Table 3-73 Concluded							
Allotment	**Pasture**	**Allotment Size (acres)**	**Administration**	**Total Stock**	**Kind**	**Acres/AUM**	**AUMs in Pasture**
School Creek/240	Calf	1098.3	Douglas RD	100	Cattle	5	219.7
School Creek/240	Lovin	2378.4	Douglas RD	300/60	Sheep/cattle	4.3	553.1
School Creek/240	Little Thunder	4467.5	Douglas RD	220	Cattle	3.5	1276.4
Ostlund/270	Cottonwood	3002.8	Douglas RD	225	Cattle	4.9	612.8
Ostlund/270	Bull	1593.1	Douglas RD	150	Cattle	6.0	265.5
Ostlund/270	Thomas (NW)	1528.1	Douglas RD	Private	Private	4.9/6.0	280.4
Stringer/273	North Highway	244.9	Douglas RD	25	Cattle	6.8	36.0
Stringer/273	Stringer	829.7	Douglas RD	25	Cattle	4.5	184.4
Teckla/298	West Beckwith Exclosure	2.9	Douglas RD	0	Cattle	0	0
Teckla/298	North	1855.8	Douglas RD	192	Cattle	11.9	155.9
Teckla/298	South	1899.0	Douglas RD	192	Cattle	11.9	159.6
School Creek/240	Mine	994.1	Douglas RD				
School Creek/240	South Basin	2467.9	Douglas RD				
School Creek/240	South Pasture	575.8	Douglas RD				
Fern Porter - 04281		80.0 (1)	BLM Newcastle		Cattle	6.7	12 (1)
True Ranches - 04337		80.0 (1)	BLM Newcastle		Cattle	3.2	25 (1)
Barton Land & Livestock Co - 14016		160.0 (1)	BLM Newcastle		Cattle	4	40 (1)
Steven Mirich - 04205		320.0 (1)	BLM Newcastle		Cattle	4	80 (1)
West Timber Creek 12091		120 (1)	BLM Buffalo		Cattle	8.6	14 (1)
Dale Osborn/ 7410		40.0 (1)	BLM Buffalo	27	Cattle	6.7	6 (1)

1 = Allotment acres and AUMs only include the BLM acres and AUMs from the BLM parcels affected within the allotment and does not consider private lands.

In November, 1998 field investigations were conducted to verify USFWS NWI Maps (1:24,000 scale) along Alternatives B and C. Approximately 5 percent of the wetlands in each type (i.e., wet meadow, aquatic bed, palustrine scrub shrub, etc.) were sampled in the field to determine how well the NWI correlated with field delineations. According to Intermountain Ecosystems (Kass, 1999), the NWI Maps proved to be accurate about 80 percent of the time in depicting the classification and extent of jurisdictional wetlands.

Tables 3-74 through 3-78 provide the miles of wetlands by type (as identified on the NWI Maps) that would be crossed by the alternatives. A general description of each of the NWI wetland types that could be affected follows.

Wet Meadow. This type accounts for the majority of the wetlands which would be crossed by the alternatives. This wetland type includes Cowardian *et al.* (1979) classifications of palustrine emergent both temporarily and seasonally flooded. Typical plant species found in this type include Baltic rush, Nebraska sedge, spikerush, prairie cordgrass, switch grass, rumex, cattails, saltgrass and bulrush.

The Black Thunder South Mine Loop Option would cross 0.3 miles of wet meadow wetland type in Wyoming. The North Antelope East Mine Loop would cross 0.06 miles of wet meadow also in Wyoming. The Black Thunder South and the North Antelope West mine loops would not cross wetlands.

Aquatic Bed. This type is the second most common type which would be crossed by the alternatives. Aquatic bed is the most frequent wetland type which would be crossed in Wyoming by Alternatives B and C. Aquatic bed wetlands are areas which support standing water less than 6 feet deep nearly all year long. Aquatic bed wetlands are typically associated with stock ponds and impoundments of intermittent streams, especially in Wyoming. This type can be found in oxbows of old river channels along the Cheyenne River and the larger perennial streams which would be crossed by the alternatives. Typical plant species found in this type include cattails, rushes and sedges.

Stock Ponds. This type represents the Cowardian *et al.* (1979) classifications of palustrine unconsolidated bottom and palustrine unconsolidated shore, both temporarily and seasonally flooded. Stock ponds are man-made excavations and small dams constructed along intermittent stream channels. They are important water sources for both wildlife and livestock. Depending on the amount of water held by the stock pond, the perimeter of the pond may support wet meadow plant species. Foxtail barley and rumex are typical plant species in this type. Many of the stock ponds have also been mapped in the wet meadow and aquatic bed types.

