, San Juan, Sevier, Uintah, Washington)	AZ (Cochise, Gila, Maricopa, Mohave, Pinal, Yavapai), CA (Kern, Riverside, San Bernardino, San Diego); NM (Grant, Hidalgo, Socorro); UT (Washington)
Eremophila alpestris strigata	Streaked horned lark	C	N	N	OR (Clackamas, Linn)	None
Falco femoralis septentrionalis	Northern Aplomado falcon	E	N	Y	NM (Dona Ana, Grant, Hidalgo, Socorro)	None
Grus americana	Whooping crane	E	Y	Y	CO (Clear Creek)	None
Gymnogyps californianus	California condor	E	Y	Y	AZ (Coconino, Mohave); CA (Kern, Los Angeles); UT (Kane, Washington)	CA (Kern, Los Angeles)
Haliaeetus leucocephalus	Sonoran desert bald eagle	T	N		AZ (Yavapai, Gila, Maricopa, Mohave, Pinal)	None
Pelecanus occidentalis	Brown pelican	E	N	Y	CA (San Diego); OR (Lane)	None
Pipilo crissalis eremophilus	Inyo California towhee	T	Y	Y	CA (Inyo)	CA (Inyo)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Birds (Cont.)						
Polioptila californica californica	Coastal California gnatcatcher	T	Y	N	CA (Los Angeles, Orange, Riverside, San Bernardino, San Diego)	CA (Los Angeles, Orange, Riverside, San Bernardino, San Diego)
Rallus longirostris levipes	Light-footed clapper rail	E	N	Y	CA (Orange, San Diego)	None
Rallus longirostris yumanensis	Yuma clapper rail	E	N	Y	AZ (Gila, La Paz, Maricopa, Mohave, Pinal, Yavapai, Yuma); CA (Imperial, Riverside, San Bernardino); NV (Clark, Nye)	None
Sterna antillarum	Interior least tern	E	N	Y	CO (Delta); NM (Chaves)	None
Sterna antillarum browni	California least tern	E	N	Y	CA (Los Angeles, Orange, San Diego)	None
Strix occidentalis caurina	Northern spotted owl	T	Y	Y	CA (Humboldt, Shasta, Siskiyou, Trinity); NM (Luna), OR (Clackamas, Deschutes, Douglas, Hood River, Jackson, Klamath, Lane, Multnomah, Wasco); WA (Chelan, King, Kittitas, Snohomish)	CA (Humboldt, Shasta, Trinity); OR (Clackamas, Deschutes, Douglas, Hood River, Jackson, Klamath, Lane, Multnomah, Wasco); WA (Chelan, King, Kittitas, Snohomish)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Birds (Cont.)						
Strix occidentalis lucida	Mexican spotted owl	T	Y	Y	AZ (Cochise, Coconino, Gila, Maricopa, Mohave, Navajo, Pinal, Santa Cruz, Yavapai); CO (Fremont, San Miguel); NM (Grant, Lincoln, McKinley, Sandoval, Sierra, Socorro); UT (Carbon, Emery, Garfield, Grand, Iron, Kane, San Juan, Washington, Uintah)	AZ (Cochise, Coconino, Gila, Maricopa, Mohave, Navajo, Pinal, Santa Cruz, Yavapai); CO (Fremont); NM (Grant, Lincoln, McKinley, Sandoval, Sierra, Socorro); UT (Carbon, Emery, Garfield, Grand, Iron, Kane, San Juan, Washington, Uintah)
Tympanuchus pallidicinctus	Lesser prairie-chicken	C	N	N	NM (Chaves, De Baca, Eddy, Lea)	None
Vireo bellii pusillus	Least Bell's vireo	E	Y	N	CA (Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego)	CA (Los Angeles, Riverside, San Bernardino, San Diego)
Mammals						
Antilocapra americana sonoriensis	Sonoran pronghorn	E	N	N	AZ (Maricopa, Yuma)	None
Brachylagus idahoensis	Pygmy rabbit	E	N	N	OR (Crook, Harney, Jefferson, Klamath, Lake, Malheur, Union)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Mammals (Cont.)						
Canis lupus	Gray wolf	E	Y	Y	AZ (Cochise); CO (Clear Creek, Delta, Dolores, Garfield, La Plata, Mesa, Moffat, Montezuma, Montrose, Rio Blanco, Routt); ID (Ada, Bingham, Blaine, Bonneville, Cassia, Clark, Elmore, Gooding, Jefferson, Jerome, Kootenai, Lincoln, Minidoka, Oneida, Owyhee, Power, Shoshone, Twin Falls); MT (Beaverhead, Carbon, Granite, Jefferson, Madison, Mineral, Missoula, Silver Bow); OR (Baker, Clackamas, Deschutes, Douglas, Harney, Jackson, Lane, Linn, Malheur); WY (Albany, Big Horn, Carbon, Converse, Fremont, Hot Springs, Natrona, Sweetwater, Uinta, Washakie)	None
Cynomys parvidens	Utah prairie dog	T	N	Y	UT (Beaver, Garfield, Iron, Kane, Millard, Piute, Sanpete, Sevier)	None
Dipodomys ingens	Giant kangaroo rat	E	N	Y	CA (Kern)	None
Dipodomys merriami parvus	San Bernardino Merriam's kangaroo rat	E	Y	N	CA (Riverside, San Bernardino)	CA (Riverside, San Bernardino)
Dipodomys nitratoides nitratoides	Tipton kangaroo rat	E	N	Y	CA (Kern)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Mammals (Cont.)						
Dipodomys stephensi	Stephens' kangaroo rat	E	N	Y	CA (Riverside, San Bernardino, San Diego)	None
Eumetopias jubatus	Steller sea-lion	T	Y	N	CA (Humboldt)	CA (Humboldt)
Herpailurus yagouaroundi tolteca	Sinaloan jaguarundi	E	N	Y	AZ (Santa Cruz)	None
Leopardus pardalis	Ocelot	E	N	Y	AZ (Yavapai)	None
Leptonycteris curasoae yerbabuenae	Lesser long-nosed bat	E	N	Y	AZ (Cochise, Maricopa, Pinal, Santa Cruz); NM (Hidalgo)	None
Leptonycteris nivalis	Mexican long-nosed bat	E	N	Y	NM (Hidalgo)	None
Lynx canadensis	Canada lynx	T	Y	N	CO (Clear Creek, Garfield, Gunnison, Montezuma, Routt); ID (Blaine, Bonneville, Cassia, Clark, Elmore, Jerome, Kootenai, Oneida, Power, Shoshone, Twin Falls); MT (Beaverhead, Broadwater, Carbon, Granite, Jefferson, Madison, Mineral, Missoula, Powell, Silver Bow); OR (Baker, Clackamas, Crook, Deschutes, Douglas, Harney, Jackson, Klamath, Lake, Linn, Multnomah, Wasco); UT (Daggett, Emery, Sanpete, Sevier, Uintah, Wasatch); WA (Chelan); WY (Albany, Carbon, Fremont)	MT (Carbon, Granite, Missoula, Powell), WA (Chelan)

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Mammals (Cont.)						
Martes pennanti	West coast fisher	C	N	Y	CA (Humboldt, Inyo, Kern, Mono, Nevada, Placer, Shasta, Sierra, Siskiyou, Trinity); OR (Clackamas, Deschutes, Douglas, Jackson, Klamath, Lane)	None
Microtus californicus scirpensis	Amargosa vole	E	N	Y	CA (Inyo)	None
Microtus mexicanus hualpaiensis	Hualapai Mexican vole	E	N	Y	AZ (Coconino, Mohave, Yavapai)	None
Mustela nigripes	Black-footed ferret	E	N	Y	AZ (Coconino, Navajo); CO (Delta, Mesa, Moffat, Ouray, Rio Blanco); UT (Carbon, Daggett, Emery, Grand, San Juan); WY (Carbon)	None
Odocoileus virginianus leucurus	Columbian white-tailed deer	E	N	Y	OR (Columbia, Douglas, Lane, Multnomah)	None
Ovis canadensis	Peninsular bighorn sheep	E	Y	Y	CA (Imperial, Riverside, San Diego)	CA (Imperial, Riverside, San Diego)
Ovis canadensis californiana	Sierra Nevada bighorn sheep	E	N	Y	CA (Inyo, Modoc, Mono)	None
Panthera onca	Jaguar	E	N	Y	AZ (Cochise, Santa Cruz); NM (Hidalgo)	None

TABLE 3.8-5 (Cont.)

Scientific Name	Common Name	Listing Status[a]	Designated Critical Habitat (Y/N)	Recovery Plan (Y/N)	Counties with Designated Corridors in Which Species Is Known to Occur[b]	Counties with Designated Corridors in Which Critical Habitat for Species Is Located[c]
Mammals (Cont.)						
Perognathus longimembris pacificus	Pacific pocket mouse	E	N	Y	CA (Orange, San Diego)	None
Sorex ornatus relictus	Buena Vista Lake ornate shrew	E	Y	Y	CA (Kern)	CA (Kern)
Spermophilus tereticaudus chlorus	Palm Springs round-tailed ground squirrel	C	N	N	CA (Riverside)	None
Spermophilus washingtoni	Washington ground squirrel	C	N	N	OR (Umatilla)	None
Thomomys mazama glacialis	Roy Prairie pocket gopher	C	N	N	WA (King)	None
Ursus arctos horribilis	Grizzly bear	T[f]	N	Y	ID (Clark); MT (Beaverhead, Carbon, Madison, Missoula, Powell); NM (McKinley); UT (Daggett, Garfield, Iron, Piute, Sanpete, Sevier, Uintah, Utah, Wasatch, Washington); WY (Fremont, Hot Springs)	None
Vulpes macrotis mutica	San Joaquin kit fox	E	N	Y	CA (Kern)	None
Zapus hudsonius preblei	Preble's meadow jumping mouse	T	Y	N	WY (Albany, Carbon, Natrona)	CO (Douglas, Jefferson, Larimer, Teller); WY (Albany)

Footnotes on next page.

TABLE 3.8-5 (Cont.)

[a] C = candidate for listing, E = listed as endangered, PT = proposed for listing as threatened, T = listed as threatened.

[b] Occurrence of species in counties was determined based on information on the NatureServe website at http://www.natureserve.org/explorer/index.htm.

[c] Location of designated critical habitat was determined based on information on the USFWS “Threatened and Endangered Species System” website at http://ecos.fws.gov/tess_public/.

[d] Includes one or more “evolutionarily significant units” that spawn in different river basins or at different times of year and that have been assigned separate listing status.

[e] More than one listing category indicates that the species has different status in different states.

[f] Grizzly bears in the Yellowstone District Population Segment in Idaho, Montana, and Wyoming are considered recovered and have been delisted.

- *Candidate*: species for which the USFWS or NMFS has sufficient information on their biological status and threats to propose them as threatened or endangered under the ESA but for which development of a proposed listing regulation is precluded by other higher priority listing actions.

- *Critical habitat*: specific areas within the geographical area occupied by the species at the time it is listed, on which are found physical or biological features essential to the conservation of the species and which may require special management considerations or protection. Except when designated, critical habitat does not include the entire geographical area that can be occupied by the threatened, endangered, or other special status species.

In the project area, there are 153 plant species and 173 animal species that are federally listed as threatened or endangered, proposed for listing, or candidates for listing under the ESA. Included in the total number of animals are 19 species of mollusks, 22 species of arthropods, 65 species of fishes, 11 species of amphibians, 5 species of reptiles, 21 species of birds, and 30 species of mammals. California has the largest number of listed species (142), whereas Montana and Wyoming have the fewest (6 and 8, respectively). Critical habitat has been designated for 108 of these species, and recovery plans have been developed for 224 species that must be followed where federal projects might affect those species (Table 3.8-5).

BLM has established a policy, as specified in BLM Manual 6840, *Special Status Species Management* (BLM 2001b), that directs the agency "to take actions to conserve listed species and the ecosystems on which they depend," and "to ensure that actions requiring authorization or approval by the BLM are consistent with the conservation needs of special status species and do not contribute to the need to list any special status species, either under provisions of the ESA or other provisions of this policy." In this case, special status species are those species that are proposed for listing, officially listed as threatened or endangered, or are candidates for listing as threatened or endangered under the provisions of the ESA; those species listed by a state in a category such as threatened or endangered implying potential endangerment or extinction; and those designated by each BLM state director as sensitive. Each BLM state director maintains a list of sensitive species, and impact to these species would have to be considered in project-specific assessments developed prior to approval of any activity that would affect listed or proposed species or critical habitat.

The FS has a comparable policy that is specified in Forest Service Manual 2600, *Wildlife, Fish, and Sensitive Plant Habitat Management* (FS 1995b). In Section 2670.22, the FS identifies these objectives related to sensitive species management: (1) develop and implement management practices to ensure that species do not become threatened or endangered because of FS actions; (2) maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands; and (3) develop and implement management objectives for populations and/or habitat of sensitive species. Sensitive species are those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by (a) significant current or predicted downward trends in population numbers or density, or (b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Each regional forester maintains a list of sensitive species (FS 2005a), and impacts to these species would have to be considered in project-specific assessments prepared prior to approval of any activity that would affect listed or proposed species or critical habitat.

Each of the 11 western states has also identified species that are of concern in the state. Each state differs in the listing status designations they use and their regulations for protecting these species. Project-specific assessments would consider impacts to these state-listed species prior to project development. Many of these species are also included in BLM and FS sensitive species lists, and some are also listed under the ESA.

3.8.2 How Were the Potential Impacts of Corridor Designation and Land Use Plan Amendment to Ecological Resources Evaluated?

This section describes the methodologies used to determine the possible impacts of corridor designation and land use plan amendment to ecological resources.

3.8.2.1 Evaluating Potential Effects to Vegetation and Wetlands

Vegetation or wetlands could be affected with development of specific projects within a designated corridor. The analysis of potential impacts from project development to terrestrial vegetation and wetlands considers direct impacts of facility construction, routine operation, and spills, as well as indirect effects. Impacts to these resources that would be expected to occur under either of the alternatives are discussed in Section 3.8.4.1. The impacts that are evaluated are associated with both the elimination of habitat and the degradation of habitat from activities occurring in adjacent areas or, in the case of wetlands, activities occurring within the watershed. The implementation of mitigation measures to reduce or eliminate the impacting factors described in Section 3.8.4.1 would help to limit the potential impacts to vegetation and wetlands. These measures are described in Section 3.8.4.2.

The evaluation of impacts to vegetation under the Proposed Action is based on the ecoregions that occur within the 11 western states in which energy corridors would be established. These ecoregions are described in Appendix Q. The potential for impacts to various types of vegetation was assumed to be proportional to the degree to which their respective ecoregions intersect with the energy corridors. Figure 3.8-3 shows the energy corridors in relation to the ecoregions. The length and area of corridor crossing each ecoregion in each state are presented in Section 3.8.3.2 for the Proposed Action.

As described in Section 3.8.1.1, many types of wetlands occur within the 11-state area. However, wetlands throughout the region are frequently associated with intermittent and perennial streams, including floodplains and riparian wetlands, and the seeps and springs that feed these streams. The total lengths of perennial streams and rivers and the surface areas of ponds and lakes that occur within the corridors in each state are presented in Sections 3.8.3.2. Wetlands that are associated with intermittent streams would be expected to occur along the tributaries of these perennial streams and rivers. Springs supporting wetlands may occur along either the perennial or intermittent streams. The degree of impacts to wetlands would depend on the specific type of energy transport project crossing the wetlands; the degree of wetland development along the identified perennial streams, lakes, and ponds; the presence of tributaries associated with wetland habitats; other wetlands within the corridor segments; and the degree to which wetlands can be avoided during ROW construction.

3.8.2.2 Evaluating Potential Effects to Aquatic Biota and Habitats

As with vegetation and wetlands, designation of energy corridors under the Proposed Action would not affect aquatic biota. These resources would only be affected if an energy transport project were developed following corridor designation or ROW approval.

The programmatic analysis of impacts to aquatic biota from subsequent project

FIGURE 3.8-3 Energy Corridors and Level III Ecoregions

development considers direct impacts of facility construction, routine operations, maintenance, decommissioning, and spills, as well as indirect effects. Impacts to these resources from project development within corridors under either of the alternatives are discussed in Section 3.8.4.1. The impacts evaluated are associated with both the elimination of habitat and the degradation of habitat from activities occurring in adjacent areas. The implementation of mitigation measures to reduce or eliminate the impacting factors described in Section 3.8.4.1 would help to limit the potential impacts to aquatic biota. These mitigation measures are described in Section 3.8.4.2.

Aquatic habitats within the proposed corridor segments were identified using GIS hydrological coverage with respect to the proposed corridor segments. It was assumed that the potential for impacts on aquatic habitats and the associated aquatic biota would be proportional to the number and extent of aquatic habitats intersected by the corridor segments, as well as the type of project proposed for development within a corridor, and the design of that project (including mitigation measures). In addition to the numbers of water bodies potentially affected, the areal extents (for ponds, lakes, and reservoirs) and lengths (for rivers and streams) of the water bodies associated with corridor segments were also identified (Tables 3.5-6 and 3.5-7; Appendix O).

3.8.2.3 Evaluating Potential Effects to Wildlife

Wildlife may be affected by subsequent development of an energy transport project within a designated corridor or ROW.

The programmatic analysis of impacts to wildlife, including wild horses and burros, considers direct and indirect impacts of project construction, routine operation, maintenance, decommissioning, and spills. Impacts of future projects that could occur under either alternative are discussed in Section 3.8.4.1. The impacts of the construction and decommissioning of energy transport systems and their associated facilities (e.g., access roads, pump stations, and substations) are related to habitat disturbance, introduction of invasive species, injury or mortality, erosion, dust, noise, contaminant exposure, and interference with behavior. Impacts resulting from operation and maintenance include electrocution and exposure to electromagnetic fields, noise, collisions, maintenance activities (including herbicide use), contaminants (including oil spills), disturbance (including habitat disturbance and interference with animal behavior), and fire effects (e.g., an indirect effect of the project could be an increase in the potential for fires).

Detailed evaluations are not possible until project-specific ROWs are authorized and project development occurs; broad differences among alternatives are discussed in Sections 3.8.3.1 and 3.8.3.2. The evaluation of wildlife impacts under the Proposed Action is based on important wildlife species (e.g., greater sage-grouse, big game species, and wild horses) known to occur within the areas of the 11 western states where the energy transport corridor segments could occur. The potential for direct and indirect impacts from project development was assumed to be proportional to the length and acreage of corridor segments within each state and/or ecoregion and the wildlife species that may occur within those areas.

Because a site-specific and project-specific evaluation cannot be performed at this time, a number of mitigation measures related to wildlife protection during major project phases (preconstruction planning, construction, restoration, operation, maintenance, and decommissioning) are identified in Section 3.8.4.2. With these mitigation measures in place, many impacts to wildlife species from project development can be avoided or minimized.

3.8.2.4 Evaluating Potential Impacts on Threatened, Endangered, and Other Special Status Species

Designation of federal energy corridors is expected to have no direct effect on threatened, endangered, and other special status species. Federally and state-listed threatened and endangered species, species that are proposed for listing or that are candidates for listing, BLM sensitive species, FS sensitive species, and species of special concern listed by individual states could be affected by development of energy transport projects within designated corridors or ROWs. Impacts to these species would be considered in project-specific NEPA evaluations and ESA consultations prior to the start of any construction activities. Those evaluations would take into consideration the specific design alternatives being considered and the exact locations of project facilities. The evaluation in this PEIS can evaluate impacts from project development (following corridor designation) to threatened, endangered, and other special status species in only a general fashion.

The impacts of construction of energy transport systems and support facilities such as access roads, pump stations, and substations are evaluated on a non-site-specific level and are related to the amount of land disturbance, the duration and timing of construction periods, and the habitats crossed by the corridors. Indirect effects, such as impacts resulting from erosion of disturbed land surfaces and disturbance and harassment of animal species, are also considered, but their magnitude is considered proportional to the amount of land disturbance associated with each alternative. Impacts resulting from operations include the amount of land dedicated to facilities, noise from facilities, spread of invasive species, and increased human access. Although detailed evaluations are not possible until a more precise project description is available, broad differences among the alternatives are discussed in Sections 3.8.3.1 and 3.8.3.2.

Because a site-specific and project-specific evaluation cannot be performed at this time, a number of general mitigation measures related to threatened and endangered species protection are identified in Section 3.8.4.2. With these mitigation measures in place, many impacts to threatened, endangered, and other special status species can be avoided or minimized.

3.8.3 What Are the Potential Impacts on Ecological Resources of the Alternatives, and How Do They Compare?

This section presents the relative impacts of the two alternatives under consideration — No Action and the Proposed Action (designate new and locally approved corridors). These alternatives are described in Chapter 2. An important consideration in evaluating the relative impacts of these two alternatives is the fact that neither of the alternatives specifies corridors with energy transport projects.

Thus, to a large extent the relative comparison of impacts depends on whether or not corridors are specified in the alternative. For the most part, it is assumed that the specificity of corridors for the Proposed Action would minimize impacts to ecological resources, because it would afford a greater degree of colocation of facilities and a reduction in redundancy, thus minimizing the total amount of land impacted by corridor development. The same area could be affected several times under the Proposed Action as new transport or transmission projects are added to a corridor. This could increase the temporal extent of impacts and make restoration after construction more difficult.

Potential impacts to ecological resources associated with future construction, operation, and decommissioning of energy transport projects are presented in Section 3.8.4.1. The impacts described in that section are more dependent on siting decisions and project design and are less dependent on the alternative chosen. The remainder of this section presents the expected differences in energy transport project development impacts among the alternatives.

3.8.3.1 Possible Effects of the No Action Alternative on Ecological Resources

Under No Action, Section 368 energy corridors would not be designated and corridor planning and development would proceed without coordination or integrated systematic planning. The colocation of energy transport projects that would occur under the Proposed Action is less likely to occur under No Action because individual project proponents would identify preferred routes and project designs independently. In addition, more ancillary facilities, such as access roads, pumping stations, and electrical substations (with greater amounts of land disturbance), would likely be developed if transport projects are not colocated.

Consequently, there is the possibility that there would be more land area affected by corridor development under the No Action Alternative with greater impacts on vegetation, wetlands, aquatic biota, wildlife, and threatened, endangered, and other special status species. Impacts would include both construction and, eventually, decommissioning impacts (e.g., habitat destruction or alteration, wetland disturbance, erosion and sedimentation to aquatic systems, wildlife displacement or harassment, and impacts on protected species) and operational impacts (e.g., vegetation management, invasive plant establishment and dispersal, impacts on wildlife movement patterns, and bird collisions). Impacts associated with corridor development in general are discussed in Section 3.8.4.1.