Riparian Scrub/Shrub. This wetland type represents the Cowardian *et al.* (1979) classification of palustrine scrub/shrub, broad-leaved deciduous. This type is primarily associated with the Cheyenne River and the larger perennial streams which would be crossed by the alternatives. Typical plant species found in this type include peachleaf willow and other willows, silver sagebrush, wild rose and plains cottonwood.

Riparian Forest. This wetland type represents the Cowardian *et al.* (1979) classification of palustrine forested, broad-leaved deciduous. This type is also primarily associated with the Cheyenne River and the larger perennial streams. Typical plant species found in this type include plains cottonwood, peachleaf willow, silver sagebrush and wild rose. This riparian forested type is important habitat for beavers and migrating species including bald eagles and other raptors.

Riverine. This wetland type primarily represents the Cowardian *et al.* (1979) classification of riverine lower perennial with unconsolidated bottoms and shores that are temporarily or seasonally flooded. These types are located on perennial and intermittent drainage channels that show signs of consistent channel forming processes (*i.e.*, are at bed and grade crossing) and may be free of vegetation.

3.17 Threatened and Endangered Species and Special Status Species

3.17.1 Impact Analysis Area. Generally, these species are described based on their occurrence in the counties which would be crossed by the alternatives.

3.17.2 Affected Environment. The USFWS (1998a, 1998b and 1999a) identified 10 Federally-listed threatened or endangered wildlife and plant species that could potentially occur in the project area. These are the black-footed ferret (*Mustela nigripes*, endangered), peregrine falcon (*Falco peregrinus*, endangered), whooping crane (*Grus americana*, endangered), interior least tern (*Sterna antillarum*, endangered), pallid sturgeon (*Scaphirhynchus albus*, endangered), Topeka shiner (*Notropis topeka*, endangered), American burying beetle (*Nicrophorus americanus,* endangered), piping plover (*Charadrius melodus*, threatened), bald eagle (*Haliaeetus leucocephalus*, threatened) and Ute ladies'-tresses (*Spiranthes diluvialis*, threatened). Since those communications, however, USFWS has proposed to remove the bald eagle from the endangered species list.[10] And, USFWS determined that the American peregrine falcon is no longer endangered or threatened and removed

[10] See Federal Register: July 6, 1999, 64(128):36453-36464.

Table 3-74 NWI Wetland Types Which Would be Crossed by Alternative B								
Wetland Type	Cowardian Classification	Miles Crossed by Land Ownership					Total	Percent
		Forest Service	DOE	BLM	State	Private		
South Dakota								
Wet Meadow	Palustrine Emergent temporarily and Seasonal Flooded	0.00	0.00	0.00	0.00	0.78	0.78	46.4
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.00	0.00	0.00	0.00	0.26	0.26	15.5
Stock Ponds	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent	0.00	0.00	0.00	0.00	0.17	0.17	10.1
Riparian Scrub/ Shrub	Palustrine Scrub Shrub	0.00	0.00	0.00	0.00	0.05	0.05	3.0
Riparian Forest	Palustrine Forested	0.00	0.00	0.00	0.00	0.03	0.03	1.8
Riverine	Riverine Lower Perennial Unconsolidated Bottom & Unconsolidated Shore	0.23	0.00	0.00	0.00	0.16	0.39	23.2
Total		0.23	0.00	0.00	0.00	1.45	1.68	100.0
Wyoming								
Wet Meadow	Palustrine Emergent Temporarily and Seasonal Flooded	0.00		0.00	0.00	0.14	0.14	21.9
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.02		0.00	0.00	0.12	0.14	21.9
Stock Ponds	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent,	0.03		0.00	0.00	<0.01	0.03	4.7
Riparian Forest	Palustrine Forested	<0.1		0.00	0.00	0.09	0.09	14.1
Riverine	Riverine Lower Perennial Unconsolidated Bottom & Unconsolidated Shore	0.00		0.00	0.00	0.24	0.24	37.4
Total		0.05		0.00	0.00	0.59	0.64	100.0

removed the species from the Federal List of Endangered and Threatened Wildlife on August 25, 1999.[11]

In addition to these species, mountain plovers (*Charadrius montanus*) have been proposed for listing as a threatened species.[12] Three other species are candidates for listing as threatened or endangered: swift fox (*Vulpes velox*), sturgeon chub (*Macrhybopsis gelida*), and sicklefin chub (*Macrhybopsis meeki*). Swift fox and sturgeon chub occur within the project area in South Dakota and swift fox are found in the project area in Wyoming. Sicklefin chub did occur in the Missouri River downstream from the alternatives. USFWS was petitioned to list both sturgeon chub and sicklefin chub as endangered and determined that listing may be warranted.[13] Draft documents for the species' listing are in preparation but both are currently candidate species. Finally, the USFWS was petitioned to list the black-tailed prairie dog (*Cynomys ludovicianus*) as threatened under the Endangered Species Act.[14] The USFWS determined listing as threatened was warranted but precluded at this time. Currently, the black-tailed prairie dog is a candidate species.[15]

Listed Species

Black-footed Ferret. The black-footed ferrets' original distribution in North America closely corresponded to distributions of prairie dogs (Hall and Kelson, 1959 and Fagerstone, 1987) and until 1985, a free-living population inhabited white-tailed prairie dog colonies located west of Meeteetse, Wyoming. This population was reduced by canine distemper in 1985 (Clark, 1985) and surviving ferrets were captured for captive breeding and eventual reintroduction to the wild. Black-footed ferrets depend on prairie dogs for food and prairie dog burrows for shelter (Hillman and Clark, 1980 and Fagerstone, 1987). They are mostly nocturnal and spend much of their time underground so their presence

[11] See Federal Register: August 25, 1999, 64(164):46541-46588.

[12] See Federal Register: February 16, 1999, 64(30):7587-7601

[13] See Federal Register. January 18, 1995, 60(11):3613-3615.

[14] See Federal Register: March 25, 1999, 64(57):14424-14428

[15] See Federal Register: February 4, 2000, 65(24):5476-5488

Table 3-75 NWI Wetland Types Which Would be Crossed by Alternative C							
Wetland Type	Cowardian Classification	Miles Crossed by Land Ownership				Total	Percent
		Forest Service	BLM	State	Private		
South Dakota							
Wet Meadow	Palustrine Emergent Temporarily and Seasonal Flooded	0.00	0.00	0.00	0.70	0.70	53.8
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.00	0.00	0.00	0.27	0.27	20.8
Stock Ponds	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent,	0.00	0.00	0.00	0.07	0.07	5.4
Riparian Scrub/ Shrub	Palustrine Scrub Shrub	0.00	0.00	0.00	0.05	0.05	3.8
Riparian Forest	Palustrine Forested	0.00	0.00	0.00	0.07	0.07	5.4
Riverine	Riverine Lower Perennial Unconsolidated Bottom & Unconsolidated Shore	0.00	0.00	0.00	0.14	0.14	10.8
Total		0.00	0.00	0.00	1.30	1.30	100.0
Wyoming							
Wet Meadow	Palustrine Emergent Temporarily and Seasonal Flooded	0.04	0.0	0.01	0.11	0.16	57.1
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.05	0.0	0.02	0.05	0.12	42.9
Stock Ponds	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent,	0.0	0.0	0.0	<0.01	0.00	0.0
Total		0.09	0.0	0.03	0.16	0.28	100.0

Table 3-76 NWI Wetland Types Which Would be Crossed by Alternative C With the Phiney Flat Route Variation							
Wetland Type	Cowardian Classification	Miles Crossed by Land Ownership				Total	Percent
		Forest Service	BLM	State	Private		
South Dakota							
Wet Meadow	Palustrine Emergent Temporarily and Seasonal Flooded	0.00	0.00	0.00	0.70	0.70	53.8
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.00	0.00	0.00	0.27	0.27	20.8
Stock Ponds	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent	0.00	0.00	0.00	0.07	0.07	5.4
Riparian Scrub/ Shrub	Palustrine Scrub Shrub	0.00	0.00	0.00	0.05	0.05	3.8
Riparian Forest	Palustrine Forested	0.00	0.00	0.00	0.07	0.07	5.4
Riverine	Riverine Lower Perennial Unconsolidated Bottom & Unconsolidated Shore	0.00	0.00	0.00	0.14	0.14	10.8
Total		0.00	0.00	0.00	1.30	1.30	100.0
Wyoming							
Wet Meadow	Palustrine Emergent Temporarily and Seasonal Flooded	0.04	0.0	0.01	0.11	0.16	57.1
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.05	0.0	0.02	0.05	0.12	42.9
Stock Ponds/ Reservoirs	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent, Palustrine Open Water	0.0	0.0	0.0	<0.01	0.00	0.0
Total		0.09	0.0	0.03	0.16	0.28	100.0