Although the impacts on ecological resources from developing energy transport projects under No Action are generally greater than those under the Proposed Action, as described above, some of the impacts of No Action could be less. Full development of an energy corridor would result in a wider corridor and more concentrated infrastructure at a given location and could pose a more formidable barrier to wildlife movements. Colocated transmission towers could be more difficult for birds to avoid, thus increasing the probability of collision. If fully developed, the wider energy corridors could make dispersal of plant propagules across the designated corridor more difficult than for an individual project ROW. In addition, under the Proposed Action, the same area could be affected several times as new transport or transmission projects are added to a designated corridor. This could increase the temporal extent of impacts and make restoration after construction more difficult relative to the No Action Alternative.

3.8.3.2 Possible Effects of the Proposed Action on Ecological Resources

Designation of energy corridors under the Proposed Action would not directly affect ecological resources. These resources could be affected with development of energy transport projects within the designated corridors. Under the Proposed Action, locally approved corridors and additional corridor segments would be designated as Section 368 energy corridors.

Development of energy projects within corridors designated under the Proposed Action is expected to have less impact than similar project development under No Action because there would be a greater likelihood for colocation of energy transport projects and fewer overall corridors or ROWs on other federal lands. Generally, the width of colocated corridors is less than the width of an equal number of projects located within separate ROWs. There would likely also be fewer ancillary facilities such as access roads, pumping stations, and electrical substations (with greater amounts of land disturbance) developed if corridors were colocated. Consequently, it is anticipated that there could be less total land disturbance under the Proposed Action than under No Action with less impact on vegetation, wetlands, aquatic biota, wildlife, and threatened, endangered, and other special status species.

However, under the Proposed Action, land within designated energy corridors could be disturbed multiple times as new energy transport facilities are added through time. Thus, although the total amount of land disturbed may be less under the Proposed Action, the duration of disturbance may be greater. Despite this, the overall levels of impacts under the Proposed Action are expected to be lower than under the No Action Alternative because less area would be affected. This would result in less direct and indirect impacts to ecological resources.

Development of energy corridors under the Proposed Action would result in a wider area of locally disturbed land and more concentrated infrastructure than under No Action. These wider developed corridors could pose a formidable barrier to movement of some wildlife species and plant propagules. Thus, in these instances, the wider proposed energy corridors could result in a greater degree of population segregation than under No Action. Colocated transmission lines could be more difficult for birds to avoid, thus increasing the probability of collision.

More detailed descriptions of the anticipated impacts of project development under the Proposed Action to vegetation and wetlands, aquatic biota, wildlife, and threatened and endangered species are provided in the remainder of this section.

Vegetation and Wetlands. Terrestrial vegetation communities would be impacted by the construction and maintenance of energy transport projects, if they become authorized, within designated corridors throughout the 11 western states. The types of vegetation that would be included within the corridors in each state would depend on local conditions along the corridor route, including elevation, precipitation, aspect, slope, and soil type. The types of vegetation that are associated with the ecoregions occurring along the corridor routes are described in Appendix Q. The ecoregions crossed by energy corridors under the Proposed Action, along with the lengths and areas of intersection, are presented in Table 3.8-6. Avoidance of sensitive or especially high-quality habitats was considered during corridor routing.

Wetlands would also be crossed by corridor segments under the Proposed Action. The wetland types associated with the ecoregions identified in Table 3.8-7 for each state would be potentially affected by energy project development. However, avoidance of wetland concentration areas, as well as other sensitive ecological resources, was considered during corridor routing. Across much of the 11-state region, riparian zones along rivers and streams represent important and sensitive habitats. The named streams intersected by the corridor segments in each of the 11 western states are presented in Table 3.5-6. The stream lengths represent the total lengths of these streams lying within the corridor segments. Riparian habitats are also located along many of the intermittent streams that are tributaries of these water bodies. If all of the corridors were developed under the Proposed Action, then at least 273 streams and canals would be intersected (some would be intersected multiple times) for a total stream length of about 412 miles. Additional stream intersections would be expected to occur within the ROWs that would be constructed between these corridor segments.

Aquatic Biota. Under the Proposed Action, Section 368 energy corridors would be designated on federal lands. Thus, compared to No Action, there would be additional multiuse corridors within which energy transport projects could be located. As a consequence, it is assumed that there would be a reduced impetus to develop multiple additional single-use project ROWs across some parcels of federal land compared to No Action. The causes and types of impacts that could occur to aquatic habitats

TABLE 3.8-6 Ecoregions Crossed by Corridors under the Proposed Action and Locally Designated Corridors[a,b]

Ecoregion	Length and Area Crossed	Total
Coast Range	OR: 0; 5/0; 2,147	0; 5/0; 2,147
Willamette Valley	OR: 3; 0/802; 1,095	3; 0/802; 1,095
Cascades	CA: 0; 6/0; 1,316. OR: 2; 60/718; 21,865. WA: 0; 2/0; 1,332	2; 68/718; 24,514
Sierra Nevada	CA: 6; 20/2,098; 8,565	6; 20/2,098; 8,565
Southern and Central California Chaparral and Oak Woodlands	CA: 7; 21/2,581; 4,560	7; 21/2,581; 4,560
Southern California Mountains	CA: 41; 0/22,238; 746	41; 0/22,238; 746
Eastern Cascades Slopes and Foothills	CA: 66; 54/27,528; 9,037. OR: 11; 91/1,900; 36,752	77; 145/29,428; 45,789
Columbia Plateau	WA: <1; 1/16; 285	<1; 1/16; 285
Blue Mountains	OR: 51; 5/9,036; 14,956	51; 5/9,036; 14,956
Snake River Plain	ID: 0; 213/0; 83,576. OR: <1; 6/17; 2,295	<1; 219/17; 85,871
Central Basin and Range	CA: 0; 83/0; 16,659. ID: 0; 2/0; 869. NV: 664; 366/474,283; 151,661. UT: 81; 269/32,088; 119,122	744; 720/506,371; 288,312
Mojave Basin and Range	AZ: 109; 5/69,585; 5,898. CA: 302; 27/389,404; 6,486. NV: 73; 396/21,755; 159,869. UT: 28; <1/14,651; 8	512; 428/495,394; 172,261
Northern Rockies	ID: 0; 15/0; 3,474. MT: 0; 98/0; 15,510.	0; 113/0; 18,984
Middle Rockies	ID: 6; <1/416; 2,329. MT: 23; 110/9,217; 21,836	29; 110/9,633; 24,164
Wyoming Basin	CO: 28; 8/11,073; 3,506. MT: 0; 4/0; 2,034. UT: 0; 19/0; 6,170. WY: <1; 422/35; 178,359	28; 454/11,108; 190,069
Wasatch and Uinta Mountains	UT: 9; 85/3,204; 35,260	9; 85/3,204; 35,260

TABLE 3.8-6 (Cont.)

Ecoregion	Length and Area Crossed	Total
Colorado Plateaus	AZ: 53; 7/32,363; 2,799. CO: 96; 129/117,451; 59,222. NM: 0; 9/0; 3,738. UT: 0; 201/0; 159,879	149; 347/149,814; 225,637
Southern Rockies	CO: 90; 74/43,624; 25,754. WY: 0; 7/0; 3,298	90; 81/43,624; 29,052
Arizona/New Mexico Plateau	AZ: 6; 0/3,733; 0. NM: 18; 76/7,789; 30,653	24; 76/11,522; 30,653
Arizona/New Mexico Mountains	AZ: 165; 25/69,815; 20,208	165; 25/69,815; 20,208
Chihuahuan Deserts	AZ: 5; 0/2,193; 5. NM: 0; 163/0; 67,775	5; 163/2,193; 67,780
High Plains	NM: 0; 27/0; 11,108	0; 27/0; 11,108
Southwestern Tablelands	CO: 1; 0/324; 0	1; 0/324; 0
Northwestern Great Plains	MT: 0; 1/0; 712. WY: 0; 8/0; 3,900	0; 9/0; 4,612
North Cascades	WA: 48; <1/4,434; 131	48; <1/4,434; 131
Klamath Mountains	CA: 2; 34/1,081; 12,963. OR: 18; 0/3,351; 4,888	20; 34/4,432; 17,851
Madrean Archipelago	AZ: 1; 15/645; 6,067	1; 15/645; 6,067
Northern Basin and Range	CA: 0; 33/0; 12,887. ID: <1; 78/47; 32,398. NV: 81; 42/80,646; 16,557. OR: 248; 64/45,154; 85,618	329; 217/125,847; 147,460
Sonoran Basin and Range	AZ: 190; 69/136,800; 36,455. CA: 103; 20/130,368; 23,985	293; 89/267,168; 60,440

[a] Locally designated corridors length (miles); Proposed Action corridors length (miles)/locally designated corridors area (acres); Proposed Action corridors area (acres).

[b] Proposed Action corridors include locally designated corridors.

TABLE 3.8-7 Area of Section 368 Corridors That Occurs within the Distribution of Greater Sage-Grouse, Big Game Species, and Wild Horse and/or Burro Herd Management Areas

	Species or Herd Management Areas (HMA)										
State	Greater Sage-grouse	American Bison	Bighorn Sheep	Elk	Moose	Mule Deer	Pronghorn	White-tailed Deer	American Black Bear	Mountain Lion	HMA[a]
AZ	–[b]	–	90,843 (0.7%)[c]	15,796 (0.3%)	–	124,435 (0.4%)	239,020 (0.7%)	54,226 (0.4%)	71,946 (0.3%)	168,181 (0.4%)	71,470 (2.3%)
CA	29,165 (1.0%)	NA[d]	237,287 (2.0%)	5,299 (0.1%)	–	76,114 (0.2%)	34,888 (0.9%)	–	30,603 (0.1%)	248,052 (0.5%)	22,716 (1.4%)
CO	197,190 (0.6%)	217,113 (0.6%)	257,271 (0.6%)	156,511 (0.4%)	29,859 (0.3%)	258,291 (0.5%)	227,502 (0.7%)	140,620 (0.4%)	230,152 (0.7%)	257,997 (0.5%)	3,547 (0.9%)
ID	69,055 (0.3%)	–	14,990 (0.4%)	45,526 (0.1%)	3,748 (<0.1%)	123,028 (0.2%)	114,509 (0.6%)	3,533 (<0.1%)	4,405 (<0.1%)	49,817 (0.2%)	7,461 (1.8%)
MT	8,186 (0.1%)	0.0 (0.0%)	1,040 (0.2%)	46,424 (0.1%)	20,972 (o.1%)	40,954 (0.1%)	14,510 (<0.1%)	18,320 (0.1%)	30,399 (0.1%)	31,883 (0.1%)	0.0 (0.0%)
NV	360,058 (1.6%)	–	208,174 (0.8%)	148,295 (1.2%)	–	235,099 (1.0%)	761,937 (1.4%)	–	0 (0.0%)	673,552 (1.3%)	117,235 (0.7%)
NM	–	NA	0 (o.0%)	0 (0.0%)	–	94,677 (0.1%)	53,346 (0.1%)	0 (0.0%)	446 (<0.1%)	1,884 (<0.1%)	0.0 (0.0%)
OR	154,889 (0.9%)	–	11,971 (0.6%)	40,688 (0.1%)	–	229,000 (0.4%)	145,341 (0.8%)	475 (<0.1%)	54,119 (0.2%)	24,222 (0.3%)	23,989 (0.8%)
UT	58,601 (0.8%)	29,640 (1.1%)	–	68,622 (0.5%)	9,708 (0.3%)	349,187 (0.8%)	215,719 (1.2%)	0 (0.0%)	134,978 (0.7%)	186,233 (0.7%)	2,158 (0.1%)
WA	0.0 (0.0%)	–	1,077 (<0.1%)	6,281 (<0.1%)	0 (0.0%)	6,281 (<0.1%)	–	1,142 (<0.1%)	6,278 (<0.1%)	6,190 (<0.1%)	NA
WY	169,144 (0.4%)	0.0 (0.0%)	30,645 (0.1%)	167,851 (0.3%)	8,985 (<0.1%)	185,692 (0.3%)	185,522 (0.3%)	7,766 (0.1%)	22,415 (0.1%)	38,339 (0.1%)	35,844 (0.8%)

[a] Arizona corridors include 45,364 acres of burro HMA and 26,106 acres of horse and burro HMA; California corridors include 13,613 acres of burro HMA and 9,103 acres of horse HMA; Nevada corridors include 434 acres of burro HMA, 72,608 acres of horse HMA, and 44,193 acres of horse and burro HMA; corridors for other states with wild horses or burros are all horse HMAs.

[b] – = Species does not occur in the state.

[c] Percentage of the species distribution or herd management areas for the state that would occur within the Section 368 corridors.

[d] NA = information was not available.

Sources: BLM (2008a); USGS (2008).

under this alternative would be the same as those under No Action (see Section 3.8.4.1 for a description of potential impacts).

It is anticipated that the total amount of stream bottom and shoreline (i.e., riparian) areas disturbed by corridor construction, operation, and maintenance, and decommissioning activities under the Proposed Action would be less than or equal to the area disturbed under No Action. Even though the total footprint of corridor crossings within a given stream might be the same between No Action and the Proposed Action, the total stream areas affected by sediment deposition from multiple narrower corridors may be greater than the area affected by a single wider corridor as described in Section 3.8.4.1. Consequently, it is anticipated that the overall impacts on streams from sediment under the Proposed Action would be less than the overall impacts under No Action.

Because the amount of shoreline that would be affected by corridor development, operation, maintenance, and decommissioning under the Proposed Action would be less than or equal to the amount affected under No Action, it is anticipated that the thermal effects on aquatic habitats of the Proposed Action would also be less than or equal to the effects under No Action.

Assuming that the types and numbers of pipelines and the types of maintenance activities that occur in the vicinity of water body crossings and along corridors are the same under both alternatives, it is anticipated that the likelihood or magnitude of spills under the Proposed Action and No Action would also be similar. Consequently, potential impacts from spills would be similar under both alternatives.

Because of the greater numbers of individual corridors that could exist under No Action, it is anticipated that there would be less public access provided to water bodies under the Proposed Action than under No Action. Therefore, the potential for impacts to aquatic ecosystems due to increased fishing pressure or recreational activities would likely be lower under the Proposed Action than under No Action.

Under the Proposed Action, it is estimated that at least 273 individual streams and canals would be crossed (some would be crossed multiple times) and approximately 412 miles of stream habitat would occur within the proposed Section 368 energy corridor segments in the 11 western states (Table 3.5-6). Appendix Table O-3 identifies the amount of stream habitat that would fall within the proposed corridor footprint by stream and corridor segments. While an unquantifiable amount of additional stream crossings would occur on federal, state, Tribal, and private lands in order to join the Section 368 energy corridor segments, it is anticipated that the overall number of crossings under the Proposed Action would be smaller than the number of crossings under No Action.

In the Pacific Northwest and in the northern portion of the California hydrologic region, approximately 12 stream and river systems with designated EFH for anadromous Pacific salmon would be intersected by Section 368 energy corridor segments. Potential effects on EFH for anadromous Pacific coast salmon in freshwater habitats from development activities would be similar in nature to impacts described for other aquatic resources.

Wildlife. The general causes and types of impacts that can occur to wildlife from construction, operation, maintenance, and decommissioning of energy transport facilities are presented in Section 3.8.2.3. This section presents the relative impacts to wildlife from project development with the Proposed Action corridors. Impacts to wildlife would be related to the type, length, and amount of habitat within which the project would be developed. Table 3.8-6 summarizes the ecosystems that would be crossed under the Proposed Action. It is anticipated that the overall impacts of project development within the Proposed Action corridors would be less than from similar project development within No Action corridors because there would be a greater likelihood for colocation of energy transport systems and fewer ROWs and ancillary facilities overall. Consequently, there could be less total development under the Proposed Action than under No Action.

The 131 energy corridors within the 11 western states for the Proposed Action total 6,112 miles with an area of 3,311,055 acres. Table 3.8-7 provides the acres of Section 368 energy corridors that would occur within the distribution of the greater sage-grouse, big game species, and wild horse and/or burro herd management areas. Habitat disturbance would not total the entire area because potential project development would not occur across the entire ROW for a given Section 368 energy corridor, particularly for those corridors that are at or near 3,500 ft wide. Habitat disturbance would also occur within additional areas where ancillary facilities would be located (e.g., access roads, pump stations, and substations). Also, as discussed in Section 3.8.4.1, areas adjacent to disturbed ROWs within the designated corridors would incur an effective loss of habitat because of wildlife avoidance of these areas. (Also, many additional miles and acres of corridor segments on federal, state, Tribal, and private lands would be required to connect the Section 368 energy corridor segments.)

Other construction- and decommissioning-related impacts to wildlife (see Section 3.8.4.1) would also be expected to be less for the Proposed Action than for No Action because of the potential for a greater distance of colocated projects and fewer ancillary facilities, particularly access roads. Similarly, overall impacts from operation and maintenance for the Proposed Action would be less than for No Action, except with the possible exception of collisions of birds with transmission lines and, in some instances, habitat fragmentation for reasons discussed above.

Overall, it is anticipated that the impacts on wildlife species from the development of energy projects within the Section 368 energy corridors would be less than the impacts from similar project development within the No Action corridors, as described in the introduction to this section. However, the actual magnitude of those impacts cannot be determined until project-specific ROWs are authorized and project development occurs. Thorough evaluations would be developed in project-specific NEPA evaluations prior to approval of applications for development.

Threatened, Endangered, and Other Special Status Species. The designation of energy corridors under the Proposed Action would have no direct effect on threatened, endangered, and other special status species. However, development of energy transport projects under the Proposed Action could affect these resources, should such development occur. The impacts of construction and operation of energy transport facilities on these species would be very site- and project-specific. For purposes of this evaluation, all of the species presented in Section 3.8.1.4 could be affected by project development within the proposed corridors. Potential impacts on these species are described in Section 3.8.4.1 and in Appendix R.

It is anticipated that the overall impacts of the Proposed Action on threatened, endangered, and other special status species would be less than the impacts of No Action as described in the introduction to this section. However, the actual magnitude of those impacts cannot be determined until there is more specificity regarding the location of facilities and project design. These actions would be the subject of project-specific NEPA evaluations and ESA consultations that would be conducted prior to approval of applications for development.

3.8.3.3 Comparison of the Alternatives

Under No Action, the colocation of energy-transport projects is less likely to occur than under the Proposed Action. More ROW corridors and ancillary facilities, such as access roads, with greater amounts of land disturbance, would likely be developed. Thus, there is the possibility that there would be more land area affected by corridor development under No Action with greater impacts to vegetation, wetlands, aquatic biota, wildlife, and threatened, endangered, and other special status species. There is a greater likelihood that more lands under nonfederal jurisdiction would be crossed, and projects would possibly undergo less or inconsistent scrutiny with a subsequent increase in impacts to ecological resources.

The designation of corridors under the Proposed Action would have no direct effect on ecological resources. However, development of energy transport projects within and between the designated corridors under the Proposed Action could affect ecological resources, should such development occur. Avoidance of sensitive ecological resources, such as wetland concentration areas, however, was considered during corridor routing. Project development under the Proposed Action is expected to have less impact on vegetation, wetlands, aquatic biota, wildlife, and threatened, endangered, and other special status species than under No Action because there would be a greater likelihood for colocation of energy transport facilities and potentially fewer corridors, fewer ancillary facilities, and thus less total development overall. Corridor designation under the Proposed Action would minimize impacts to ecological resources, because it would afford a greater degree of colocation of facilities and a reduction in redundancy, thus minimizing the total amount of land impacted by ROW development.

The corridor segments for the Proposed Action total 6,112 miles with an area of 3,311,041 acres. Within the proposed corridors, the effects of habitat fragmentation (particularly edge effects), behavioral impacts to wildlife, effects from accidental chemical spills, and potential for the spread of invasive species would be less than under No Action. However, full development of the corridors would result in a wider corridor and more concentrated infrastructure at a given location, potentially creating a greater barrier to wildlife movements and dispersal of plant propagules, and a greater risk of collision for birds. Under the Proposed Action, at least 297 streams and canals would be crossed (some crossed multiple times) for a total stream length of about 400 miles.

The total amount of stream bottom and shoreline (i.e., riparian) areas disturbed under the Proposed Action would be less than or equal to the area disturbed under No Action, with less or equal thermal effects on aquatic habitats. The total area affected by sedimentation downstream of multiple narrower corridors, as under No Action, may well be greater than the area affected by a single wider corridor, however, potential impacts from spills would be similar under both alternatives. There would also be lower potential for impacts to aquatic ecosystems due to increased fishing pressures or recreational activities under the Proposed Action than under No Action because of less public access to water bodies. However, under the Proposed Action, the same area could be affected several times as new transport or transmission projects are added to a designated corridor. This could increase the temporal extent of impacts and make restoration after construction more difficult relative to the No Action Alternative.

3.8.4 Following Corridor Designation, What Types of Impacts Could Result to Ecological Resources with Project Development, and How Could Impacts Be Minimized, Avoided, or Compensated?

This section describes the impacts associated with construction, operation, and decommissioning of energy transport facilities regardless of the alternative chosen. Both direct and indirect impacts to vegetation and wetlands, aquatic biota, wildlife, and threatened, endangered, and other special status species are presented. Mitigation measures, as described in Section 3.8.4.2, would minimize or avoid the adverse impacts described in this section (BLM 2007b).

3.8.4.1 What Are the Usual Impacts to Ecological Resources of Building, Operating, and Decommissioning Energy Transport Projects?

How Could Vegetation and Wetlands Be Affected by Project Development? Terrestrial vegetation communities would be affected by the construction of energy transport systems, including the construction of pipelines and electricity transmission lines, as well as support facilities and access roads. Impacts to wetlands from construction activities may also occur. Routine operations and accidental spills may also result in impacts to terrestrial vegetation and wetlands. Impacts to wetlands are regulated under the River and Harbors Act and Section 404 of the Clean Water Act. Permitting from the U.S. Army Corp of Engineers will be required for each project that disturbs wetlands under its jurisdiction, both within and outside of corridors. In addition, E.O. 11990, "Protection of Wetlands," requires all federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. DOE implementation of this E.O. is included in 10 CFR 1022.