Table 3-77 NWI Wetland Types Which Would be Crossed by Alternative C With the W G Flat Route Variation							
Wetland Type	Cowardian Classification	Miles Crossed by Land Ownership				Total	Percent
		Forest Service	BLM	State	Private		
South Dakota							
Wet Meadow	Palustrine Emergent Temporarily and Seasonal Flooded	0.00	0.00	0.00	0.57	0.57	57.0
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.00	0.00	0.00	0.16	0.16	16.0
Stock Ponds	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent,	0.00	0.00	0.00	0.00	0.00	0.0
Riparian Scrub/ Shrub	Palustrine Scrub Shrub	0.00	0.00	0.00	0.05	0.05	5.0
Riparian Forest	Palustrine Forested	0.00	0.00	0.00	0.07	0.07	7.0
Riverine	Riverine Lower Perennial Unconsolidated Bottom & Unconsolidated Shore	0.00	0.02	0.00	0.13	0.15	15.0
Total		0.00	0.02	0.00	0.98	1.00	100.0
Wyoming							
Wet Meadow	Palustrine Emergent Temporarily and Seasonal Flooded	0.04	0.0	0.01	0.11	0.16	57.1
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.05	0.0	0.02	0.05	0.12	42.9
Stock Ponds/ Reservoirs	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent, Palustrine Open Water	0.0	0.0	0.0	<0.01	0.00	0.0
Total		0.09	0.0	0.03	0.16	0.28	100.0

Table 3-78 NWI Wetland Types Which Would be Crossed by Alternative D							
Wetland Type	Cowardian Classification	Miles Crossed by Land Ownership				Total	Percent
		Forest Service	BLM	State	Private		
South Dakota							
Wet Meadow	Palustrine Emergent Temporarily and Seasonal Flooded	0.00	0.00	0.00	0.29	0.29	58.0
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.00	0.00	0.00	0.06	0.06	12.0
Stock Ponds	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent	0.00	0.00	0.00	0.00	0.00	0.0
Riparian Scrub/ Shrub	Palustrine Scrub Shrub	0.00	0.00	0.00	0.03	0.03	6.0
Riparian Forest	Palustrine Forested	0.00	0.00	0.00	0.00	0.00	0.0
Riverine	Riverine Lower Perennial Unconsolidated Bottom & Unconsolidated Shore	0.00	0.00	0.00	0.12	0.12	24.0
Total		0.00	0.00	0.00	0.50	0.50	100.0
Wyoming							
Wet Meadow	Palustrine Emergent Temporarily and Seasonal Flooded	0.10	0.0	0.01	0.70	0.80	61.1
Aquatic Bed	Palustrine Aquatic Bed Semipermanently Flooded	0.05	0.0	0.00	0.35	0.40	30.5
Stock Ponds/ Reservoirs	Palustrine Unconsolidated Bottom and Shore Palustrine Emergent, Palustrine Open Water	0.01	0.0	0.00	0.10	0.11	8.4
Total		0.16	0.0	0.01	1.15	1.31	100.0

in an area is difficult to confirm. Black-footed ferrets breed from mid-March through early April (Clark and Stromberg, 1987) and young are born in prairie dog burrows. Young ferrets venture above ground during July but remain near the nest burrow (Fagerstone, 1987).

Black-tailed prairie dog colonies occur throughout the project area in Wyoming and South Dakota. Some have been mapped by the Forest Service and dated mapping is available from the WGFD. Maps of colonies on private lands have been provided by county weed and pest control district agents in Wyoming and South Dakota. And, black-tailed prairie dog colonies were mapped along Alternative C from black-and-white aerial photographs (1:2,400) extending to approximately 1,000 feet on each side of the alternative's centerline. The North Antelope West Mine Loop would pass through prairie dog colonies for 0.6 miles. The current activity status of each prairie dog colony is unknown: some colonies have become inactive due to sylvatic plague epizootics (in Wyoming only) and others have been poisoned by county weed and pest control agents and/or private land owners. For most of the colonies that have been mapped there are no additional data about the areal extent or geographic proximity of other colonies that would form a local colony complex.