Terrestrial plant communities provide habitats for numerous wildlife species and contribute to the hydrologic inflow to wetlands within their watershed through surface drainage or groundwater recharge. Wetlands provide a number of valuable functions within the landscape (NRC 1995). Surface water storage in wetlands provides for the absorption of stormwater flows, maintaining water tables as well as reducing downstream flood peaks and subsequent damage from floodwaters. Wetlands help maintain water quality by retaining and removing dissolved substances, sediments, and contaminants. The transformation and cycling of elements in wetlands maintain nutrient levels. Many fish and wildlife species depend on wetlands for habitat.

Ground-disturbing activities, including excavation, grading, and clearing of vegetation, during the construction of ROWs would result in direct impacts on plant communities. Vegetation types that are associated with the ecoregions occurring along the corridor routes are described in Appendix Q. Direct impacts occur generally at the time and location of the impacting factor, while indirect effects are generally separated in time and/or space from the impacting factor. Construction would require the removal or cutting of some vegetation within the area of the ROW, as well as the cutting of tall trees adjacent to electricity transmission line ROWs and the disturbance of substrates (e.g., soil, rocks). Excavation for the construction of buried pipelines would eliminate existing vegetation over the area of the trenches and the adjacent areas where the excavated soils would be placed. The construction of facility components would require the permanent removal of vegetation and replacement with facilities and gravel yards. In addition to vegetation clearing within the ROWs, the construction of access roads and the establishment of support facilities would require the clearing of vegetation, in some cases outside of the ROW. A minimal amount of grading would occur in material laydown areas and staging areas.

Areas from which vegetation is removed would be replanted, except where permanent facilities or access roads are located. However, the reestablishment of some natural communities, such as those in alpine or very arid locations, may be very difficult. Unique habitats, such as old growth habitats, which may have never been physically disturbed by activities such as logging and typically contain centuries-old trees or other plants, could not be reestablished and would be permanently lost.

Losses of such habitats would be considered a greater impact than losses of previously disturbed habitats. However, avoidance of sensitive or especially high quality habitats, such as old growth, was generally considered during corridor routing. Operation of heavy equipment during construction may result in injury or destruction of existing vegetation and the compaction and disturbance of soils. Soil aeration, infiltration rates, and moisture content could be impacted. The disturbance of biological (microbiotic) soil crusts, which occur in deserts and other sparsely vegetated arid habitats and are important for soil stability, nutrient cycling, and water infiltration, may affect plant community development (Fleischner 1994; Gelbard and Belnap 2003).

All these factors could affect the rate or success of vegetation reestablishment. In arid regions, such as desert or shrub habitats, the reestablishment of plant communities may be very slow. Some of these communities are not adapted to disturbance, making recovery difficult. Some replanted areas over buried pipelines may continue over the long term to support vegetative communities different from surrounding natural communities, due to the slow reestablishment of native species and continued differences in substrate characteristics, such as soil moisture levels, organic material, and, in rocky soils, the amount of fine soil particles (BLM 2002).

Invasive plant species are present in many of the areas where corridors would be located. Seeds or other propagules of such species typically become easily dispersed, and seed germination and seedling growth and survival of these species generally tolerate disturbed conditions. Invasive plant species typically develop a high population density and tend to exclude most other plant species, reducing species and structural diversity. Diversity in faunal assemblages utilizing that habitat may also subsequently be reduced. Soil disturbed by clearing or excavation could provide opportunities for non-native species or invasive species to become established, resulting in potential long-term indirect effects. The longer time periods required for reestablishment of plant communities in arid regions, such as scrub or desert communities, may create an increased potential for invasive species establishment and spread.

Past or present land uses may affect the susceptibility of natural areas adjacent to ROWs to the establishment of invasive species. In some cases, areas that have been subjected to previous disturbances, such as livestock grazing, may have an increased potential for the establishment of invasive species (Fleischner 1994; Gelbard and Harrison 2003; Gelbard and Belnap 2003). Replanting of disturbed areas with non-native species may result in introduction of those species into nearby natural areas, including other federal and nonfederal land. ROWs, such as energy transport corridors or roads, can provide routes for the introduction and spread of invasive species into new, uninfested areas. These corridors can facilitate the dispersal of invasive species by altering existing habitat conditions, stressing or removing native species, and allowing easier movement by wild or human vectors (Trombulak and Frissell 2000). Because they are typically linear projects, they have the potential for widespread, landscape-scale promotion of invasive species.

In addition to reducing species diversity through competition, invasive species may alter ecological processes, such as fire regimes. Long-term effects may include an increase in the frequency and intensity of wildfires, particularly from the establishment of annual grasses (such as cheatgrass [*Bromus tectorum*]), which produce large amounts of easily ignitable fuel over large contiguous areas. In some areas, a fire regime may be created where none was present before, such as in some scrub or desert communities. Native species, particularly shrubs and trees, in habitats not adapted to frequent or intense fires may be adversely affected, and their populations may be greatly reduced in affected areas, creating opportunities for greater increases in invasive species populations. Increases in fire frequency or severity may result in a reduction in biodiversity, and may promote the conversion of plant communities such as forest, shrubland, or shrub-steppe communities to other types, prolonging or preventing the development of later, mature successional stages (BLM 2007a). Vehicle traffic along ROWs can promote the incidence of fires in affected areas by the contact of hot exhaust systems with ignitable plant material, and in some cases lightning strikes to electricity transmission towers may increase the risk of fire.

Removal of tall mature trees in or near wetlands could result in an increase in growth of shrubs and herbaceous species present there due to the increased availability of light. Tree removal from wetlands may initially result in indirect wetland impacts, such as reductions in soil moisture, erosion of exposed substrates, increase in water temperatures, or sedimentation of downgradient wetland areas, including streams. Such impacts may affect the type of a native plant community able to become established, including species composition and community structure. These communities may consist of species tolerant of disturbed conditions.

Areas of tree removal would become vegetated with shrub and herbaceous species. Where trees are allowed to reestablish, such as in portions of electricity transmission line ROWs, early successional stages of forests or woodlands may become established as the permanent vegetation cover, depending on the reduction of mature trees by ROW maintenance programs. However, some forested wetlands within the ROWs could permanently change to scrub-shrub or emergent wetlands, depending on the density of shrub and herbaceous species present and the presence of species that naturally occur in local nonforested wetlands. The eventual permanent vegetation on any area disturbed during ROW construction would depend on the species present on and outside the ROW, the degree of disturbance to vegetation and substrates, and vegetation management practices implemented. The placement or disposal into wetlands of slash or debris from cutting could affect wetland communities by covering existing vegetation or blocking water flow.

Additional indirect impacts of construction may include habitat fragmentation and isolation of terrestrial habitats or wetland areas. In addition to habitats crossed by corridor segments, habitat remnants between future ROWs, such as those on private or other non-federal land that would connect segments, would be affected by factors associated with habitat fragmentation. Dispersal of pollen or seeds between isolated habitat patches may be difficult, resulting in eventual declines in biodiversity. Removal of trees within or along forest or woodland areas would potentially result in an indirect disturbance to forest or woodland interior areas, through changes in light and moisture conditions and introduction of nonforest or nonwoodland species, including potentially invasive species. In addition, trees remaining along the margin of the construction area may decline as a result of stress induced by altered conditions. Disturbance of surface soils near trees could also adversely affect trees along the margin. Root disturbance, soil compaction, topsoil loss, reduced soil moisture or reduced aeration, or altered drainage patterns may contribute to tree losses in addition to those removed during land clearing. Biodiversity may be reduced in fragmented or isolated habitats, including the diversity of plant and animal species. Effects on wildlife are discussed later in this section. The fragmentation of large, high quality, undisturbed habitats by ROW construction would be considered a greater impact than construction through previously disturbed or fragmented habitat. Where ROWs are constructed adjacent to existing energy transmission ROWs, the impacts of fragmentation would generally be much smaller than nonadjacent ROWs.

In areas where loose soils such as sand dunes occur, erosion along excavations, such as for pipelines burial, may occur due to stormwater runoff, wind erosion, or sloughing of unstable slopes, in addition to direct habitat losses from vegetation and soil removal.

Stabilization of slope margins may be difficult, and establishment of vegetative cover may be slow, possibly resulting in prolonged habitat losses near construction areas. If a corridor is widened or otherwise used for additional projects, vegetative cover may not be reestablished before it is removed again, resulting in even more prolonged habitat losses.

Fugitive dust from exposed soil surfaces or gravel roadways may result in reduced photosynthesis and primary production in adjacent terrestrial and wetland habitats. Impacts may include reduced growth and density of vegetation and changes in community composition to more tolerant species.

The construction of facilities and access roads could potentially result in the direct loss of wetlands from the placement of fill material. Construction of pipeline stream crossings, where directional drilling is not used, and access road bridges could also result in losses of wetland habitat. Wetland losses could result in the localized reduction or loss of wetland functions. Soils excavated for placement of electricity transmission towers and support anchors could cover wetland vegetation and other biota. Subsoils left on the surface may not be colonized readily by native wetland species and may provide the opportunity for establishment of non-native invasive plant species.

The construction of pipelines through wetlands would result in direct losses of wetland habitat due to excavation. Additional losses could occur along pipeline routes as a result of widening from continued erosion of wetland substrates in locations where strong currents or waves or ice movements in winter are present and subsequent conversion of vegetated wetland areas to open water.

Impacts to wetlands from heavy equipment operation may include reductions in vegetation and the compaction and disturbance of substrates, such as rutting, resulting in long-term impacts to wetlands. Such disturbances may alter local hydrologic conditions, such as changes in inundation. Seedling establishment and the survival of plants of native species with low tolerances to disturbance may subsequently be affected. These impacts may reduce the success of the reestablishment of wetland plant communities. Soil compaction may also convert some areas of vegetated wetlands to open water or to communities of submerged vegetation.

Large amounts of gravel may be required for pipeline construction, road construction, or for the construction of gravel yards for new facilities. If gravel is excavated from river floodplains near the construction site, such activities may impact wetland communities on those floodplains. Wetland areas may be destroyed by gravel excavation.

Wetlands may be indirectly impacted by a number of factors associated with construction activities occurring within the wetland or in adjacent areas within the watershed. Altered hydrology, sedimentation, and the introduction of contaminants may impact wetlands, including wetlands on other federal as well as nonfederal land. In addition, elevated temperatures of runoff from impervious surfaces may adversely affect wetland biota. The changes resulting in wetlands affected by these factors may include changes in plant community structure, reduction of biodiversity, and the establishment and predominance of invasive plant species. Many native wetland species indicative of high-quality habitats are sensitive to disturbance and may be displaced by species more tolerant of disturbance or by invasive non-native species, reducing biodiversity.

The alteration of soils and vegetative communities and the construction of impervious surfaces within wetland watersheds could result in an altered hydrology. Hydrologic alteration of wetlands may result in a change in the quantity of surface or groundwater inflow to the wetland and increased variability in flow and water surface elevations in wetlands. Impacts may be associated with a change in water source (surface or groundwater), reduced infiltration and increased runoff, or an increase or decrease in the frequency, duration, depth, or extent of soil saturation or inundation. Hydrologic changes may result in a change in the wetland biotic community as in the replacement of one wetland community for another (such as by dewatering or ponding), or hydrologic changes may promote wetland losses by conversion to upland communities or conversion of wetland vegetative communities to open water.

Hydrologic changes can result from changes in surface drainage patterns or isolation of wetland areas from water sources, such as from blocking natural surface flows, which can result in flooding or dewatering and could have long-term effects. Land surface changes that affect stormwater flows may redirect water away from wetland watersheds. A depletion of inflow to wetlands, both as surface flow and shallow groundwater flow, could result in a reduction in wetland surface area and reduced water depth, frequency of inundation, and duration of inundation. Wetlands supported by surface water flows may experience changes to inflow or outflow rates or patterns, or changes in streamflow velocity. Wetlands that collect surface water may be impacted by soil disturbances. For example, the hydrology of playas, which are ephemeral lakes intermittently inundated due to impermeable soils, may be adversely affected by pipeline trenching or other soil disturbances that disrupt the storage of surface water, potentially reducing the frequency or duration of inundation. Water removal or disposal may also alter wetland hydrology.

Construction of impervious or compacted surfaces can increase the degree of fluctuation of water surface elevations in relation to precipitation events in wetlands within the watershed. Such changes may result in greater extremes of high and low water levels, including the reduction of streambase flows and increases in flood flows. Wetland types that are typically supported by groundwater flows may be greatly affected by increases in surface water flows or altered surface drainage patterns. In addition, they may experience a reduction in groundwater inflow if a high degree of development occurs within the recharge area.

Soil disturbance and compaction resulting from construction on upland areas adjacent to wetlands may reduce infiltration rates and increase surface water runoff rates. The presence of facilities within the watershed could potentially result in an increase in surface runoff of precipitation. Increased runoff potentially results in greater variability in inflow and more rapid changes in water surface elevation within wetlands following storm events, as well as more rapid reductions in water levels during low precipitation periods. Increased fluctuations may impact wetland biotic communities, as species less tolerant of disturbance are replaced by tolerant species.

Degradation of water quality as a result of construction may also impact wetlands. Wetland impacts associated with degraded water quality could include sedimentation and turbidity and the introduction of contaminants in stormwater runoff. Persistent toxins, heavy sedimentation, or contaminants that are frequently introduced may result in the elimination of wetland biota in affected areas, including aquatic invertebrates and vegetation.

Sedimentation can adversely impact wetland biota and decrease biodiversity. The erosion of exposed or disturbed soils or insufficiently stabilized soils and unstable slopes that follows site grading may result in sediment inputs and turbidity in wetlands receiving stormwater runoff. Runoff from areas of heavy accumulations of fugitive dust may result in sediment inputs to wetlands. Shoreline erosion of exposed soils and unstable slopes may occur at pipeline stream or lake crossings. Wetland vegetation and other biota could also be impacted by sedimentation and increased turbidity by disturbance of bottom sediments, such as during trench excavation in wetlands and backfilling. Excavated sediments may cover areas adjacent to the trench, impacting wetland biota. Sediment impacts to local streams near the

Pacific Coast could affect coastal wetlands. Moderate sedimentation may reduce photosynthesis, and therefore productivity, in submerged plants. Other effects of sedimentation can include a decrease in the abundance of plants and animals or the displacement of sensitive species by more tolerant species, which may occur in high-quality undisturbed wetlands. Heavy sedimentation may cover vegetation, resulting in reduced growth or mortality.

Contaminants could be introduced into wetlands if contaminants migrate into groundwater or enter stormwater that flows into wetlands. Organic compounds, such as petroleum products and coolants, metals, and other contaminants, such as salts, may be found in runoff from parking areas and roadways and can adversely affect wetland biota. The introduction of contaminants may promote the establishment and predominance of invasive plant species.

Increased access along ROWs may result in an increase in the disturbance of terrestrial vegetation communities, streams, ponds, or other wetland or riparian areas. Disturbances may include trampling, erosion, taking, increased fire frequency, or other factors that may adversely impact plant communities. The spread of invasive plant species may also be promoted by increased access. Disturbances may be associated with recreational activities, such as off-road vehicle (ORV) use, hunting, or access by livestock and wildlife.

Routine maintenance of the ROWs, monitoring of facilities, and repairs may result in continued impacts to terrestrial vegetation and wetlands. Repairs to pipelines or electricity transmission lines could have localized impacts similar to the original construction impacts. Maintenance of access roads could introduce sediments into downstream wetlands. Vehicle use for monitoring or maintenance may result in an ongoing impact to vegetation. Vegetation management programs would generally result in continued existence of disturbed vegetative communities within the ROWs. Continued cutting or removal of woody species, such as over pipelines, would maintain habitats as herbaceous communities or altered shrub communities. Cutting of trees below electricity transmission lines would continue to allow higher light levels in previously forested areas, with associated effects on soils and vegetation. Herbicides used for vegetation management could impact nontarget plants or other organisms. The vegetation communities along the corridors would be expected to be different from those in nearby undisturbed natural areas throughout the life of the corridors.

Spills of oil or other toxic compounds such as diesel fuel or fuel oil may result from pipeline leaks or other accidental spills along the ROWs. Petroleum spilled onto ground surfaces would likely result in direct injury and mortality of plants and other biota in terrestrial or wetland habitats, and migration through the soil may make recovery and restoration difficult.

Spilled oil may penetrate into subsurface layers or enter burrows or crevices. Permeable substrates could increase oil penetration, especially that of light oils and petroleum products. Habitats with highly permeable soils may experience rapid migration of contaminants through the root zone. Some contaminants may migrate to shallow groundwater and subsequently enter the root zone of nearby vegetation in the path of groundwater movement. Spills on upland soils may impact wetlands that receive shallow groundwater inputs, such as riparian wetlands and wetlands supported by seeps and springs. Oil spilled on uplands could potentially flow into a nearby stream. Vegetation along the path of the spill would be injured or killed, including wetland vegetation along the stream. Impacted wetlands may be located at considerable distances from the location of the spill. Wetlands in river deltas and estuaries could be impacted by oil spilled in upstream areas. Oil reaching the coastline may persist for extended periods of time and slow or reduce vegetation recovery.

Effects may range from a short-term reduction in photosynthesis to extensive vegetation injury or mortality. Vegetation may resprout and recover following an oil spill. However, long-term impacts may include reduced stem density, lower biomass, poor regrowth, and reduced reproduction. Spills can cause changes in community structure and dynamics. Effects of spills could include a change in plant community composition or the displacement of sensitive species by more tolerant species. Toxic compounds in oil may selectively remove the more sensitive organisms, and opportunistic species may colonize affected areas, resulting in a long-term shift in species composition. Impacts to soil microbial communities might result in long-term wetland effects, and wetland recovery would likely be slowed.

Various factors influence the degree of impacts to wetlands and length of recovery. Impacts would depend on site-specific factors at the location and time of the spill. Factors include the quantity of the spill (lightly or heavily oiled substrates), the oil type and degree of weathering, time of year, extent and duration of the exposure of biota, plant species affected, percent of plant surface oiled, substrate type and moisture level, and degree of substrate contamination and subsurface penetration (Hayes et al. 1992; Hoff 1995; NOAA 1994, 1998). The most acutely toxic components of crude oil are rapidly lost through weathering. Higher mortality and poorer recovery of vegetation generally result from spills of lighter petroleum products (such as diesel fuel), heavy deposits of oil, spills during the growing season, contact with sensitive plant species, completely oiled plants, and deep penetration and accumulation of oil in substrates. Where oil spills occur in flooded areas or on saturated soils, recovery of vegetation is generally better than that on unsaturated soils (BLM 2002).

Spill cleanup may require the excavation and removal of soils and biota. Spilled oil that remains following cleanup degrades naturally by weathering and biodegradation by soil microbial communities. However, biodegradation would likely be slow in areas with cool temperatures and a short growing season. Oil could remain in some wetland substrates for decades, particularly in sheltered areas, even if it was cleaned from the surface, persisting as a long-term source of exposure. Full recovery of wetlands might require more than 10 years, depending on site and spill characteristics (Hoff 1995). Spill cleanup actions might damage wetlands through trampling of vegetation and other biota and incorporation of oil deeper into substrates from foot traffic and equipment, which could have long-term effects and delay or prevent recovery from oil spills (Hoff 1995; NOAA 1994, 2000). Where soils are excavated, increased erosion and lowered substrate elevation may result in wetland loss by conversion to open water. Spill cleanup operations might adversely impact shorelines if the removal of contaminated substrates affects shoreline stability and results in accelerated shoreline erosion. Effective low-impact cleanup actions may include bioremediation, low-pressure flushing, or use of chemical cleaners (Hoff 1995; Proffitt 1998; Mendelssohn and Lin 2003).

The decommissioning of energy transport projects would also result in impacts to terrestrial plant communities and wetlands. Decommissioning activities would be expected to include the dismantling and removal of aboveground structures such as electricity transmission towers, pipelines, and other associated facilities, as well and some underground structures such as pipelines. Some buried pipelines may potentially be purged, cleaned, and left in place. The types of impacts resulting from decommissioning would be similar to those associated with energy project construction. Decommissioning would generally result in soil disturbance, including potentially extensive regrading of areas within the ROWs. Temporary work areas and storage areas would also result in some surface disturbance. Vegetation would be removed or damaged in areas of disturbed soils, and these areas would require the reestablishment of plant communities. Wetlands may be excavated and temporarily drained during the removal of some structures. Decommissioning activities would generally impact habitat previously disturbed by initial project construction.

Indirect impacts associated with decommissioning activities could include erosion, sedimentation, soil compaction from the operation of heavy equipment, changes to surface water or groundwater hydrology, the establishment of invasive species, deposition of airborne dust, and potential spills of oil or other toxic materials. However, impacts of vehicle traffic within the ROW associated with maintenance and monitoring, and the effects of vegetation management activities, would decrease following decommissioning. The use of recreational vehicles within some ROWs may decline as woody vegetation increases due to the absence of vegetation management. The difficulties in restoring plant communities following initial construction would also occur following decommissioning. In some locations, such as in deserts and other arid regions, the reestablishment of plant communities may require considerable periods of time. Within some ROWs, permanent differences between restored plant communities and nearby undisturbed areas may remain.

How Could Aquatic Biota Be Affected by Project Development? Potential construction impacts of corridor development on aquatic biota would result primarily from ground disturbance, vegetation removal, and excavation during clearing of the ROWs and from installation of access roads and structures (e.g., transmission line towers, substations, or pipelines) near or in water bodies. Potential impacts could include changes in water surface flow patterns, deposition of sediment in surface water bodies, changes in water quality or temperature regimes, loss of riparian vegetation, introduction of toxic materials, restrictions to fish movements, and changes in human access to water bodies. The severity of impacts would depend upon such factors as the type of aquatic habitat, season of construction, size of the aquatic habitat, corridor width to be cleared, construction procedures used, and the quality of the existing habitat.

During construction, ground disturbance and direct disturbance of stream bottoms could result in increased suspended sediment loads both during construction activities and for a limited period of time after construction activities cease. Thus, it can be anticipated that pulses of suspended sediment occur throughout the construction period. These suspended sediments typically settle to the bottom within some distance downstream of the construction area, with that distance depending upon factors such as the size of sediment particles and water velocity in the receiving body of water. The overall area of aquatic habitat affected by a particular construction activity would then include the footprint of the disturbed area plus an area downstream of the activity.

Characteristics of surface water runoff, such as flow direction and flow rates following rain events, are controlled, in part, by local topography and vegetation cover. As a consequence, construction activities that affect the terrain and vegetation during corridor development could alter the water flow patterns. Impacts to aquatic ecosystems could result if these alterations affect the amount, timing, or flashiness of runoff entering a particular water body. Generally, attempts are made to control or reduce such impacts on aquatic ecosystems by ensuring that the overall grade of a corridor remains similar to the grade present prior to construction, by maintaining some vegetative cover in corridors, and by maintaining a relatively unaltered buffer of vegetation along the margins of water bodies.

Turbidity and sedimentation from erosion are part of the natural cycle of physical processes in water bodies, and most populations of aquatic organisms have adapted to short-term changes in these parameters. However, if sediment loads are unusually high or last for extended periods of time compared to natural conditions, adverse impacts can occur (Waters 1995). Increased sediment loads can suffocate aquatic vegetation, invertebrates, and fish; decrease the rate of photosynthesis in plants and phytoplankton; decrease fish feeding efficiency; decrease the levels of invertebrate prey; reduce fish spawning success; and adversely affect the survival of incubating fish eggs, larvae, and fry. In addition, some migratory fishes may avoid streams that contain excessive levels of suspended sediments (Waters 1995).

The level of effects from increased sediment loads depend on the natural condition of the receiving waters and the timing of sediment inputs. Whereas most aquatic systems might be expected to be impacted by large increases in levels of suspended and deposited sediments, aquatic habitats in which waters are normally turbid may be less sensitive to small to moderate increases in suspended sediment loads than habitats that normally have clear waters. Similarly, increased sedimentation during periods of the year in which sediment levels might naturally be elevated (e.g., during wet parts of the year) may have smaller impacts compared to sediment impacts that occur during periods in which natural sediment levels would be expected to be lower.

In addition to potentially resulting in increased sediment loads, the removal of riparian vegetation, especially tall trees, can affect the temperature regime in aquatic systems by altering the amount of solar radiation that reaches the water surface. This thermal effect would be most pronounced in small stream habitats, where a substantial portion of the stream channel may be shaded by vegetation. As water temperature increases, the level of dissolved oxygen in the water decreases. As a consequence, changes in temperature regimes of aquatic habitats can affect the ability of some species to survive within the affected areas, especially during periods of elevated temperatures. For a stream to support coldwater species, such as trout, the water temperature should not exceed about 68°F for more than short periods of time or distances. In some warmwater habitats, water temperatures during summer periods may sometimes approach temperatures that are lethal to resident species under natural conditions, and alterations to the environment that increase water temperatures by even a few degrees could result in fish kills during such periods.

Fish exposed to stressful temperatures generally move along the temperature gradient until acceptable temperatures are encountered. Fish typically avoid elevated temperatures by swimming to areas of groundwater inflow, to deep holes, or to shaded areas. As long as the proportion of a water body's riparian area affected by vegetation clearing is not excessive, fish will likely be able to find temporary refuge in nearby areas. The level of thermal impact associated with the clearing of riparian vegetation would be expected to increase as the amount of affected shoreline increases.

During operation of the corridors, aquatic systems could be adversely affected by maintenance activities, especially vegetation control. For most transmission line corridors, vegetation control in a particular area is relatively infrequent (generally no more often than once every 3 to 4 years) and the amount of vegetation disturbed is much less than would occur during construction. Selected trees might be removed or trimmed if they are considered likely to pose a risk to the transmission system. If control of vegetation along shorelines can be accomplished using manual techniques, the erosion of stream banks from maintenance activities would be expected to be relatively minor.

The potential exists for toxic materials (e.g., fuel, lubricants, and herbicides) to be accidentally introduced into waterways during construction and maintenance activities or as a result of leaks from pipelines. The level of impacts from releases of toxicants would depend on the type and volume of chemicals entering the waterway, the location of the release, the nature of the water body (e.g., size, volume, and flow rates), and the types and life stages of organisms present in the waterway. In general, lubricants and fuel would not be expected to enter waterways as long as heavy machinery is not used near waterways, fueling locations for construction and maintenance equipment are located away from the waterway, and measures are taken to control potential spills. Mitigation measures for development and maintenance of corridors generally restrict the use of machinery near waterways. Similarly, mitigation measures generally place restrictions on the application methods, quantities, and types of herbicides that are used in the vicinity of waterways in order to limit the potential for impacts on aquatic ecosystems.

In areas where corridors cross streams, obstructions to fish movement could occur if culverts, low-water crossings, or buried pipelines are not properly installed, sized, or maintained. During periods of low water, vehicular traffic can result in rutting and accumulation of cobbles in some crossings that can interfere with fish passage. In streams with low flows, flow could become discontinuous if disturbance of the stream bed during construction of the corridor or due to pipeline burial results in increased porosity or if alteration of the channel spreads flow across a wider area. Restrictions to fish movement would likely be most significant if they occur in streams that support migratory fishes, such as anadromous salmon species, that need to reach upstream spawning areas in order to reproduce.

In addition to the potential for the direct impacts identified above, indirect impacts on fisheries could occur as a result of increased public access to remote areas via ROWs and associated access roads. Fisheries could be impacted by increased fishing pressure, and other human activities (e.g., all-terrain vehicle [ATV] use) could disturb vegetation and soils, resulting in erosion and sediment-related impacts on water bodies, as discussed above. Such impacts would likely be smaller in locations where the corridor segments would be colocated with roads or existing ROWs, or where they would be located close to existing features (e.g., trails or logging roads) that already provide access to waterways. Nevertheless, construction of the additional corridors would likely add access points to waterways.

The overall impact of corridor development and maintenance activities on aquatic resources would depend on the type and amount of aquatic habitat that would be disturbed, the nature of the disturbance, and the aquatic biota that occupy the project site and surrounding areas.

The decommissioning of energy transport projects would also result in impacts to aquatic habitats and the associated biota. Decommissioning activities would be expected to include the dismantling and removal of structures such as electricity transmission towers, pipelines, and other associated facilities, as well and some underground structures such as pipelines. Some buried pipelines may potentially be purged, cleaned, and left in place. The types of impacts resulting from decommissioning would be similar to those associated with energy project construction, including increased erosion and sedimentation, potential changes to surface water hydrology, potential establishment of invasive species, and potential spills of oil or other toxic materials.

Decommissioning would generally result in soil disturbance, potentially including regrading of areas within the ROWs. Establishment and use of temporary work areas and storage areas would also result in some surface disturbance. Vegetation adjacent to aquatic habitats at stream crossings could be removed or damaged during decommissioning, increasing the potential for erosion and subsequent sedimentation in nearby aquatic habitats.

Decommissioning activities would generally impact habitat previously disturbed by initial project construction. Depending upon the time since initial construction was completed, the type of construction activities that occurred, and the type of aquatic habitat present, the aquatic communities present at the time of decommissioning may closely resemble nearby undisturbed areas. Some aquatic habitats would again recover from the disturbance associated with decommissioning after some period of time. Recovery time could range from months to many years, depending upon the nature of the disturbance and the type of aquatic habitats present. Within some ROWs, permanent differences between aquatic communities in disturbed areas and nearby undisturbed areas may remain.

How Could Wildlife Be Affected by Project Development?

Construction Impacts. Wildlife, including wild horses and burros, may be affected during construction of energy transport facilities. The wildlife species that could be affected would depend on the ecoregion within which each corridor segment would be located (Section 3.8.1.3) and the nature and extent of the habitats within each corridor segment and its surrounding vicinity.

Construction of the Section 368 energy corridor system may adversely affect wildlife through (1) habitat reduction, alteration, or fragmentation; (2) introduction of invasive species, particularly vegetation; (3) injury or mortality of wildlife; (4) erosion and runoff; (5) fugitive dust; (6) noise; (7) exposure to contaminants; and (8) interference with behavioral activities (Table 3.8-8). The overall impact of construction activities on wildlife populations would depend on:

- The type and amount of wildlife habitat that would be disturbed;
- The nature of the disturbance (e.g., complete, permanent reduction because of support structure placement; complete, permanent alteration due to pipeline placement; or temporary disturbance in construction support areas);
- The wildlife that occupy the project site and surrounding areas; and
- The timing of construction activities relative to crucial life stages (e.g., breeding season).

Habitat Disturbance. The reduction, alteration, or fragmentation of habitat would result in a major construction-related impact to wildlife. Habitat within the construction footprints of the transmission line and pipeline ROWs, support facilities, and access road corridors would be disturbed. The amount of habitat that would be disturbed would be a function of the current degree of disturbance already present in the project site area and the width of the corridor. The construction of a corridor project would not only result in the direct reduction or alteration of wildlife habitat within the project footprint but could also affect the diversity and abundance of area wildlife through the fragmentation of habitat.

Effects from habitat reduction, disturbance, or fragmentation would be related to the type and abundance of the habitats affected and the wildlife species that occur in those habitats. For example, habitat disturbance in forested areas could cause an impact to local wildlife populations, especially to those species whose affected habitats are uncommon and not well represented in the surrounding landscape. In contrast, few population-level impacts would be expected where corridor segments would be located on currently disturbed or modified lands such as existing ROWs and rangelands. Wildlife species least likely to be affected by the energy transport facilities would be habitat generalists.

Fragmentation can separate wildlife populations into smaller populations that are more susceptible to extirpation from random events such as drought, disease, introduction of

TABLE 3.8-8 Potential Energy Transport Facility Construction Effects on Wildlife[a]

Ecological Stressor	Associated Project Activity or Feature	Potential Effect	Effect Extent and Duration[b]
Habitat disturbance	Site clearing and grading; tower construction; pipeline trenching; access road and ancillary facility construction; construction equipment travel.	Reduction or alteration of habitat.	Long-term habitat reduction within tower, building, and access road footprints; long-term reduction, modification, and fragmentation of habitat in corridor segments.
Invasive vegetation	Site clearing and grading; corridor, access road, and support facility construction; construction equipment travel.	Reduced habitat quality.	Long-term, if established in areas where corridors, support facilities, and access roads are situated.
Injury or mortality	Site clearing and grading; corridor, access road, and support facility construction; construction equipment travel.	Destruction and injury of wildlife, mostly those with limited mobility.	Ongoing potential within construction areas and along access roads.
Erosion and runoff	Site clearing and grading; corridor, access road, and support facility construction; construction equipment travel.	Reduced reproductive success of amphibians using on-site surface waters; drinking water supplies may be affected.	Short-term; may extend beyond site boundaries.
Fugitive dust	Site clearing and grading; corridor, access road, and support facility construction; construction equipment travel.	Respiratory impairment; forage less palatable.	Short-term and localized.
Noise	Site clearing and grading; corridor, access road, and support facility construction; construction equipment travel.	Disturbance of foraging and reproductive behaviors; habitat avoidance.	Short-term and localized.
Exposure to contaminants	Accidental spill during equipment refueling; accidental release of stored fuel or hazardous materials.	Exposure may affect survival, reproduction, development, or growth.	Short-term and localized to spill area.
Interference with behavioral activities	Site clearing and grading; corridor, access road, and support facility construction; construction equipment travel.	Disturbance of migratory movements, foraging, and reproductive behaviors; avoidance of construction areas by some species.	Short-term for some species; long-term for other species that may completely abandon the disturbed habitats and adjacent areas.

[a] Potential effects on wildlife from decommissioning would be similar.

[b] Short-term impacts would generally last only during the period of construction or with an event, such as a contaminant spill, is ameliorated. Long-term impacts would generally last throughout the life of the project.

exotic predators, and so forth. It can also make movement between habitat fragments more difficult during periods when resources are limited. Habitat fragmentation can degrade the unique habitat characteristics of large, unbroken habitat tracts; the characteristics include accessible migration corridors, cover and forage that are free from disturbance, and areas isolated from hunting and predators (BLM 2005d). Additionally, habitat fragmentation can cause loss of genetic interchange among populations (Mills et al. 2000; Wang and Schreiber 2001; Willyard et al. 2004; Epps et al. 2005; Dixon et al. 2007). Complete genetic isolation could cause the local extinction of a population (Templeton et al. 1990).

Where corridor segments would be routed through forested areas, the primary impact on wildlife would be a change in species using the ROW segments from those favoring forested habitats to those using edge and more open habitats. The loss of forest habitat and the creation of early successional and edge habitats can decrease the quality of habitat for forest interior species for distances up to 100 to 300 feet from the edge of the ROW (Anderson et al. 1977). This may reduce the density and diversity of forest interior species in a much wider area than that of the actual cleared ROW segment. Open-land habitat species such as the red-tailed hawk, American kestrel, osprey (*Pandion haliaetus*), brown-headed cowbird (*Molothrus ater*), and yellow warbler (*Dendroica petechia*) may increase in numbers. An increase in brown-headed cowbird populations could adversely affect other bird species since it is a brood parasite, laying its eggs in the nests of other species, especially warblers, vireos, and sparrows.

Many neotropical migrants have characteristics that make them especially susceptible to brood parasitism and nest predation (e.g., open cup nests, nest placement near or on the ground, lack of defense mechanisms against brood parasites, and generally producing only one small clutch per season) (Rich et al. 1994). Nests along the forest edge could also be more vulnerable to predators such as raccoons and jays. Predators such as coyote and foxes commonly use ROWs for hunting due to the increase in small mammals that prefer open areas. The cleared ROW segments may also encourage population expansion of invasive bird species, such as the house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*), which compete with many native species. Wild horses and burros compete with big game for available forage. This competition could lead to adverse impacts on big game species in areas where habitat loss or modification occurs.

Although most fragmentation research has focused on forested areas, similar ecological impacts have been reported for the more arid and semiarid landscapes of the western United States, particularly shrub-steppe habitats that are dominated by sagebrush or salt desert scrub communities. For example, habitat fragmentation, combined with habitat degradation, has been shown to be largely responsible for the decline in sage grouse throughout most of its range (Strittholt et al. 2000; see also Text Box 3.8-2 on sage grouse later in this section).

The creation of edge habitat can (1) increase predation and parasitism of vulnerable forest interior animals in the vicinity of edges; (2) have negative consequences for wildlife by modifying their distribution and dispersal patterns; (3) be detrimental to species requiring large undisturbed areas, because increases in edges are generally associated with concomitant reductions in habitat size and possible isolation of habitat patches and corridors (habitat fragmentation); or (4) increase local wildlife diversity and abundance.

Direct effects of edge creation can include (1) physical disturbance of vegetation and soil; (2) changes in abiotic components such as light, wind, and moisture; and (3) increased access for organisms, material (e.g., pollen, seeds, contaminants), and energy (Harper et al. 2005). The ecological importance of the edge largely

Text Box 3.8-2
Compatibility of Energy Transport Facilities and Sage Grouse

Most concerns about the effects of development on sage grouse have focused on potential impacts associated with the reduction, fragmentation, and modification of grassland and shrubland habitats. The Gunnison sage-grouse (*Centrocercus minimus*) and, particularly, the greater sage-grouse (*C. urophasianus*) are of concern relative to reduction and fragmentation of sagebrush habitat within the 11 western states. Within the 11 western states, the Gunnison sage-grouse is restricted to southwestern Colorado and southeastern Utah, while the greater sage-grouse occurs in all the states except Arizona and New Mexico, where they are extirpated (Bird and Schenk 2005; NatureServe 2006). The life history and habitat requirements of both species are similar (Bird and Schenk 2005); therefore, the following discussion emphasizes the more widely distributed greater sage-grouse.

Populations of greater sage-grouse can vary from nonmigratory to migratory (having either one-stage or two-stage migrations) and can occupy an area that exceeds 1,040 square miles on an annual basis. The distance between leks (strutting grounds) and nesting sites can exceed 12.4 miles (Connelly et al. 2000; Bird and Schenk 2005). Nonmigratory populations can move 5 to 6 miles between seasonal habitats and have home ranges up to 40 square miles. The distance between summer and winter ranges for one-stage migrants can be 9 to 30 miles apart. Two-stage migrant populations make movements between breeding habitat, summer range, and winter range. Their annual movements can exceed 60 miles. The migratory populations can have home ranges that exceed 580 square miles (Bird and Schenk 2005). However, the greater sage-grouse has a high fidelity to a seasonal range. They also return to the same nesting areas annually (Connelly et al. 2000, 2004).

The greater sage-grouse needs contiguous, undisturbed areas of high-quality habitat during its four distinct seasonal periods: (1) breeding, (2) summer-late brooding and rearing, (3) fall, and (4) winter (Connelly et al. 2000). The greater sage-grouse occurs at elevations ranging from 4,000 to 9,000 feet. They are omnivorous and consume primarily sagebrush and insects. Over 99% of their diet in winter consists of sagebrush leaves and buds. Sagebrush is also important as roosting cover, and the greater sage-grouse cannot survive where sagebrush does not exist (USFWS 2004).

Leks are generally areas supported by low, sparse vegetation or open areas surrounded by sagebrush that provide escape, feeding, and cover. They can range in size from small areas of 0.1 to 10 acres to areas of 100 acres or more (Connelly et al. 2000). The lek/breeding period occurs March through May, with peak breeding occurring from early to mid-April. Nesting generally occurs 1 to 4 miles from lek sites, although it may range up to 11 miles (BLM 2004a). The nesting/early brood-rearing period occurs from March through July. Sagebrush at nesting/early brood-rearing habitat is 12 to 32 inches above ground with 15 to 25% canopy cover. Tall, dense grass combined with tall shrubs at nest sites decreases the likelihood of nest depredation. Hens have a strong year-to-year fidelity to nesting areas (BLM 2004a). The late brood-rearing period occurs from July through October. Sagebrush at late brood-rearing habitat is 12 to 32 inches tall with a canopy cover of 10 to 25% (BLM 2004a). The greater sage-grouse occupies winter habitat from November through March. Suitable winter habitat requires sagebrush 10 to 14 inches above snow level with a canopy cover ranging from 10 to 30%. Wintering grounds are potentially the most limiting seasonal habitat for greater sage-grouse (BLM 2004a).

While no single or combination of factors have been proven to have caused the decline in greater sage-grouse numbers over the past half-century, the decline in greater sage-grouse populations is thought to be due to a number of factors including drought, oil and gas wells and their associated infrastructure, powerlines, predators, and a decline in the quality and quantity of sagebrush habitat (due to alteration of historical fire regimes, water developments, drought, use of herbicides and pesticides, livestock and wildhorse grazing, range, and establishment of invasive species) (Lyon and Anderson 2003; WDGF 2003; Holloran 2005; Holloran et al. 2005; Rowland 2004; Schroeder et al. 2004; Bird and Schenk 2005; Braun 2006; Unita Basin Adaptive Resource Management Local Working Group 2006; Aldredge and Boyce 2007; Bohne et al. 2007; Southwest Wyoming Local Sage-grouse Work Group 2006; Walker et al. 2007; Colorado Greater Sage-grouse Steering Committee 2008; Doherty et al. 2008 and references cited therein); Connelly et al. 2000; Crawford et al. 2004). West Nile virus is also a significant stressor of greater sage-grouse (Naugle et al. 2004).

Text Box 3.8-2 (Cont.)
Compatibility of the Energy Transport Facilities and Sage Grouse

Loud, unusual sounds and noise from construction and human activities disturb gallinaceous birds, cause birds to avoid traditional use areas, and reduce sage grouse use of leks (Young 2003). Disturbance at leks appears to limit reproductive opportunities and may result in regional population declines. Most observed nest abandonment is related to human activity (NatureServe 2006). Thus, site construction, operation, and site-maintenance activities could be a source of auditory and visual disturbance to sage grouse.

Transmission lines, pipelines, and access roads may adversely affect habitats important to gallinaceous birds by causing fragmentation, reducing habitat value, or reducing the amount of habitat available (Braun 1998). Transmission lines, pipelines, and other structures can also provide perches and nesting areas for raptors and ravens that may prey upon gallinaceous birds.

Measures that have been suggested for management of sage grouse and their habitats (e.g., Paige and Ritter 1999; Connelly et al. 2000; Montana Sage Grouse Work Group 2005) that have pertinence to energy transport facilities include:

- Identify and avoid both local (daily) and seasonal migration routes.
- Consider sage grouse and sage habitat when designing, constructing, and utilizing project access roads and trails.
- Avoid, when possible, siting energy developments in breeding habitats.
- Adjust the timing of activities to minimize disturbance to sage grouse during critical periods.
- When possible, locate energy-related facilities away from active leks or near other sage grouse habitat.
- When possible, restrict noise levels to 10 dB above background noise levels at lek sites.
- Minimize nearby human activities when birds are near or on leks.
- As practicable, do not conduct surface-use activities within crucial sage grouse wintering areas from December 1 through March 15.
- Maintain sagebrush communities on a landscape scale.
- Provide compensatory habitat restoration for impacted sagebrush habitat.
- Avoid the use of pesticides at sage grouse breeding habitat during the brood-rearing season.
- Develop and implement appropriate measures to prevent the introduction or dispersal of noxious weeds.
- Avoid creating attractions for raptors and mammalian predators in sage grouse habitat.
- Consider measures to mitigate impacts at off-site locations to offset unavoidable sage grouse habitat alteration and reduction at the project site.

The BLM manages more sage grouse habitat than any other entity; therefore, it has developed a National Sage Grouse Habitat Conservation Strategy for BLM-administered public lands to manage public lands in a manner that will maintain, enhance, and restore sage grouse habitat while providing for multiple uses of BLM-administered public lands (BLM 2004e). The strategy is consistent with the individual state sage grouse conservation planning efforts. The purpose of this strategy is to set goals and objectives, assemble guidance and resource materials, and provide more uniform management directions for the BLM's contributions to the multistate sage grouse conservation effort being led by state wildlife agencies (BLM 2004e). The BLM strategy includes guidance for (1) addressing sagebrush habitat conservation in BLM land use plans, and (2) managing sagebrush plant communities for sage grouse conservation. This guidance is designed to support and promote the rangewide conservation of sagebrush habitats for sage grouse and other sagebrush-obligate wildlife species on public lands administered by the BLM, and presents a number of suggested management practices (SMPs). These SMPs include management or restoration activities, restrictions, or treatments that are designed to

Text Box 3.8-2 (Cont.)
Compatibility of the Energy Transport Facilities and Sage Grouse

enhance or restore sagebrush habitats. The SMPs are divided into two categories: (1) those that will help maintain sagebrush habitats (e.g., practices or treatments to minimize unwanted disturbances while maintaining the integrity of the sagebrush communities), and (2) those that will enhance sagebrush habitat components that have been reduced or altered (BLM 2004e).

SMPs that are or may be pertinent to energy transport facilities include:

- Development of monitoring programs and adaptive management strategies,
- Control of invasive species,
- Prohibition or restriction of ATV activity,
- Consideration of sage-grouse habitat needs when developing restoration plans,
- Avoidance of placing facilities in or next to sensitive habitats such as leks and wintering habitat,
- Location or construction of facilities so that facility noise does not disturb grouse activities or leks,
- Consolidation of facilities as much as possible,
- Initiation of restoration practices as quickly as possible following land disturbance,
- Installation of antiperching devices on existing or new power lines in occupied sage grouse habitat, and
- Design of facilities to reduce habitat fragmentations and mortality to sage grouse.

In addition to BLM's National Sage Grouse Habitat Conservation Strategy, the Western Association of Fish and Wildlife Agencies has produced two documents that together comprise a Conservation Assessment for Greater Sage Grouse. The first is the *Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats* (Connelly et al. 2004). The second document is the *Greater Sage-Grouse Comprehensive Conservation Strategy* (Stiver et al. 2006). Additionally, a Gunnison Sage-Grouse Rangewide Conservation Plan has been prepared (Gunnison Sage-grouse Rangewide Steering Committee 2005). Also, state and/or regional recovery, management, or conservation plans have been prepared for grouse species that occur throughout the western states. The recommendations in these documents would be considered for Section 368 energy corridor projects. For example, the conservation plan for Idaho recommends that new aboveground major power transmission lines should be sited so as to avoid sage grouse habitat to the extent possible or should otherwise be buried (Idaho Sage-grouse Advisory Committee 2006).

depends on how different it is from the regional landscape. For example, the influence of the edge would be less ecologically important where the landscape has a high degree of heterogeneity. Also, edge influence would be less ecologically important in a forest with a more open and diverse canopy (Harper et al. 2005). Landscapes with a patchy composition (e.g., tree-, shrub-, and grass-dominated cover) may already contain edge-adapted species that make the influence of a created edge less likely (Harper et al. 2005).

The density of several forest-dwelling bird species can increase within a forest stand soon after the onset of fragmentation, as a result of displaced individuals packing into remaining habitats (Hagan et al. 1996). The habitats within which displaced animals would move would be subject to some degree of overuse and degradation. This overcrowding may also cause an increase in competition for space and forage, an increase in the animals' stress, and a decrease in the animals' physical conditions. The pairing success of ovenbirds (*Seiurus aurocapilla*) was found to be lower in the fragments, possibly due to behavioral dysfunction resulting from high densities (Hagan et al. 1996). The duration and extent of increased densities following onset of fragmentation depend on many factors, including the sensitivity of a species to edge and area effects, the duration and rate of habitat loss and fragmentation, and the proximity of a forest stand to the disturbance (Hagan et al. 1996).

Fragmentation of forests into small patches is detrimental to many migrant songbird species (Parker et al. 2005). In a study of four corridors varying in widths from 40 to 300 feet through a forest in Tennessee, the narrowest corridors provided the least change from a forest-bird community, while the wide corridors tended to contain grassland communities of birds (Anderson et al. 1977). Nevertheless, corridor widths as narrow as 26 feet were found to produce forest fragmentation effects in New Jersey, in part by attracting brown-headed cowbirds and nest predators to corridors and adjacent forest interiors (Rich et al. 1994).

Although habitats adjacent to facilities may remain unaffected, wildlife tend to make less use of these areas. Road avoidance by wildlife could be greater in open landscapes compared to forested landscapes (Thomson et al. 2005). The effective habitat (amount of habitat actually available to wildlife) loss due to roads was reported to be 2.5 to 3.5 times as great as actual habitat loss (Reed et al. 1996). Those individuals that make use of these areas can be subjected to increased physiological stress. This combination of avoidance and stress reduces the capability of wildlife to use habitat effectively (WGFD 2004). Overall, direct and indirect habitat losses can potentially reduce the carrying capacity within the species range and result in population-level effects such as reduced survival or reproduction (Sawyer et al. 2006).

A pipeline ROW through undisturbed forest habitats in Alberta was found to be beneficial to ungulates such as moose, elk, and deer, mainly due to increased browse availability. However, the immediate benefit of a ROW depends on the rate of establishment of woody browse species (Lunseth 1988). Long-term displacement of elk, mule deer, pronghorn, or other species from critical (crucial) habitat or parturition areas due to habitat disturbance would be considered significant (BLM 2004a). For example, activities around parturition areas have the potential to decrease the usability of these areas for calving and fawning. A corridor segment through a crucial winter area could directly reduce the amount of habitat available to the local population. This could force individuals to use suboptimal habitat, which could lead to debilitating stress and possibly to population-level effects.

The energy transport ROW segments, particularly the pipeline portions, would reduce the amount of suitable winter cover available to deer and other ungulates. While not an absolute barrier, a cleared ROW may also limit travel by wildlife species between areas on either side of the ROW. Studies have shown that deer will cross an open ROW as wide as 450 feet in winter (Doucet et al. 1981, 1987). Habitat specificity, seasonal changes in microclimate, and population pressures may all influence the extent and rate at which small mammals may cross a cleared area. The white-footed mouse (*Peromyscus leucopus*) and short-tailed shrew (*Blarina brevicauda*) were found to cross transmission line corridors with a width up to 340 feet. However, it is not known if such species would cross wider corridors associated with more lines or higher voltage lines (Schreiber and Graves 1977).

Migration corridors are vulnerable, particularly at pinch points where physiographic constrictions force herds through relatively narrow corridors (Berger 2004). Loss of habitat continuity along migration routes would severely restrict the seasonal movements necessary to maintain healthy big game populations (Sawyer and Lindzey 2001; Thomson et al. 2005). As summarized by Strittholt et al. (2000), roads have been shown to impede the movements of invertebrates, reptiles, and small and large mammals.

Rock piles inhabited by reptiles may be impacted by clearing for access roads, support tower sites, pipeline ROWs, substations, and other ancillary facilities.

Specified distance limits on surface disturbance would be applied for big game parturition areas, raptor nesting areas, and greater sage-grouse winter concentration areas and leks. Construction restrictions (e.g., buffer zones and seasonal restrictions) would lessen the potential for inadvertent loss of migratory bird nests during the avian breeding season.

Introduction of Invasive Vegetation. Fragmentation can facilitate the spread and introduction of invasive plant species (a more thorough discussion of effects on vegetation is found earlier in this section). Roads (and other corridors) can facilitate the dispersal of invasive species by altering existing habitat conditions, stressing or removing native species, and allowing easier movement by wildlife or human vectors (Trombulak and Frissell 2000). Wildlife habitat could also be impacted if invasive vegetation becomes established in the construction-disturbed areas and adjacent off-site habitats. The establishment of invasive vegetation could reduce habitat quality for wildlife and locally affect wildlife occurrence and abundance. The introduction or spread of non-native plants such as cheatgrass (*Bromus tectorum*), salt-cedar (*Tamarix ramosissima*), and Russian olive (*Elaeagnus angustifolia*) would be detrimental to wildlife such as neotropical migrants and sage grouse. Invasion of exotic species on public lands has been estimated at more than 5,000 acres/day (Strittholt et al. 2000). Cheatgrass has invaded over 50% of existing sagebrush habitat (i.e., over 10 million acres) with about 10% of that likely being a cheatgrass monoculture (Wisdom and Rowland 2007).

Wildlife Injury or Mortality. Clearing, grading, and trenching activities would result in the direct injury or death of wildlife that are not mobile enough to avoid construction operations (e.g., reptiles, small mammals), that utilize burrows (e.g., ground squirrels and burrowing owls), or that are defending nest sites (such as ground-nesting birds). Although more mobile wildlife species, such as deer and adult birds, may avoid the initial clearing activity by moving into habitats in adjacent areas, it is conservatively assumed that adjacent habitats are at carrying capacity for the species that live there and could not support additional biota from the construction areas. The subsequent competition for resources in adjacent habitats would likely preclude the incorporation of the displaced individuals into the resident populations.

Corridor and access road development increases use by recreationists and other users of public lands, increasing the amount of human presence and the potential for harassment and legal or illegal taking of wildlife. This may include the collection of live animals, particularly reptiles and amphibians, for pets. Direct mortality from snowmobiles and ATVs may occur due to crushing or suffocation of small mammals occupying subnivean spaces and from increased access to predators over compacted vehicular trails (Gaines et al. 2003).

Collision with vehicles can be a source of wildlife mortality, especially in wildlife concentration areas or travel corridors. Sage grouse are susceptible to vehicular collision along dirt roads because they are sometimes attracted to them to take dust baths (Strittholt et al. 2000). However, access roads not needed for maintenance would be removed following construction, and as public use of these access roads would be restricted, roadkills would not be expected to result in a significant impact from a wildlife population perspective.

Erosion and Runoff. Construction activities may result in increased erosion and runoff from freshly cleared and graded sites. This could reduce water quality in on-site and surrounding water bodies that are used by amphibians, thereby affecting reproduction, growth, and survival. The potential for water quality impacts during construction would be short-term for the duration of construction activities and post-construction soil stabilization (e.g., reestablishment of natural or man-made ground cover). Any impacts to amphibian populations would be localized to the surface waters receiving site runoff. Although the potential for runoff would be temporary, pending the completion of construction activities and the stabilization of disturbed areas with vegetative cover, erosion could result in significant impacts to local amphibian populations if an entire recruitment class is eliminated (e.g., complete recruitment failure for a given year because of siltation of eggs or mortality of aquatic larvae).

Fugitive Dust. Little information is available regarding the effects of fugitive dust on wildlife; however, if exposure is of sufficient magnitude and duration, the effects may be similar to those identified for humans (e.g., breathing and respiratory symptoms). A more probable effect would be the dusting of plants, which could make forage less palatable. Fugitive dust from vehicle use settles on forage adjacent to access roads, making it unpalatable for wildlife and wild horses, which could increase competition for remaining forage. This effect would be short-term and would generally coincide with the displacement of and stress to wildlife and wild horses from human activity (BLM 2004d).

Fugitive dust generation during construction activities is expected to be short-term and localized to the immediate construction area and is not expected to result in any long-term individual or population-level effects.

Noise. Principal sources of noise during construction activities would include truck and aircraft traffic, the operation of heavy machinery, and blasting (if necessary). (See Section 3.7.1.1 for a discussion of the fundamentals of sound and noise.) The most adverse impacts associated with construction noise could occur if critical life-cycle activities were disrupted (e.g., mating and nesting). If birds were disturbed sufficiently during the nesting season to cause displacement, then nest or brood abandonment might occur, and the eggs and young of displaced birds would be more susceptible to cold or predators.

On the basis of the types of construction equipment that would likely be employed (such as bulldozers and graders), the noise levels associated with the equipment would range from about 80 to 90 dBA within 50 feet; site preparation noise would be at the mid-40-dB level approximately 0.25 miles from the site (Section 3.7.4.1).

Much of the research on wildlife-related noise effects has focused on birds. This research has shown that noise may affect territory selection; territorial defense, dispersal, foraging success, fledging success; and song learning (e.g., Reijnen and Foppen 1994; Foppen and Reijnen 1994; Larkin 1996). Several studies have examined the effects of continuous noise on bird populations, including the effects of traffic noise, coronal discharge along electricity transmission lines, and gas compressors. Several studies (Foppen and Reijnen 1994; Reijnen and Foppen 1994, 1995; Reijnen et al. 1995, 1996, 1997) have shown reduced densities of some species in forest (26 of 43 species) and grassland (7 of 12 species) habitats adjacent to roads, with effects detectable from 66 to 11,581 feet from the roads. On the basis of these studies, Reijnen et al. (1996) identified a threshold effect sound level of 47 dBA for all species combined and 42 dBA for the most sensitive species; the observed reductions in population density were attributed to a reduction in habitat quality caused by elevated noise levels. This threshold sound level of 42 to 47 dBA (which is somewhat below the EPA-recommended limit for residential areas) is at or below the sound levels generated by truck traffic that would likely occur at distances of 250 feet or more from the construction area or access roads, or the levels generated by typical construction equipment at distances of 2,500 feet or more from the construction site.

Blast noise (e.g., from military activities or construction blasting) has been found to elicit a variety of effects on wildlife (Manci et al. 1988; Larkin 1996). Brattstrom and Bondello (1983) reported that peak sound pressure levels reaching 95 dB resulted in a temporary shift in hearing sensitivity in kangaroo rats that required at least 3 weeks for the recovery of hearing thresholds. The authors postulated that such hearing shifts could affect the ability of the kangaroo rat to avoid approaching predators. A variety of adverse effects of noise on raptors have been demonstrated, but for some species, the effects were temporary and the raptors became habituated to the noise (Brown et al. 1999; Delaney et al. 1999). Factors in raptors that may lead to greater sensitivity to noise include: lack of previous exposure to sound levels associated with an activity; nocturnal activities; reliance on auditory cues for critical life functions, such as prey detection, mate selection, and predator avoidance; and sensitivity to a particular frequency range. Additional criteria for susceptibility include: dwelling in or on cliffs, habitat in open environments with little tree cover, and lack of previous exposure to an activity and its associated sound level (Efroymson et al. 2001; Efroymson and Suter 2001).

Exposure to Contaminants. Accidental fuel spills or releases of hazardous materials could result in the exposure of wildlife at the project site. Potential impacts to wildlife would vary according to the material spilled, the volume of the spill, the location of the spill, and the species that could be exposed. Spills could contaminate soils and surface water and could affect wildlife associated with these media. A spill would be expected to have a population-level adverse impact only if the spill was very large or contaminated a crucial habitat area where a large number of individual animals were concentrated. The potential for either event is very unlikely. Because the amounts of fuels and hazardous materials are expected to be small, an uncontained spill would affect only a limited area (much less than 1 acre). In addition, wildlife use of the area during construction would be very minor or nonexistent, thus greatly reducing the potential for exposure (BLM 2005c).

Interference with Behavioral Activities. The location and timing of construction activities may also affect the migratory and other behavioral activities of some species. Construction activities could affect local wildlife by disturbing normal behavioral activities. Wildlife may cease foraging, mating, or nesting or vacate active nest sites in areas where construction is occurring; some species may permanently abandon the disturbed areas and adjacent habitats. In addition, active construction may also affect movements of some birds and mammals; for example, they may avoid a localized migratory route because of ongoing construction (BLM 2005c).

Disturbed wildlife can incur a physiological cost either through excitement (i.e., preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness and reproductive potential (BLM 2004d). Factors that influence displacement distance include:

- Inherent species-specific characteristics,
- Seasonally changing thresholds of sensitivity as a result of reproductive and nutritional status,
- Type of habitat (e.g., longer disturbance distances in open habitats),
- Specific experiences of the individual or group,

- Weather (e.g., adverse weather such as wind or fog may decrease the disturbance),
- Time of day (e.g., animals are generally more tolerant during dawn and dusk), and
- Social structure of the animals (e.g., groups are generally more tolerant than solitary individuals) (BLM 2004c).

Operation and Maintenance Impacts. Once established, a transmission line or pipeline corridor can have the following functions, serving as a:

- Specialized habitat for some species;
- Travel lane that enhances species movement;
- Barrier to the movement of species, energy, or nutrients (i.e., due to fragmenting existing habitat);
- Source of biotic and abiotic effects on the adjacent ecosystem matrix; and
- Sink (i.e., wildlife enters the corridor and dies as a result, such as by colliding with transmission lines).

The degree to which an energy corridor carries out these functions would depend on the wildlife species, the size of the corridor and matrix, and the habitat contrast between them (Williams 1995; Jalkotzy et al. 1997).

Operational impacts to wildlife, including wild horses and burros, would generally be less intense than during construction. Nevertheless, wildlife may still be affected by the reduction in habitat quality associated with habitat fragmentation due to the presence of the corridor segment ROWs, support facilities, and access roads. During the operation and maintenance of the energy transport system, wildlife may be affected by (1) electrocution and electromagnetic field exposure from transmission lines; (2) noise; (3) collisions with transmission lines and other above-ground facilities; (4) maintenance activities, such as mowing; (5) exposure to contaminants; (6) disturbance associated with the workforce; (7) interference with migratory behavior; and (8) increased potential for fire (Table 3.8-9).

Additionally, the transmission lines, above-ground portions of the pipelines, and other facility structures would provide additional perch sites for raptors and corvids (e.g., ravens, crows, and magpies), thereby increasing predatory levels on other wildlife (such as small mammals and birds). These facilities enable birds such as the golden eagle, great-horned owl, red-tailed hawk, ferruginous hawk (*Buteo regalis*), common raven (*Corvus corax*), prairie falcon (*Falco mexicanus*), American kestrel, and osprey to nest or perch in otherwise treeless landscapes (BirdLife International 2003; Fernie and Reynolds 2005). Predators are the main cause of nest failures for prairies grouse species (Manzer and Hannon 2005; Wolfe et al. 2007). Conversely, a transmission line may lead to a loss of usable feeding areas for species (e.g., Arctic-breeding geese) that avoid the close proximity of these facilities (BirdLife International 2003). The lesser prairie-chicken (*Tympanuchus pallidicinctus*) seldom nests within 1,300 ft of transmission lines (Pitman et al. 2005). Development may also cause areas that were once considered areas of high probability of use to become areas of low use, while areas considered as low probability of use become used more frequently as a result of development (a shift to presumably less-suitable habitat) (Sawyer et al. 2006).

Transmission support structures can also protect some bird species from mammalian predators, range fires, and heat (Steenhof et al. 1993). However, high winds can cause nest failure for birds that utilize transmission line support structures. Entanglement in tower stanchions may be another hazard (Steenhof et al. 1993).

TABLE 3.8-9 Potential West-wide Energy Transport Facility Operation and Non-Facility-Related Human Activity Effects on Wildlife

Ecological Stressor	Activity or Facility	Potential Effect and Likely Wildlife Affected	Effect Extent and Duration[a]
Operations and Maintenance			
Electrocution and electromagnetic field effects	Electricity transmission lines.	Mortality of birds from electrocution; health effects from electromagnetic field exposure.	Very low magnitude, but long-term potential.
Noise	Corona, support machinery, vehicles and aircraft, and mowing equipment.	Disturbance of foraging and reproductive behaviors; habitat avoidance.	Short- and long-term; greatest effect in highest noise areas.
Collision with transmission lines and other above-ground facilities	Presence of transmission lines, communication towers, and buildings.	Injury or mortality of birds and, to a lesser degree, bats.	Low magnitude but long-term for many species; population effects possible for rare species.
Predation	Transmission lines, above-ground portion of pipelines, ancillary facilities.	Increase in avian predators due to more perch sites for foraging; may decrease local prey populations.	Long-term; may be of high magnitude for some prey species.
Mowing	Mowing along corridor segments and at support buildings.	Injury and/or mortality of less mobile wildlife: reptiles, small mammals, ground-nesting birds.	Infrequent, but repetitive over the life of the project.
Exposure to contaminants	Herbicide use; accidental spill or release of oil, herbicides, fuel, or other hazardous materials.	Exposure may affect survival, reproduction, development, or growth.	Short- or long-term; localized to spill locations.
Workforce presence	Daily human and vehicle activities.	Disturbance of nearby wildlife behavior; habitat avoidance.	Short- or long-term; localized and of low magnitude.
Decreased aquatic habitat quality	Erosion and runoff from poorly stabilized surface soils.	Reduced reproductive success of amphibians; wildlife drinking water supplies may be affected.	Short-or long-term; localized.
Interference with behavioral activities	Presence of energy transport corridors and support structures.	Migratory mammals may avoid previously used migration routes, potentially affecting condition and survival.	Long-term; localized to populations directly affected by the presence of the project.

TABLE 3.8-9 (Cont.)

Ecological Stressor	Activity or Facility	Potential Effect and Likely Wildlife Affected	Effect Extent and Duration[a]
Operations and Maintenance (Cont.)			
Interference with behavioral activities (Cont.)	Presence of energy transport corridors and support structures.	Species may avoid areas surrounding the support facilities, including foraging and nesting habitats.	Long-term for species that completely abandon adjacent areas; population-level effects possible for some species.
Non-Facility-Related Human Activity			
Disturbance of nearby biota	Access to surrounding areas by people, including unauthorized vehicles, along facility access roads and corridor segments.	Impacts to wildlife habitats by foot and vehicle traffic; disturbance of foraging and reproductive behaviors.	Short- or long-term in areas within and adjacent to the corridor segments.
Legal and illegal take of wildlife	Access to surrounding areas.	Reduced abundance and/or distribution of some wildlife.	Short- or long-term, depending on species affected and magnitude of take.
Invasive vegetation	Access to surrounding areas by people, including unauthorized vehicles, along facility access roads and corridor segments.	Establishment of invasive vegetation resulting in reduced wildlife habitat quality.	Long-term, off-site.
Fire	Access to surrounding areas by people, including unauthorized vehicles, along facility access roads and corridor segments.	Some mortality of wildlife; reduction in habitat quality due to loss of vegetation and introduction and establishment of invasive vegetation.	Long-term.

[a] Short-term impacts would generally last only during and shortly after the period of the impact (e.g., noise event). Long-term impacts would have long-lasting effects (e.g., from a fire) or occur over the lifetime of the project (either a long-lasting or repetitive impact).

Wildlife may also be affected by human activities that are not directly associated with the energy transport facilities or their workforces but that are instead associated with the potentially increased access to BLM- and FS-administered lands that had previously received little use. Potential impacts associated with increased access include the disturbance of wildlife from human activities, an increase in legal and illegal take, an increase of invasive vegetation, and an increase in the incidence of fires (Table 3.8-9).

Electrocution and Electromagnetic Effects. Except under the unusual circumstances discussed below, no electrocution of raptors or other birds would be expected when they are on the transmission line structures because the spacing between the conductors and between a conductor and ground wire or other grounding structure would exceed the wing span of the California condor (the largest bird to occur in the 11-state project area). However, while it is a rare event, electrocution can occur to flocks of small birds (e.g., house sparrows, European starlings, and thrushes) that cross a line; it can also happen when several roosting birds take off simultaneously, because of current arcing. This is most likely to occur in humid weather conditions (Bevanger 1998; BirdLife International 2003). Arcing can also occur as a result of waste streamers from large birds roosting on the crossarms above insulators (BirdLife International 2003).

Electromagnetic field exposure can potentially alter the behavior, physiology, endocrine systems, and immune functions of birds, which, in theory, could result in negative repercussions on their reproduction or development. However, the reproductive success of some wild bird species, such as ospreys, does not appear to be compromised by electromagnetic field conditions (Fernie and Reynolds 2005).

Noise. The activities associated with the energy transport facility operations that could generate noise include transmission lines (corona), trucks and maintenance equipment, and aircraft overflights. The magnitude and duration of noise associated with trucks and maintenance equipment are expected to result in only minor annoyance of wildlife at the site and not result in any long-term adverse effects. The response of wildlife to this disturbance would vary by species; physiological or reproductive condition; distance; and type, intensity, and duration of the disturbance (BLM 2002). Wildlife response can include avoidance, habituation, or attraction.

The results of various studies suggest that the densities of bird populations may be reduced near transmission lines and other facility equipment if continuous noise levels are 40 dBA or higher. A study of the effects of gas well compressor noise on breeding bird populations in New Mexico found the response to noise varied among species (LaGory et al. 2001). Lower numbers of some species were associated with noise levels greater than 40 dBA. The greatest reductions were found in areas where species were exposed to sound pressure levels of 50 dBA or greater (areas within 150 feet of a compressor).

The highest noise levels would be associated with vehicle and aircraft use, while noise during activities such as hiking would be primarily associated with speech. Eighty-five percent of helicopter flights within 1,640 feet of mountain goats (*Oreamnos americanus*) caused the goats to move more than 328 feet, while 9% of flights within 4,921 feet caused similar movements. Helicopter flights caused the disintegration of social groups on some occasions and resulted in one case of severe injury to an adult (Cote 1996). Bighorn sheep have been reported to respond at a distance of 1,640 feet from roads with more than one vehicle per day, while deer and elk response occurs at a distance of 3,280 feet or more (Gaines et al. 2003). Snowmobile traffic was found to affect the behavior of moose located within 984 feet of a trail and displaced them to less favorable habitats (Colescott and Gillingham 1998).

Displaced animals could have lower reproductive success if they would be displaced to areas already occupied by others of their species (Riffell et al. 1996). If birds are disturbed sufficiently during the nesting season to cause displacement, then nest or brood abandonment might occur and the eggs and young of displaced birds would be more susceptible to cold or predators (BLM 2002). Regular or periodic disturbance at energy transport facilities could cause adjacent habitats to be less attractive to wildlife and result in a long-term reduction of wildlife use in areas exposed to repeated visual disturbances and noise (BLM 2002). Repeated human intrusion has the potential to cause impacts that accumulate over time, which may result in progressive declines in avian richness and abundance (Riffell et al. 1996).

Collisions with Transmission Lines and Other Facilities. The presence of the energy transport facilities (e.g., transmission lines, elevated portions of the pipelines, pump stations, communication antennas, and other ancillary facilities) creates a physical hazard to some wildlife. In particular, birds and, to a lesser extent, bats may collide with transmission lines, communication antennas, and buildings, while mammals may collide with fences. (No scientific studies were found that evaluated bat collisions with transmission lines; therefore, the evaluation of collisions focuses on birds.) The potential for bird collisions with a transmission line depends on variables such as habitat, relation of the line to migratory flyways and feeding flight patterns, migratory and resident bird species, and structural characteristics of the line (Beaulaurier et al. 1984). Waterfowl, wading birds, shorebirds, and passerines are most vulnerable to colliding with transmission lines near wetlands, while in habitats away from wetlands, raptors and passerines are most susceptible (Faanes 1987). Highest concern for bird collisions are where lines span flight paths, including river valleys, wetland areas, lakes, areas between waterfowl feeding and roosting areas, and narrow corridors (e.g., passes that connect two valleys). A disturbance that leads to a panic flight can increase the risk of collision with transmission lines (BirdLife International 2003).

The shield wire is often the cause of bird losses involving higher voltage lines because birds fly over the more visible conductor bundles only to collide with the relatively invisible, thin shield wire (Thompson 1978; Faanes 1987). Young inexperienced birds, as well as migrants in unfamiliar terrain, appear to be more vulnerable to wire strikes than resident breeders. Also, many species appear to be most highly susceptible to collisions when alarmed, pursued, searching for food while flying, engaged in courtship, taking off, landing, when otherwise preoccupied and not paying attention to where they are going, and during night and inclement weather (Thompson 1978). Sage grouse and other upland game birds are vulnerable to colliding with transmission lines because they lack good acuity and because they are generally poor flyers (Bevanger 1995).

Meyer and Lee (1981) concluded that, while waterfowl (in Oregon and Washington) were especially susceptible to colliding with transmission lines, no adverse population or ecological results occurred because all species affected were common and because collisions occurred in less than 1% of all flight observations. A similar conclusion was reached by Stout and Cornwell (1976), who suggested that less than 0.1% of all nonhunting waterfowl mortality nationwide was due to collisions with transmission lines. The potential for waterfowl and wading birds to collide with the transmission lines could be assumed to be related to the extent of preferred habitats crossed by the lines and the extent of other waterfowl and wading bird habitats within the immediate area.

Raptors have several attributes that decrease their susceptibility to collisions with transmission lines: (1) they have keen eyesight; (2) they soar or use relatively slow flapping flight; (3) they are generally maneuverable while in flight; (4) they learn to use utility poles and structures as hunting perches or nests and become conditioned to the presence of lines; and (5) they do not fly in groups (like waterfowl), so their position and altitude are not determined by other birds. Therefore, raptors are not as likely to collide with transmission lines unless distracted (e.g., while pursuing prey) or when other environmental factors (e.g., weather) contribute to increased susceptibility (Olendorff and Lehman 1986).

The best method to minimize avian collisions with transmission lines is to avoid siting them in sensitive areas. Where this cannot be done, marking power lines has been proven to appreciably reduce mortality (e.g., by more than 40%, with reductions as high as 89% having been reported) (Brown and Drewien 1995). Transmission lines designed with conductor bundles arranged at one height (single-level arrangement) rather than at different heights (multilevel arrangement) also pose a reduced risk to birds (BirdLife International 2003).

Site Maintenance. During the operational period, vegetation clearing would be required every few years (e.g., as often as every 3 to 5 years for the transmission lines and yearly for the underground portions of the pipelines). Because of the temporary nature of maintenance activities, disturbance from noise and human presence would be localized and of short duration. The most notable impact would be from habitat modification. During vegetation clearing operations, wildlife would be displaced to adjacent undisturbed habitats; however, less mobile individuals may be destroyed. Impacts on local wildlife populations would likely be minor, because the quality and carrying capacity of the maintained habitats are likely to be limited.

Periodic brush cutting to maintain a ROW in forested areas would maintain those sections of the ROW in an early stage of plant community succession that could benefit small mammals that use such habitats (e.g., hares) and their predators (e.g., bobcat [*Lynx rufus*]). Temporary growth of willows and other trees following brush cutting could benefit moose and other ungulates that use browse. Conversely, habitat maintenance would have localized adverse effects on species such as the red squirrel (*Tamiasciurus hudsonicus*), southern red-backed vole (*Myodes gapperi*), and American marten, that prefer late-successional or forested habitats (BLM 2002). Except where annual vegetation maintenance may be required over the pipelines to facilitate periodic corrosion and leak surveys, routine vegetation maintenance within a ROW segment done once every 3 to 4 years would lessen impacts to migratory bird species and other wildlife species that may make permanent use of the ROW segments.

The response of wildlife to herbicide use is attributable more to habitat changes resulting from treatment rather than direct toxic effects of the applied herbicide on wildlife. Herbicide treatment reduced structural and floral complexity of vegetation on clearcuts in Maine, resulting in lower overall abundance of birds and small mammals due to a decrease in invertebrate and plant foods and cover associated with decreased habitat complexity (Santillo et al. 1989a,b). However, some researchers have found increases in small mammal numbers due to increases in species that use grassy habitats (particularly small rodents such as voles or lemmings). Nevertheless, small mammal communities rapidly returned to pretreatment numbers (e.g., within a 2-year period) due to regrowth of vegetation damaged by herbicides (Anthony and Morrison 1985). Moose tended to avoid herbicide-treated areas of clearcuts since browse was less available for up to 2 years posttreatment. When they did feed in treated clearcuts, they fed heavily in areas that were inadvertently skipped by spraying (Santillo 1994; Eschholtz et al. 1996).

Wildlife can be exposed to herbicides by being sprayed directly, inhaling spray mist or vapors, drinking contaminated water, feeding on or otherwise coming in contact with treated vegetation or animals that have been contaminated, and directly consuming the chemical if it is applied in granular form (DOE 2000). Raptors, small herbivorous mammals, medium-sized omnivorous mammals, and birds that feed on insects are more susceptible to herbicide exposure, as they either feed directly on vegetation that might have been treated or feed on animals that feed on the vegetation. The potential for toxic effects would depend on the toxicity of the herbicide and the amount of exposure to the chemical. Generally, smaller animals are at greater risk, since less substance is required for them to be affected (DOE 2000).

Many of the herbicides currently used on federally administered lands pose some risks to wildlife (BLM 2005d, 2007c). Direct effects to animals could include death, damage to vital organs, decrease in growth, decrease in reproductive output and the condition of offspring, and increased susceptibility to predation. Indirect adverse effects following application would include a reduction in plant diversity and availability of preferred forage, habitat, and breeding areas; decrease in wildlife population densities as a result of limited regeneration; habitat and range disruption because wildlife may avoid sprayed areas following treatment; and increase in predation of small mammals due to loss of ground cover (BLM 2005d). Generally, the main risk of herbicide use to wildlife would occur from habitat modification. However, harm at the population level to unlisted species is unlikely because of the size and distribution of treated areas relative to the dispersal of wildlife populations and the foraging area and behavior of individual animals (BLM 2005d, 2007c).

Wildlife species that consume grass (e.g., deer, elk, rabbits and hares, chukar, quail, and geese) are at potentially higher risk from herbicides than species that feed on other vegetation and seeds because herbicide residue tends to be higher on grass. However, harmful effects are not likely unless the animal forages exclusively within the treated area shortly after application. Similarly, bats, shrews, and numerous bird species that feed on herbicide-contaminated insects could be at risk (BLM 2005d).

Herbicide vegetation management could affect wild horses and burros though exposure to chemicals (e.g., death, damage to vital organs, decrease in growth, decrease in reproductive output and the condition of offspring, and increased susceptibility to predation) or through changes in vegetation that could positively or negatively alter the carrying capacity of the herd management areas through improving or decreasing, respectively, the amount and quality of forage (BLM 2005d). The potential for adverse impacts from direct exposure to herbicides would be minimal when herbicides are applied according to label instructions and under other standard operating procedures established for herbicide use (BLM 2005d, 2007c).

The licensed use of herbicides would not be expected to adversely affect local wildlife populations. Applications of these materials would be conducted by following label directions and in accordance with applicable permits and licenses. However, accidental spills or releases of these materials could impact exposed wildlife. Potential effects of such exposures are discussed below.

Exposure to Contaminants. During operation of the energy transport system, wildlife may be exposed to accidental spills or releases of oil, herbicides, fuel, or other hazardous materials. Exposures to these materials could affect reproduction, growth, development, or survival of exposed individuals. If the magnitude and extent of a spill and subsequent exposure are sufficient, population-level effects may be incurred. However, such exposures are not expected under normal operations. Except for a large oil spill from a pipeline, only small amounts of these materials would be expected to be present at any facility, and spill response plans would be in place to address any accidental spills or releases. Furthermore, given the small area potentially affected by a spill (much less than 1 acre), a land-based spill would affect relatively few individual animals and a relatively limited portion of the habitat or food resources for large-ranging mammal species (e.g., deer or elk) (BLM 2005c).

The impacts to wildlife from an oil spill would depend on such factors as the time of year and volume of the spill, the type and extent of habitat affected, and the home range and density of the wildlife species. For example, as the size of a species' home range increases, the effects of an oil spill would generally decrease (Irons et al. 2000). Generally, small mammals and other species that have small home ranges and/or high densities per acre would be most affected by a land-based oil spill.

The potential effects to wildlife from oil spills could occur from direct contamination of individual animals, contamination of habitats, and contamination of food resources. Acute (short-term) effects generally occur from direct oiling of animals; chronic (long-term) effects usually occur from such factors as accumulation of contaminants from food items and environmental media (Irons et al. 2000). Moderate to heavy contact with oil is most often fatal to wildlife. In aquatic habitats, death occurs from hypothermia, shock, or drowning. In birds, chronic oil exposure can reduce reproduction, cause pathological conditions, reduce chick growth, and reduce hatching success (BLM 2002). The reduction or contamination of food resources from an oil spill could also reduce survival and reproductive rates. Oil ingestion during preening or feeding may impair endocrine and liver functions, reduce breeding success, and reduce growth of offspring (BLM 2002).

A land-based oil spill would contaminate a limited area. Therefore, an oil spill would affect relatively few individual animals and a relatively limited portion of the habitat or food resources for large-ranging species (e.g., moose, mule deer, pronghorn, elk, and American black bear). It would be unlikely that a land-based spill would cause significant impacts to movement (e.g., block migration) or foraging activities at the population (herd) level, largely because of the vast amount of surrounding habitat that would remain unaffected (BLM 2002). An oil spill would be expected to have a population-level adverse impact only if the spill was very large or contaminated a crucial habitat area where a large number of individual animals were concentrated. The potential for either event to occur is very unlikely.

Human presence and activities associated with response to spills of oil and other hazardous substances would also disturb wildlife in the vicinity of the spill site and spill-response staging areas. Such activities could be more intensive and prolonged than normal pipeline maintenance and operation and could disturb and displace larger numbers of animals. In addition to displacing wildlife from areas undergoing oil cleanup activities, habitat damage could also occur from cleanup activities (BLM 2002). Avoidance of contaminated areas by wildlife during cleanup due to disturbance would minimize the potential for wildlife to be exposed to oil before site cleanup is completed.

Disturbance of Wildlife. During project operation and maintenance, wildlife both on-and off-site could be disturbed by vehicles, workers, and project machinery. The response of wildlife to such disturbance is highly variable and depends on species; distance; and type, intensity, and duration of the disturbance. Some species may temporarily move from the area, while others may permanently move from the area. Wildlife permanently moving from the area may incur high mortality levels if the surrounding habitats are at or near carrying capacity, or have little similar habitat capable of supporting the displaced individuals.

Wildlife may also incur injury or death through collision with vehicles, particularly ATVs. While wildlife may be injured or killed occasionally by a vehicle, most can be expected to respond to the noise of an oncoming vehicle by temporarily fleeing the area or by seeking shelter in a burrow (where they may be smothered) or under rocks. Wildlife may also be impacted if increased access leads to an increase in the legal and illegal take, which could impact local populations of some species.

Text Box 3.8-2 provides information about how sage grouse may be impacted by corridor development, including information about possible measures to mitigate impacts.

Interference with Migratory Behavior. Wildlife may also be affected if a corridor segment and/or ancillary facilities interfere with migratory movements. While migrating, birds are expected to simply fly over the corridor and continue their migratory movement. The presence of a corridor project could disrupt movements of terrestrial wildlife, particularly during migration. Herd animals, such as elk, deer, and pronghorn, could potentially be affected if the corridor segments transect migration paths between winter and summer ranges or in calving areas. The corridor segments would be maintained as areas of low vegetation that may hinder or prevent movements of some wildlife species. It is foreseeable that corridor segments may be used for travel routes by big game if they lead in the direction of their normal migrations.

Fire. Increased human activity, including increased vehicle access often enabled by modified vegetation within the ROWs, also increases the potential for fires. Fire may affect wildlife through direct mortality and through a reduction of habitat or habitat quality. In general, short-term and long-term fire effects on wildlife are related to fire impacts on vegetation, which in turn affect habitat quality and quantity, including the availability of forage or shelter (Hedlund and Rickard 1981; Groves and Steenhof 1988; Knick and Dyer 1996; Schooley et al. 1996; Watts and Knick 1996; Sharpe and Van Horne 1998; Lyon et al. 2000b; USDA 2002a,b,c).

Wildlife may survive fires by either seeking underground or above-ground refuge within the fire or by moving away from it (Ford et al. 1999; Lyon et al. 2000a). While individuals caught in a fire could incur increased mortality, depending on how quickly the fire spreads, most wildlife would be expected to escape by either outrunning the fire or seeking safety in burrows. Some mortality of burrowing mammals from asphyxiation in their burrows during fire has been reported (Erwin and Stasiak 1979). Burrowing kangaroo rats were reported as the only rodents to survive a chaparral fire, probably because the burrows protected them from the fire (Lyon et al. 2000b).

In the absence of long-term vegetation changes, rodents in grasslands usually show a decrease in density after a fire, but they often recover to achieve densities similar to or greater than preburn levels (Beck and Vogel 1972; Lyon et al. 2000b; USDA 2002d). Long-term changes in vegetation from a fire (such as loss of sagebrush or the invasion or increase of non-native annual grasses) may affect food availability and quality and habitat availability for wildlife; the changes could also increase the risk from predation for some species (Hedlund and Rickard 1981; Groves and Steenhof 1988; Schooley et al. 1996; Watts and Knick 1996; Knick and Dyer 1997; Lyon et al. 2000b; USDA 2002b,c).

Raptor populations generally are unaffected by, or respond favorably to, burned habitat (Lyon et al. 2000b). Fires may benefit raptors by reducing cover and exposing prey; raptors may also benefit if prey species increase in response to post-fire increases in forage (Lyon et al. 2000b; USDA 2002d). Direct mortality of raptors from fire is rare (Lehmen and Allendorf 1989), although fire-related mortality of burrowing owls has been documented (USDA 2002d). Most adult birds can be expected to escape fire, while fire during nesting (prior to fledging) may kill young birds, especially of ground-nesting species (USDA 2002d).

Decommissioning Impacts. Impacts to wildlife from decommissioning activities would be similar to those from construction, but may be of more limited scale and of shorter duration. This would depend, in part, as to whether decommissioning would involve full removal of facilities, partial removal of key components, or abandonment. For example, a buried pipeline might be cleaned and sealed without being removed. Leaving buried pipelines in place would reduce the amount of trenching and soil disturbance required for decommissioning and contribute to reduced impacts relative to those that occurred during construction.

Decommissioning activities could occur anywhere along the 6,112 miles of designated corridors on federal lands. Decommissioning activities could impact wildlife by altering habitat characteristics and the species supported by these habitats. These activities could vary among corridor locations depending upon the extent of infrastructure that needs to be removed, the projected future land use, and the amount of site restoration (e.g., type of revegetation) required. Decommissioning activities that could affect wildlife include:

- The dismantling process,
- Purging and cleaning of pipe or other structures left in place,
- Generation of waste materials,
- Regrading of project areas,
- Revegetation activities, and
- Accidental releases (spills) of oil or other materials.

Generally, decommissioning activities for the aboveground facilities would have the higher level of impacts because of the more intensive activities and longer time required to dismantle and dispose of pipeline and transmission line components. During decommissioning activities, localized obstruction of wildlife movement across the ROWs could occur in the areas where the pipelines and transmission lines are being dismantled.

There would be a short-term increase in noise and visual disturbance associated with removal of project facilities and site restoration. Negligible to no reduction in wildlife habitat would be expected. Increased traffic levels during decommissioning would probably result in increased roadkills, but injury and mortality rates of wildlife would be lower than they would be during construction.

The impacts on wildlife from dust generation, surface erosion and runoff, and bird collisions associated with decommissioning would be minor and would continue only until decommissioning activities were completed. Equipment noise, vehicles, human presence, aircraft operations, and other activities associated with decommissioning activities would disturb wildlife. Most wildlife would avoid portions of the ROWs and adjacent areas while decommissioning activities would be taking place. Avoidance would be a short-term impact. However, animal feeding and nuisance animal issues might become problematic because of the presence of an increased number of workers who might have a shorter-term view of the consequences of their actions. Problematic animals (e.g., bears, mountain lions) might have to be deliberately displaced to protect lives and property, either through harassment or live-trapping and releasing.

Decommissioning of some corridor projects could require the reconstruction or installation of new access roads. These and existing access roads that are not left to naturally rehabilitate would require some actions prior to abandonment. These actions could include removal of drainage structures, road material, and associated steps to minimize and control erosion (Berger 1995). If access roads are not restored, they would continue to create an opportunity for human access on or adjacent to the ROWs. Recreational use of the decommissioned corridors (e.g., use of the ROWs as a travel corridor by OHVs) might also increase after aboveground structures were removed. Wildlife would be disturbed by these uses, although the eventual growth of woody vegetation would inhibit the use of vehicles.

Other potential environmental concerns resulting from decommissioning would include disposal of solid wastes, hazardous materials, and remediation of contaminated soils. For example, during the time that oil pipelines are being purged of remaining oil, small-volume oil spills could occur (the potential for a large oil spill would be extremely unlikely). Some fuel and chemical spills could also occur, but these would be generally confined to access roads and work areas. The probability that wildlife would be exposed to such spills would be small and limited to a few individuals. After decommissioning activities were complete, there would be no oil, fuel, or chemical spills associated with the decommissioned corridors.

Removal of aboveground facilities would reduce potential nesting, perching, and resting habitats for several bird species, particularly raptors and common ravens. However, this could benefit species such as small mammals and greater sage-grouse that are preyed upon by those species. Removal of transmission lines would also reduce bird and bat collisions. Additionally, the removal of aboveground sections of pipelines would ensure free passage of wildlife. The revegetation of decommissioned corridors would increase wildlife habitat diversity, as control of ROW vegetation (including cutting of woody vegetation) would cease, allowing native shrubs and trees to grow and increase in density within the ROWs. As disturbed areas become revegetated with plants from adjacent natural areas, any impacts from fragmentation that existed during the lifetime of the project would diminish. Also, the negative interactions with humans that were facilitated by increased access (e.g., hunting [including poaching], OHV use, noise, and other types of accidental or intentional harassment) would decrease. Habitats that had been avoided by wildlife because of the close proximity of facilities and humans would become re-inhabited.

Following site restoration, the wildlife resources in the project area site could return to pre-project conditions. This would partly depend upon the habitat and vegetation conditions that existed prior to construction. In the extreme, natural recovery to predisturbance plant cover and biomass in desert ecosystems may take 50 to 300 years with complete ecosystem recovery potentially requiring over 3,000 years (Lovich and Bainbridge 1999).

How Could Threatened, Endangered, and Other Special Status Species Be Affected by Project Development? Threatened, endangered, and other special status species could be affected by future development of energy transport projects, whether this occurs within a designated corridor or within a ROW elsewhere on federal or nonfederal land. These development actions would be the subject of future project-specific consultations that would identify and evaluate project-specific impacts. This section describes the impacts associated with construction, operation, and decommissioning of energy transport facilities regardless of the alternative chosen or project location.

Impacts of future development projects on threatened, endangered, and other special status species are fundamentally similar to or the same as those described for impacts to vegetation, aquatic biota, and wildlife discussed earlier in this section. The most important difference from these impacts is the potential consequence of the impacts. Threatened, endangered, and other special status species are far more vulnerable to impacts because of their low population sizes compared to the more common and widespread species. This low population size makes them more vulnerable to the effects of habitat fragmentation, habitat alteration, habitat degradation, human disturbance and harassment, mortality of individuals, and loss of genetic diversity. This places great importance on the successful implementation of the mitigation measures described in Section 3.8.4.2.

Impacts to threatened, endangered, and other special status species could result from:

- Habitat destruction or degradation resulting from clearing of a ROW, construction of energy transport facilities and associated infrastructure, alteration of topography, alteration of hydrologic patterns, removal of soils, erosion of soils, fugitive dust, sedimentation of adjacent habitats, oil or other contaminant spills, and the spread of invasive plant species (BLM 2007c).

- Habitat and population fragmentation resulting from development of energy transport projects through intact habitat patches and populations, preventing the free movement of organisms within the entire population area.

- Disturbance of animals resulting from noise and human activities during construction, operations, and decommissioning. Disturbance during the breeding season generally would have the largest adverse effects and could result in animals abandoning traditional breeding grounds and nest sites.

- Increases in human access (including ATV use) and subsequent disturbance or mortality resulting from establishment of corridors through otherwise intact and/or difficult-to-reach habitats.

- Localized increases in predator populations (and subsequent increased mortality of vulnerable listed species) resulting from increased access afforded by corridors, attraction to corridor infrastructure for nesting or breeding sites, and attraction to human-occupied sites.

- Aquatic species could be affected by increases in water temperature in areas crossed by transport facilities resulting from the removal of riparian vegetation that would otherwise shade surface water.

The relative magnitude and duration of these impacts to threatened and endangered species that could occur during construction, operation, and decommissioning of energy transport facilities are presented in Table 3.8-10. As stated earlier, the impacts described for vegetation, wetlands, aquatic biota, and wildlife species may also be relevant to threatened, endangered, and other special status species.

3.8.4.2 What Mitigation Is Available to Minimize, Avoid, or Compensate for Potential Project Impacts to Ecological Resources?

The programmatic evaluations identified a number of potential impacts that could be incurred if project development would occur within an energy corridor designated under the Proposed Action or within a No Action ROW. In addition to the mandatory implementation of IOPs (see Section 2.4), which are intended to help ensure that energy transport projects proposed for Section 368 corridors are planned, implemented, operated, and eventually removed in a manner that protects and enhances ecological resources, a variety of mitigation measures could be implemented to reduce potential ecological impacts, and these are described in this section. In addition, monitoring during the various phases of corridor development could be performed to identify potential concerns and direct actions to address those concerns. Monitoring data could be used to track the condition of ecological resources, identify the onset of impacts, and direct appropriate site management responses to address those impacts (BLM 2008c).

This section identifies measures to mitigate impacts associated with development of Section 368 energy corridors. In addition to these measures, a variety of federal and state agencies and environmental organizations have identified measures for mitigating the ecological impacts of other human activities. Guidance documents developed by the BLM and the FS also identify measures for mitigating ecological impacts associated with other approved activities, and these mitigation measures may be applicable to minimize impacts to ecological resources from the development, operation, and decommissioning of the energy corridors (see Section 3.8.4.1).

TABLE 3.8-10 Potential Impacts on Threatened, Endangered, and Other Special Status Species Associated with Construction and Operation of Energy Transport Facilities

	Impact Magnitude and Duration According to Species Type[a]						
Impact Category	Upland Plants	Wetland and Riparian Plants	Aquatic and Wetland Animals	Terrestrial Invertebrates	Terrestrial Amphibians and Reptiles	Terrestrial Birds	Terrestrial Mammals
Construction and Decommissioning							
Alteration of topography	Moderate, short-term	Large, short-term	Large, short-term	Small, short-term	Small, short-term	Small, short-term	Small, short-term
Behavioral disturbance/ harassment	None	None	None	None	Large, short-term	Large, short-term	Large, short-term
Changes in drainage patterns	Moderate, short-term	Large, short-term	Large, short-term	Small, short-term	Small, short-term	Small, short-term	Small, short-term
Erosion	Large, short-term	Large, short-term	Large, short-term	Small, short-term	Small, short-term	Small, short-term	Small, short-term
Fugitive dust	Moderate, short-term	Moderate, short-term	Small, short-term	Small, short-term	Small, short-term	Small, short-term	Small, short-term
Injury or mortality of individuals	Large, short-term	Large, short-term	Large, short-term	Large, short-term	Large, short-term	Large, short-term	Large, short-term
Noise	None	None	Large, short-term	None	Small, short-term	Large, short-term	Large, short-term
Oil and contaminant spills	Moderate, short-term	Large, short-term	Large, short-term	Small, short-term	Large, short-term	Small, short-term	Small, short-term
Sedimentation from runoff	Large, short-term	Large, short-term	Large, short-term	Small, short-term	Small, short-term	Small, short-term	Small, short-term
Soil compaction	Large, long-term	Small, short-term	Small, short-term	Small, short-term	Moderate, short-term	Small, short-term	Small, short-term
Spread of invasive plant species	Large, long-term	Large, long-term	Moderate, long-term	Moderate, long-term	Moderate, long-term	Moderate, long-term	Moderate, long-term
Vegetation clearing	Large, short-term	Large, short-term	Small, short-term	Large, short-term	Large, short-term	Large, short-term	Large, short-term
Operations							
Alteration of topography	Moderate, long-term	Large, long-term	Large, long-term	Small, long-term	Small, long-term	Small, long-term	Small, long-term
Behavioral disturbance/ harassment	None	None	Large, long-term	None	Small, long-term	Large, long-term	Large, long-term
Changes in drainage patterns	Moderate, long-term	Large, long-term	Large, long-term	Small, long-term	Small, long-term	Small, long-term	Small, long-term

TABLE 3.8-10 (Cont.)

	Impact Magnitude and Duration According to Species Type[a]						
Impact Category	Upland Plants	Wetland and Riparian Plants	Aquatic and Wetland Animals	Terrestrial Invertebrates	Terrestrial Amphibians and Reptiles	Terrestrial Birds	Terrestrial Mammals
Operations (Cont.)							
Collision mortality	None	None	None	None	None	Moderate, long-term	Small, long-term
Habitat alteration	Large, long-term	Large, long-term	Moderate, long-term	Large, long-term	Large, long-term	Large, long-term	Large, long-term
Habitat fragmentation	Moderate, long-term	Moderate, long-term	Small, long-term	Moderate, long-term	Moderate, long-term	Moderate, long-term	Moderate, long-term
Injury or mortality of individuals	Moderate, long-term	Moderate, long-term	Moderate, long-term	Moderate, long-term	Large, long-term	Moderate, long-term	Moderate, long-term
Increased human access	Moderate, long-term	Moderate, long-term	Moderate, long-term	Moderate, long-term	Moderate, long-term	Large, long-term	Large, long-term
Increased predation rates	None	None	Moderate, long-term	None	Moderate, long-term	Moderate, long-term	Moderate, long-term
Movement/dispersal blockage	Moderate, long-term	Moderate, long-term	Large, long-term	Small, long-term	Moderate, long-term	Small, long-term	Moderate, long-term
Noise	None	None	None	None	Small, long-term	Moderate, long-term	Moderate, long-term
Oil and contaminant spills	Small, long-term	Small, long-term	Small, long-term	Small, long-term	Small, long-term	Small, long-term	Small, long-term
Sedimentation from runoff	Large, long-term	Large, long-term	Large, long-term	Small, long-term	Small, long-term	Small, long-term	Small, long-term
Spread of invasive plant species	Large, long-term	Large, long-term	Small, long-term	Small, long-term	Moderate, long-term	Moderate, long-term	Moderate, long-term
Temperature increases	None	Moderate, long-term	Moderate, long-term	None	None	None	None
Vegetation maintenance	Large, long-term	Large, long-term	Large, long-term	Large, long-term	Large, long-term	Large, long-term	Large, long-term

[a] Indicators of potential impact magnitude and duration (without mitigation measures in place) are presented as magnitude/duration with magnitude presented as no effect (None), small, moderate, or large, and duration presented as short-term (construction period) or long-term (beyond construction period). A small impact is one that is limited to the immediate project area, affects a relatively small proportion of the local population (less than 10%), and does not result in a measurable change in carrying capacity or population size in the affected area. A moderate impact could extend beyond the immediate project area, affects an intermediate proportion of the local population (10 to 30%), and results in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area. A large impact would extend beyond the immediate project area, could affect more than 30% of a local population, and results in a large, measurable, and destabilizing change (50% or more) in carrying capacity or population size in the affected area.

Mitigation Measures for Vegetation and Wetlands. Potential impacts to terrestrial vegetation communities and wetlands from the development of energy transport projects within the proposed corridors or No Action ROWs could potentially be reduced, minimized, or avoided by the implementation of mitigation measures and IOPs. The following measures would address many of the impacts identified in Section 3.8.4.1. Additional mitigation measures may need to be developed during site-specific NEPA evaluations, for further protection of soils, vegetation, and wetlands.

Mitigation during Construction.

- Operators should conduct surveys to identify wetlands, springs, seeps, streams, 100-year floodplains, ponds, riparian habitat, and rare natural communities in the project vicinity and design the project to avoid (if possible), minimize, or mitigate potential impacts to these resources. Surveys submitted by operators need to be completed by qualified and trained ecologists, botanists, or biologists. Damage to biological soil crusts should be avoided or minimized. The design and siting of the facilities should follow appropriate guidance and requirements from the BLM and other resource agencies, as available and applicable. For example, a number of BLM state offices have policies that are protective of these resources.

- Where avoidance of long-term impacts to wetlands or riparian areas is not possible, compensatory mitigation should be provided. Such mitigation should be developed and approved in coordination with federal, state, and local resource agencies.

- Impacts to wetlands from construction could be minimized by establishing buffer zones of 500 feet around wetlands, streams, springs, seeps, riparian areas, lakes, and ponds. Disturbance, including operation of machinery or vehicles, within these resources or buffer areas should be avoided or minimized.

- The impacts of construction on wetlands could be reduced by the restriction of construction activities, including mechanized tree removal, in or near wetlands to the winter months on frozen ground with snow cover, to support equipment without disturbing soil surface, compaction, or rutting and to avoid disturbance of biota.

- Impacts to wetlands from construction could be minimized by maintaining natural drainage and flow patterns, including those across temporary and permanent access roads. All stream and wetland crossings should be perpendicular to the stream or wetland boundary, or at points of minimum impact.

- Wetlands and streams should be avoided during routing of access roads. Access roads in wetlands should be constructed only when no other practical means for placing structures would be available or when equipment crossing of a wetland could not be conducted during winter when the ground is frozen. No gravel should be placed in wetlands. Access across streams should be provided by temporary equipment bridges, where necessary.

- When temporary access roads were no longer required, the materials used to construct them should be removed from wetlands. The wetlands would then be reclaimed in accordance with a developed reclamation plan and monitored to assess adequate establishment of appropriate vegetation and maintenance of riparian function.

- The implementation of erosion and sedimentation control measures that comply with county, state, and federal standards (such as using hay bales, jute netting, silt fences, check dams, organic berms, and slope breakers) would minimize the likelihood of stormwater impacts to wetlands from sedimentation and contaminants.

- Impacts from turbidity could be reduced by implementing measures to restrict the dispersal of sediments during trenching in wetland or aquatic areas.

- Where a pipeline trench may drain a wetland, trench breakers should be constructed and/or the trench bottom should be sealed to maintain the original wetland hydrology.

- Topsoil and subsoil should be segregated during excavation. Soils should be replaced in reverse order to reestablish original horizons, and original grades should be reestablished.

- Only selective cutting should occur in wetlands and 100-feet buffers and only in conductor security zones. Selective cutting should include only those trees that would encroach into the transmission line security zone within 3 to 4 years.

- Cutting in wetlands or stream and wetland buffers should be conducted by hand or feller-bunchers to minimize disturbance of soil and remaining vegetation.

- Vegetation removal should be designed to avoid formation of new drainage channels in erodible areas.

- Trench dewatering activities should not result in the deposition of sand, silt, or sediment into wetlands, streams, or other water bodies.

- Disposal of material excavated from wetlands for support poles should be addressed by the appropriate surface management agency and included in the operator's reclamation plan.

- Temporary access roads should be used to minimize stream crossings by equipment during ROW clearing, support structure placement, and transport line stringing.

- Temporary access roads should be developed primarily by the removal of woody vegetation, although temporary timber mats should be used in areas of wet soils.

- The placement of ROW structures should be excluded from streams, floodplains, playas, wetlands, riparian areas, and lakeshores.

- Soil stockpiles should be located and protected to minimize wind and water erosion and maximize reclamation potential.

- Site runoff should be trapped on or near the location with the use of sediment fences and water retention ponds.

- Topsoil should be salvaged and reused on road ditches, cut slopes, and fill slopes.

- Pipelines should not block, dam, or change the natural course of any drainage.

- The area disturbed during the installation of facilities (pipelines, transmission towers, pump stations, substations, laydown areas, assembly areas, access roads) should be kept to a minimum to retain native vegetation and minimize soil disturbance.

- If survey results indicate the presence of wetlands, springs, streams, ponds, or riparian habitats in the project vicinity, project design should locate facilities in areas least likely to impact those habitats.

- Habitat disturbance should be minimized by locating facilities, access roads, stream crossings, and laydown areas in previously disturbed areas.

- New ROWs and access roads should be configured to avoid high-quality terrestrial habitats and minimize habitat fragmentation.

- Site access roads and ROWs should minimize stream crossings.

- To minimize impacts to aquatic habitats from increased erosion, the use of fill ramps rather than stream bank cutting should be designated for all stream crossings by access roads.

- The extent of habitat disturbance should be reduced by keeping vehicles on access roads and prohibiting vehicle or foot traffic through unauthorized areas.

- Dust abatement techniques should be used on unpaved, unvegetated surfaces to minimize airborne dust.

- Erosion and fugitive dust control measures should be inspected and maintained regularly.

- Spills should be immediately addressed per the appropriate spill management plan, and soil cleanup and soil removal initiated, if needed.

- Operators must develop a plan for control of noxious weeds and invasive plants, which could occur as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations. The use of certified weed-free mulching should be required.

- An inspection and cleaning area must be established to conduct visual inspections, power washing, or (in cold weather) high-pressure air cleaning of trucks and construction equipment arriving at the project area, or leaving if work is in an infested area, to remove and collect seeds that may be adhering to tires and other equipment surfaces to prevent the spread of invasive species.

- Directional drilling for pipeline installation should be considered for wetland, stream, water body, and riparian crossings where feasible. Stream crossings by buried pipelines using directional drilling should not intersect alluvial aquifers. Trench crossings should be conducted only during no-flow periods on dry substrates.

- Where forest clearing is conducted, trees more than 24 inches in diameter at breast height (dbh) that do not pose a safety hazard to transmission lines or pipelines should be preserved. Cut trees should be used to provide large woody debris for stream restoration.

- The removal of trees from riparian habitat should be avoided, particularly trees greater than 8 inches dbh that do not pose a safety hazard to transmission lines or pipelines.

- Methods and timing of construction near wetlands should be designed to minimize potential impacts.

- The movement of equipment or materials within areas authorized for construction and support activities within a ROW should be confined as much as possible to a single path. This can be facilitated by constructing road turnouts.

- In areas where vegetation must be cleared (such as in material laydown areas), ground-level vegetation and stumps should be left in place following cutting.

- Wide-tracked or balloon-tired equipment, timber corduroy, or timber mat work areas should be used on wet soils, where wetland or stream crossings are unavoidable and when crossing on frozen ground is not possible in winter. Areas rutted by equipment should be immediately regraded and revegetated. Tower installation should be conducted by airlift helicopter, where necessary, to avoid extensive wetland crossings or highly sensitive areas (such as those identified as rare natural habitats).

- No structures should be located in stream buffer areas, and no soil disturbance or vehicular traffic should be allowed, except to construct temporary equipment crossing bridges.

- Runoff and erosion from access roads and work areas should be prevented by diverting water using structures or techniques such as water bars, silt fences, hay bales, or erosion berms.

- Rock cutters rather than explosives may be used for trench excavations in rocky soils, unless alternative methods are required by law, local regulation, or to protect sensitive high-value habitat.

- Road damage and impacts to adjacent areas caused by operations during periods of saturated soil should be immediately reported to the surface management agency and reclaimed.

- Excavating and filling should be prohibited with frozen soil that would be difficult to restore, or during periods when the soil material is saturated, or when watershed damage is likely to occur.

Mitigation during Site Restoration.

- A habitat restoration and management plan should be developed that identifies vegetation, soil stabilization, and erosion reduction measures and requires that restoration activities be implemented as soon as possible following facility construction activities. The plan must be approved by the applicable resource management agency.

- Restoration should be used to return areas to original contours.

- Weed-free mulch, matting, or other erosion control measures should be used on all exposed soils immediately following seeding, or within 48 hours of disturbance (or before a predicted storm event, if sooner) when not immediately seeded on areas within 300 feet of a wetland, stream, or other water resource.

- Disturbed shoreline and streambank areas should be stabilized and planted with locally native riparian plant species immediately following construction. Streambank and shoreline stabilization should include biodegradable fiber materials, such as erosion mats and rolls.

- Fill materials that originate from areas with known invasive vegetation problems should not be used.

- Road ditches, cut slopes, and fill slopes should be replanted immediately following road construction and covered with mulch or other sediment control measure.

- Disturbed soil should be revegetated immediately following completion of the disturbance. Preparation should include topsoil respreading and actions for seedbed preparation, such as ripping or scarifying on contour.

- Only certified weed-free seed should be used for revegetation of disturbed soil. Locally native species should be used, as directed and approved by the local office of the appropriate agency, with a composition able to restore the previous or potential natural community of the site. Seed mixtures to help reduce the establishment of invasion species may need to be developed. Seed mixes for revegetation projects need to follow guidance in the new directive, *Forest Service Manual (FSM) 2070*, for native plant materials, which provides direction for the use, growth, development, and storage of native plant materials. These seed mixes need to be approved by a local botanist. Reseeding or replanting should be repeated, with fertilizing and mulching, until revegetation is successful. Seeding on slopes should be done by drilling on contour.

- Following the replanting of disturbed areas, monitoring must be conducted to evaluate the progress of habitat restoration and identify the occurrence of non-native/invasive/noxious weed species. Any plants of such species must be immediately eliminated.

Mitigation during Operation and Maintenance.

- A 500-foot buffer zone should be maintained around wetlands and water bodies where no ground surface disturbance is permitted during maintenance.

- Tree-cutting in stream buffers should only target trees able to grow into a transmission line conductor clearance zone within 3 to 4 years.

- Cutting in wetlands or stream and wetland buffers should be conducted by hand or feller-bunchers to minimize disturbance of soil and remaining vegetation.

- Broadcast spraying of herbicides should not be used for clearing vegetation along a ROW. Herbicides should be applied by qualified personnel and effects on wildlife and nontarget plant species should be considered.

- Pesticide and herbicide use should be limited to nonpersistent, immobile formulations and should only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications. Herbicide use to control weed infestations on ROWs where the redevelopment of broadleaf vegetation is desired should be limited to application methods that minimize exposure of non-target vegetation (e.g., spot treatments via ground equipment).

- No herbicides should be used near wetland areas. Vegetation maintenance, if any is needed, should be limited and done mechanically rather than with herbicides.

- Access roads and newly established ROWs should be monitored regularly for invasive species establishment as part of a long-term management program, and weed control measures should be initiated immediately upon evidence of invasive species introduction.

- Spills should be immediately addressed per the appropriate spill management plan, and soil cleanup and soil removal initiated, if needed.

- Operators should develop a long-term plan for control of noxious weeds and invasive plants, which could occur as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations. The use of certified weed-free mulching should be required.

- ROW management should promote a patchwork or mosaic of native plant communities and successional stages across the landscape to develop a level of habitat and structural diversity similar to native habitats of the region.

- Road maintenance should include dust abatement, ditch cleaning, culvert cleaning, and noxious weed control.

- Management of corridors should maintain the proper functioning physical condition of watersheds, including their upland, riparian-wetland, and aquatic components; maintain ecological processes in order to support healthy biotic populations and communities; maintain water quality; and maintain or restore habitat for special status species.

Mitigation Measures for Aquatic Biota. Mitigation measures may be considered during project design to ensure that the development of energy transport projects within the proposed corridors or No Action ROWs do not result in unacceptable impacts on ecological resources. This section provides a number of potential mitigation measures that should be employed to limit or avoid potential impacts to aquatic resources.

- Discussions should be held with the field office staff of the appropriate state and federal land management agencies regarding the occurrence of sensitive aquatic species or other valued aquatic resources in the proposed project area. If resources within the project area are not well known, conduct evaluations or surveys to identify important, sensitive, or unique aquatic habitats and biota in the project vicinity. Such evaluations may be especially important for spring habitats, since they are more likely to contain unique or endemic flora and fauna.

- If survey results indicate the presence of important, sensitive, or unique habitats (such as streams supporting native fish assemblages, trout streams, or anadromous salmon streams) in the project vicinity, facility design should attempt to locate stream crossings, roads, and support facilities in areas least likely to impact those habitats.

- Habitat disturbance should be minimized by locating facilities in previously disturbed areas, whenever possible. Existing roads, stream crossings, and utility corridors should be utilized to the maximum extent feasible.

- New access roads and utility corridors should be configured to avoid high quality aquatic habitats and minimize the number of stream crossings within a particular stream or watershed.

- Stream crossings should be designed to provide in-stream conditions that allow for and maintain uninterrupted movement and safe passage of fish during all periods, including under typical low-flow conditions.

- Explosives should be used only at specified safe distances from surface waters to avoid concussive effects on aquatic organisms.

- Erosion controls that comply with county, state, and federal standards should be applied. Practices such as using jute netting, silt fences, and check dams should be applied near disturbed areas. All areas of disturbed soil should be reclaimed using weed-free native grasses, forbs, and shrubs; such reclamation activities should be undertaken as early as possible on disturbed areas.

- Dust abatement techniques should be used on unpaved, unvegetated surfaces to minimize airborne dust that enters aquatic habitats.

- Spill management plans should be developed to address potential fuel spills, and any spills should be immediately addressed by following the appropriate spill management plan.

- Refueling areas should be located away from surface water locations and drainages and should include a temporary berm to limit the spread of any spill. Drip pans should be used during refueling to contain accidental releases and under the fuel pump and valve mechanisms of any bulk fueling vehicles parked at the construction site.

- Pesticide use should be limited to nonpersistent, immobile pesticides and should only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications. Use of pesticides should be avoided within aquatic habitats and riparian areas to avoid introduction of contaminants into surface waters.

- Loss or disturbance of riparian habitats should be minimized.

- When considered feasible, use directional drilling to place pipelines at major river crossings to reduce surface disturbance and to reduce the need for activities in riparian habitat. Ensure that directional drilling does not intercept or degrade alluvial aquifers.

- Any pipelines transporting liquids that cross rivers or streams containing sensitive aquatic species should have block or check valves on both sides of the river to minimize the amount of product that could be released into waterways due to leaks. Such pipelines should be constructed of double-walled pipe at river crossings.

- Low-water fords should be used only as a last resort, and then during the driest time of the year. Rocked approaches to fords should be used whenever possible. The preexisting stream channel, including bed and banks, should be restored after the need for a low-water ford has passed.

Mitigation Measures for Wildlife. Potential impacts to wildlife, including wild horses and burros, from construction, operation, maintenance, and decommissioning of energy transport projects within the proposed energy corridors or No Action ROWs could be reduced, minimized, or avoided by the implementation of mandatory IOPs (Section 2.4) and mitigation measures. Many of the mitigation measures listed to minimize impacts to geologic resources (Section 3.3.4.2), water resources (Section 3.5.4.2), vegetation and wetlands (this section), and aquatic biota (this section) would also minimize impacts to wildlife. In addition to these measures, a variety of federal and state agencies and environmental organizations have identified measures for mitigating ecological impacts.

Spanning or routing around important habitat areas, limiting the development or use of access roads and other ancillary facilities, and restricting construction during key periods would be the primary methods to mitigate impacts to wildlife species. The use of marginal habitat areas, to the extent practicable, for substations, pump stations, and other ancillary facilities would also minimize localized impacts to wildlife. The following lists additional measures that would be appropriate for mitigating impacts to wildlife associated with energy transport systems proposed for Section 368 corridors. The mitigation measures are listed according to project phase (i.e., preconstruction, construction, site restoration, operation and maintenance, and decommissioning). Monitoring, inspection, and enforcement of many of the mitigation measures would be necessary to ensure that they are effective and remain necessary. Once construction starts, there should be routine visits by BLM, FS, USFWS, and appropriate state agencies to ensure compliance with permits and that the mitigation measures are being appropriately applied.

Mitigation during Project Planning Activities. Mitigation measures may be considered during project design to ensure that the siting of the overall project and individual facility structures, as well as various aspects of the design of individual facility structures, do not result in unacceptable impacts to wildlife resources. Site surveying would generally result in only minimal impacts to wildlife resources. The amount and extent of necessary preproject survey data would be determined on a segment-by-segment basis, based in part on the environmental setting of the proposed segment location. The following mitigation measures may ensure that wildlife impacts during this stage of the project would be minimized:

- Prior to construction, all construction personnel should be instructed on the protection of wildlife resources, including mitigation measures required by federal, state, and local agencies.

- Existing roads should be used to the maximum extent feasible to access a proposed segment.

- If new access roads are necessary, they should be designed and constructed to the appropriate standard, including the ability to close or restrict access. Access roads should be managed consistent with the landowner's or administrator's travel management strategy.

- Existing or new roads should be maintained to the condition needed for facility use, where appropriate, including revegetation of the roadbed and cut/fill slopes.

- Operators should identify important, sensitive, or unique habitat and biota in the project vicinity and site, and design the project to avoid (if possible), minimize, or mitigate potential impacts to these resources. The design and siting of the facility should follow appropriate guidance and requirements from the BLM, FS, and other resource agencies, as available and applicable.

- Appropriate agencies should be contacted early in the planning process to identify potentially sensitive ecological resources that may be present in the area of the corridor segments. As examples, (1) areas of important wildlife crossings can be identified by actual observations, telemetry data, or evaluation of habitat conditions; and (2) location of core population areas for sage grouse should be obtained from appropriate state agencies. Prior to any clearing or construction in or near these areas, a seasonally appropriate "walkthrough" should be conducted. Attendees at the walkthrough should include representatives of the BLM, FS, USFWS, state natural resource agency, and construction contractor.

- Development within core population areas for sage grouse should only occur if it can be demonstrated that the action would have no negative effects on sage grouse.

- An evaluation of avian use (including the locations of active nest sites, colonies, roosts, and migration corridors) of the project area should be conducted by using scientifically rigorous survey methods.

- The project should be planned to avoid (if possible), minimize, or mitigate impacts to wildlife and habitat. For example, unless appropriate easement agreements are received, crucial winter ranges for elk, deer, pronghorn, and other species should be avoided during their periods of use. Set-aside dates can be coordinated with the state wildlife agencies.

- Discussion should be held among the appropriate federal and state agencies regarding the occurrence of valued wildlife resources (both species and habitats) in the proposed project area.

- Existing information on species and habitats in the project area should be reviewed.

- If survey results indicate the presence of important, sensitive, or unique habitats (such as wetlands and sagebrush habitat) in the project vicinity, facility design should locate roads and support facilities in areas least likely to impact those habitats.

- Habitat disturbance should be minimized by locating facilities (such as utility corridors and access roads) in previously disturbed areas (i.e., locate transmission lines within or adjacent to existing powerline corridors).

- New access roads and utility corridors should be configured to avoid high quality habitats and minimize habitat fragmentation.

- A habitat restoration management plan should be developed that identifies vegetation, soil stabilization, and erosion reduction measures and requires that restoration activities be implemented as soon as possible following facility construction activities.

- Individual project facilities should be located to maintain existing stands of quality habitat and continuity between stands.

- The creation of, or increase in, the amount of edge habitat between natural habitats and disturbed lands should be minimized.

- Raptor nest and roost surveys should be conducted each year prior to construction and should implement mitigation (avoidance, screening, and timing of construction) to prevent the project from disrupting any active nests or roosts in at least 6 of the last 10 years and were found to be unoccupied each time they were monitored), as per federal or state recommended buffer zones and seasonal restrictions. This would include restrictions on the use of explosives and aircraft.

- Construction activities should be sited as far as possible (up to 0.5 mile with buffers ranging up to 1 mile for bald eagles, and sage grouse leks, up to 2 miles). Attempts should also be made to conceal work locations and access roads from the nest using topography. Timing restrictions are also important because not all raptor pairs use the same nest every year within their nesting territory.

- Known nesting or roosting areas that are heavily utilized by migrating birds should be avoided.

- Transmission line support structures and other facility structures should be designed to discourage their use by raptors for perching or nesting, particularly within 2 miles of sage grouse habitat.

- Prior to construction, environmental training should be provided to contractor personnel whose activities or responsibilities could impact the environment during construction. An environmental compliance officer and other inspectors, the contractor's construction field supervisor(s), and all construction personnel would be expected to play an important role in maintaining strict compliance with all permit conditions to protect wildlife and their habitats to the extent practicable during construction.

Mitigation during Construction. Construction of the Section 368 corridor projects could impact wildlife resources. A variety of measures may be implemented to minimize the potential for these impacts (mitigation measures for sage grouse are identified in Text Box 3.8-2):

- Structures should be located to avoid sensitive or crucial habitats. Allow conductors to span the habitats clearly within limits of standard structure design.

- The transmission lines should be designed and constructed in conformance with the *Avian Protection Plan Guidelines* (APLIC and USFWS 2005), in conjunction with *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006), to reduce the operational and avian risks that result from avian interactions with electric utility facilities.

- The size of all disturbed areas should be minimized to the extent practicable to meet project needs.

- Existing large stands of sagebrush and continuity between stands should be maintained, wherever possible.

- Snags and brush piles should be retained or increased and rockpiles should be created within or adjacent to the project area to the extent practicable except where they may compromise key wildlife habitat such as breeding and parturition areas, or where hazardous fuels build up and/or fire suppression access issues are identified.

- To the extent practicable, structures (e.g., buildings, substations, pump houses, and powerlines) should not be located on hilltops and ridgelines.

- Construction activities in riparian areas should be planned to avoid active nesting and brood-rearing of birds, as identified by project biological surveys, particularly within the more arid areas where riparian areas are a crucial habitat for many migratory birds.

- Outside of riparian areas, if construction must be conducted during the bird breeding season, the construction area should first be surveyed for nests. If a migratory bird nest were to be found with eggs or nestlings present, the area should be avoided, to the extent practicable, until the birds have fledged. E.O. 13186 defines the responsibilities of federal agencies to protect migratory birds. The Migratory Bird Treaty Act of 1918 and subsequent amendments (16 USC 703–711) state that it is unlawful to take, kill, or possess migratory birds. A list of these protected birds is in 50 CFR 10.13.

- To the extent practicable, access roads should be located away from the bottom of drainages, which often provide the most important sources of cover and forage for wildlife.

- Where applicable, the extent of habitat disturbance should be reduced by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas.

- Shuttle vans or car pooling should be used where feasible to reduce the amount of traffic on access roads.

- Maximum allowable speeds on access roads should be reduced as much as practicable.

- Temporary or project-created access roads should be closed to unauthorized vehicular use.

- A removal program for wildlife carcasses along access roads should be implemented. Distribution of carcasses to appropriate areas could be considered to supplement food sources for some raptor species, especially during winter.

- Access roads should be the shortest distance practicable. However, where feasible, access roads should not cross crucial water range and other important wildlife habitats.

- ROW development and construction activities should remain subject to locally established wildlife and/or habitat protection provisions. Exceptions or modifications to spatial buffers or timing limitations should be evaluated on a site-specific/species-specific basis in coordination with the local federal administrator and state wildlife agency.

- All construction employees should be instructed to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship, nesting) seasons. In addition, any pets should not be permitted on-site during construction.

- Buffer zones should be established (through agency consultations) around raptor nests and other biota and habitats of concern.

- Noise-reduction devices (e.g., mufflers) should be maintained in good working order on vehicles and construction equipment.

- Explosives should be used only within specified times and at specified distances from sensitive wildlife or surface waters as established by the BLM, FS, or other federal and state agencies.

- As appropriate, the occurrence of flyrock from blasting should be limited by using blasting mats.

- Areas where wildlife could hide or be trapped should be minimized.

- The uncovered pipe that has been placed in the trench should be capped at the end of each workday to prevent animals from entering the pipe.

- As open trenches could impede seasonal big game movements and alter their distribution, they should be backfilled as quickly as is reasonable.

- Wildlife should be removed from open trenches during construction. Earthen ramps should be used in open trenches to allow wildlife an escape mechanism.

- The use of guy wires should be avoided.

- The movement of equipment and materials within the corridor segments should be confined as much as possible to a single road or travel path.

- All refueling should occur in a designated fueling area that includes a temporary berm to limit the spread of any spill.

- Drip pans should be used during refueling to contain accidental releases.

- Drip pans should be used under fuel pump and valve mechanisms of any bulk fueling vehicles parked at the construction site.

- Spills should be immediately addressed per the appropriate spill management plan, and soil cleanup and soil removal initiated, if needed.

- Water required during construction and subsequent site restoration should be obtained from off-site areas so that natural watering sources for wildlife are not depleted or unnecessarily disturbed.

Mitigation during Site Restoration. Most mitigation measures during site restoration should focus on restoring the landscape, vegetation, and wetlands (earlier in this section). These would also mitigate impacts to wildlife from habitat loss, fragmentation, and disturbance. The following measures may also be implemented to minimize potential impacts to wildlife during site restoration:

- To minimize habitat loss and fragmentation, habitat restoration activities should be initiated as soon as possible after construction activities are completed in a given area.

- Access roads should be reclaimed as soon as they are no longer needed. However, seasonal buffer periods (e.g., nest and brood rearing) should be considered, as appropriate.

Mitigation during Operation and Maintenance. The following measures may be implemented to minimize potential impacts to wildlife from operation and maintenance of energy transport systems in Section 368 corridors:

- Areas left in a natural condition during construction (e.g., wildlife crossings) should be maintained in as natural a condition as possible within safety and operational constraints.

- Where transmission lines would cross areas where bird collisions are likely (e.g., river crossings, waterfowl staging areas), consideration should be given to marking the shield wires with devices that have been scientifically tested and found to significantly reduce collision potential.

- Remote telemetry on pipeline facilities can reduce the number of maintenance and inspection trips made during critical time periods for wildlife and result in less wildlife disturbance.

- Drip pans should be used during refueling to contain accidental releases.

- Raptor nests should be allowed to remain in place on transmission line support structures unless there is a chance that they would come into contact with a conductor. If there is a risk of arcing or conductor contact, appropriate guidelines for removing nests should be followed. Removal should take place only if the birds are not actively using the nest, particularly during the nesting and brood-rearing period. Nests should be relocated to nesting platforms, when possible; otherwise, they would be destroyed when removed. An annual report on all nests moved or destroyed should be provided to the appropriate federal and/or state agencies.

- Aircraft flight paths (e.g., for corridor inspections) should respect recommended spatial and seasonal buffer zones. Where intrusions within these zones occur, flights should maintain a minimum elevation of 1,000 feet and speed of 30 mph.

- Pesticide use should be limited to nonpersistent, immobile pesticides and herbicides and should be applied only by licensed applicators in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.

- The typical herbicide application rate should be used rather than the maximum application rate.

- Only herbicides with low toxicity to wildlife and wild horses and burros should be used.

- Herbicides should not be applied during rain.

- Routine vegetation maintenance clearing should not occur between April 15 and August 1, to minimize potential impacts to nesting birds.

- Spills should be addressed immediately per the appropriate spill management plan, and soil cleanup and removal initiated, if needed.

- Optimum height of vegetation to be encouraged (e.g., shrub or grass species) along energy corridors should be determined based, in part, on local wildlife species and their needs. For example, if raptors occur in the area, grasses may be preferred, as such habitat would provide them with better foraging opportunities.

- Observations of potential wildlife problems, including wildlife mortality, should be immediately reported to the BLM and FS authorized officer.

- BLM and FS should maintain an updated database to note important wildlife occurrences and wildlife habitats along the corridor segments.

  These data would be incorporated into the vegetative maintenance plan, along with any restrictions required to protect these species or their habitats.

Mitigation during Decommissioning. The measures to mitigate construction impacts and subsequent restoration are applicable to decommissioning activities. Additionally, the following mitigation measures, some taken from Berger (1995), would be applicable.

All holes and ruts created by removal of structures and ROW travel should be filled or graded.

Entrances to abandoned access roads should be barricaded to prevent vehicle access.

Ongoing visual inspections would be required to ensure adequate restoration and minimal environmental degradation.

While aboveground sections of pipelines and transmission lines are being dismantled, care would need to be taken to avoid piling pipes and poles on the ground in areas known to be regularly used by wildlife for movement.

Treated wood should not be disposed of in areas where it could come in contact with fish and wildlife.

To the extent practicable, component removal and regrading in wildlife habitat concentration areas would be conducted during periods when these areas were not being extensively used by wildlife.

The vegetation cover, composition, and diversity should be restored to values commensurate with the ecological setting.

Mitigation Measures for Threatened, Endangered, and Other Special Status Species. The mitigation measures described earlier in this section would serve to reduce or avoid impacts to threatened, endangered, and other special status species from development of energy transport projects within the proposed energy corridors or No Action ROWs by generally reducing impacts to the ecological systems on which they depend. In addition to these measures, there are a number of mitigation measures that are specifically related to avoiding impacts to threatened, endangered, and other special status species. These species, by virtue of their small population sizes and over-dispersed populations, are generally far more vulnerable to impacts than other species. Thus, mitigation measures recommended for threatened, endangered, and other special status species focus on avoidance of impacts and habitat areas that support these species.

General Measures. A number of general measures can be incorporated into all phases of activities to reduce impacts to threatened, endangered, and other special status species. These include:

- Surveys for plant and animal species that are listed or proposed for listing as threatened or endangered and their habitats should be conducted in areas proposed for development where these species could potentially occur, following accepted protocols and in consultation with the USFWS or NMFS, as appropriate. Particular care should be taken to avoid disturbing listed species during surveys in any designated critical habitat. If any threatened or endangered species are found, the USFWS should be consulted as required by Section 7 of the ESA, and an appropriate course of action should be determined to avoid or minimize impacts.

- Activities and their effects on ESA-listed species should be monitored throughout the duration of the project. To ensure desired results are achieved, minimization measures should be evaluated and, if necessary, Section 7 consultation reinitiated.

- Surveys for special status species (e.g., BLM sensitive, FS sensitive, and state-listed species) and their habitats should be conducted in areas proposed for development and in which these species could potentially occur, following accepted protocols developed in consultation with the appropriate state or federal agencies. If such species are found, an appropriate course of action should be taken to avoid or minimize impacts.

- Disturbances to and within suitable habitat of threatened, endangered, and other special status species should be limited by staying on designated routes.

- New access routes created by the project should be limited.

- Nonpermitted access should be prohibited, and gating should be employed, if necessary.

- Dust abatement practices should be implemented near occupied plant habitat.

- All disturbed areas should be revegetated with native species, especially species indigenous to the area.

- Post-construction and post-decommissioning monitoring for invasive plant species should be required.

- On-site practices should include implementation of a garbage management plan to reduce scavenger predation on ground-nesting birds and reptiles.

- All areas of surface disturbance within riparian areas and/or adjacent uplands should be revegetated with native species.

Recommendations to Protect Threatened, Endangered, and Other Special Status Plant Species. To avoid or minimize impacts to threatened, endangered, and other special status plant species, the following recommendations can be applied:

- Construction and related activities should avoid direct disturbance to populations and to individual plants.

- Construction plans and project design should avoid concentrating water flows or sediments into plant-occupied habitat.

- Construction should occur downslope of plants, where feasible. If construction must be sited upslope, buffers of a minimum of 200 feet between surface disturbances and plants should be established. Stabilizing construction techniques should be used on slopes to ensure downslope plants are not affected.

- Where plant populations occur within 200 feet of construction areas, a buffer or fence should be established around individuals or groups during and after construction.

- Areas to avoid should be visually identifiable in the field, for example, by flagging, using temporary fencing or rebar, etc.

Recommendations to Protect Threatened, Endangered, and Other Special Status Animal Species. The following recommendations can be applied to avoid or minimize impacts to special status animal species:

- Activities should be managed to ensure maintenance or enhancement of riparian and wetland habitat.

- Loss or disturbance of riparian and wetland habitats should be avoided.

- For crossings of rivers and major streams, directional drilling should be used to reduce surface disturbance and eliminate activities in riparian habitat. Such directional drilling must not intercept or degrade alluvial aquifers.

- Guidance provided in BLM (2004g) should be followed when pipelines are constructed across streams or rivers that could contain or support threatened, endangered, or other special status fish species.

- Water depletions from any portion of the Upper Colorado River drainage basin upstream of Lake Powell are considered to jeopardize the four resident endangered fish species (bonytail, humpback chub, Colorado pikeminnow, and razorback sucker), and must be evaluated with regard to the criteria described in the Upper Colorado River Endangered Fish Recovery Program (USFWS 2006c). Because portions of the corridors and potential water sources occur within the Upper Colorado River drainage basin, and because construction and hydrostatic testing of pipelines may require water, consultation regarding depletions should be required.

- To avoid impacts to the four endangered Colorado River fish mentioned above, no in-stream work should occur between July 1 and September 30.
- Construction activities should avoid modification of critical habitat for any species.
- Any pipelines crossing rivers with listed aquatic species should have remotely actuated block or check valves on both sides of the river; pipelines should be double-walled pipe at river crossings; and pipelines should have a spill/leak contingency plan, which includes timely notification of the local USFWS ecological service office.

3.9 VISUAL RESOURCES

3.9.1 What Are the Visual Resources Associated with Energy Corridors in the 11 Western States?

Visual resources refer to all objects (man-made and natural, moving and stationary) and features (e.g., landforms and water bodies) that are visible on a landscape. These resources add to or detract from the scenic quality of the landscape, that is, the visual appeal of the landscape. A visual impact is the creation of an intrusion or perceptible contrast that affects the scenic quality of a landscape. A visual impact can be perceived by an individual or group as either positive or negative, depending on a variety of factors or conditions (e.g., personal experience, time of day, and weather/seasonal conditions).

The 11 western states analyzed in this PEIS encompass a wide variety of landscape types, determined by geology, topography, climate, soil type, hydrology, and land use. Included in this vast region encompassing nearly 1.2 million square miles are spectacular landscapes such as the Grand Canyon, Mt. Rainier, and Glacier and Yellowstone National Parks, as well as relatively flat and visually monotonous landscapes such as the Wyoming Basin and High Plains of eastern Colorado. Although much of the region is sparsely populated, human influences have altered much of the visual landscape, especially with respect to land use and land cover, and, in some places, intensive human activities such as mineral extraction and energy development have seriously degraded visual qualities. Large, fast-growing cities such as Las Vegas and Phoenix also contain heavily altered landscapes, with urban sprawl and associated visual blight spreading into what were recently relatively intact landscapes. Nonetheless, the various scenic attractions of the 11-state area help attract millions of tourists to the region each year and contribute to making tourism a major component of some regional and local economies.

Table 3.9-1 summarizes selected scenic resources, such as national parks, monuments, and recreation areas; national historic sites, parks, and landmarks; national memorials and battlefields; national seashores, national wild and scenic rivers, national historic trails, and national scenic highways; and other national scenic areas occurring within the 11-state region by state. In addition, many other scenic resources exist on federal, state, and other nonfederal lands, including traditional cultural properties important to Tribes.

Because scenic resources in a given area are largely determined by geology, topography, climate, soil type, and vegetation, scenic resources are generally homogenous within an ecoregion, defined as an area that has a general similarity in ecosystems and characterized by the spatial pattern and composition of biotic and abiotic features, including vegetation, wildlife,