According to available information compiled by Clark (1978 and 1980), the WGFD (Kinter and Martin, 1992), USFWS (Jobman and Anderson, 1991), Wyoming Natural Diversity Database (WNDDB, 1999), and South Dakota Natural Heritage Database (SDNHDB, 1999), the following sightings or physical evidence exists for black-footed ferrets within counties in Wyoming and South Dakota which would be crossed by the alternatives: 16 in Campbell; 14 in Converse; 4 in Crook; 6 in Niobrara; 6 in Weston; 3 in Custer; 2 in Fall River; 5 in Pennington; and 3 in Shannon (adjacent but not crossed). Some of these sightings were rated by the various sources as "confirmed", "positive", or "probable" but most are farther than 20 miles from the alternatives. Those closer than 20 miles are listed in Table 3-79. Only 3 of these, records of 2 skulls and 1 skin, are unquestionably physical evidence.

Experimental populations of black-footed ferrets have been reintroduced to Federally-managed lands in South Dakota from 1994 through 1999. Those areas (the Conata Basin/Badlands reintroduction site) are within portions of BGNG and Badlands National Park. All black-tailed prairie dog colonies within the reintroduction area were mapped and indicate lower densities on the periphery of core reintroduction areas (USFWS, unpublished information). Densities of black-tailed prairie dog colonies are low on portions of BGNG that would be closest to the alternatives.

The Black-footed Ferret Recovery Implementation Team has identified TBNG as a high-priority reintroduction site for black-footed ferrets. The Forest Service has worked with The Nature Conservancy to block up NFS ownership in the Rosecrans Area, south of the alternatives. These blocked up NFS lands will form the core of the TBNG's ferret reintroduction site. If the site is successful, ferrets may expand to prairie dog towns which would be crossed by the alternatives.

Whooping Crane. Until several years ago, whooping cranes occurred in western Wyoming (Ritter, 1990). These birds were from the experimental flock from the Grays Lake National Wildlife Refuge in Idaho, which was initiated in 1975 as an experiment to cross-foster whooping crane eggs in nests of sandhill cranes (USFWS, 1986). The cross-fostering program was discontinued in 1989 and there were only 2 birds from the Grays Lake flock known to be alive in 1999. The USFWS designated the Rocky Mountain population of whooping cranes as experimental and nonessential in 1997.[16] As a nonessential experimental population, the potential presence of whooping cranes from the Greys Lake population do not require formal consultation with USFWS but Federal programs are required to conserve the species nevertheless. Habitats utilized by whooping cranes in Wyoming included marshes, wet meadows, and grain fields near water (Dorn and Dorn, 1990). Similar habitats are utilized in South Dakota during cranes' migrations (Ashton and Dowd, 1991).

The only reproducing wild population of whooping cranes is the Aransas/Wood Buffalo flock that nests in northern Canada and migrates to the Gulf of Mexico (Binkley and Miller, 1988). Their migration pathway appears to pass through central (Hughes, Stanley, Sully counties; USFWS, 1989) and western (Pennington County; USFWS, 1989) South Dakota, but were mainly in the Missouri River drainage (Ashton and Dowd, 1991).

From 1957 through 1990, 5 confirmed sightings of whooping cranes were made in Pennington County, 7 sightings were from Jackson County, 2 from Haakon County, 20 from Stanley and 14 from Hughes counties (USFWS, unpublished data). During the spring migration in 1988, a small group (4 adults and 1 young) of whooping cranes was observed feeding in a grain field north of Rapid Creek approximately 3 miles from Alternative D in Pennington County. Possibly the same group was observed a week later approximately 11 miles southeast of Wall in eastern Pennington County (SDNHDB, 1999). The following year, 1989, a single whooping crane was seen flying 3 miles east of Ellsworth Air Force Base in Pennington County during fall migration (USFWS, 1989).

Interior Least Tern. This species occurs in South Dakota where successful nesting has been documented on the Missouri and Cheyenne rivers (Dirks *et al.*, 1993a).

[16] See Federal Register July 21, 1997, 62(139): 38932-38939.

Table 3-79
Reports of Black-footed Ferrets (Listed as Possible, Probable, or Confirmed) Within an Approximate 20-mile Distance of the Alternatives

County, State	Year Observed	Location Description or Twp	Rng	Sec	Distance from Alternative	Observation Rating
Campbell, WY	1972	41N	69W	26	1 mile from Alternative C	Possible/Probable (1)
	1974	43N	73W	05	16 miles from Alternatives B, C	Confirmed (2)
	1976	43N	70W	30	1.5 miles from Alternatives B, C	Possible/Probable (1)
	1976	43N	73W	24	13 miles from Alternatives B, C	Possible/Probable (1)
	1981	43N	72W	02	6.5 miles from Alternatives B, C	Probable (1)
	1981	43N	72W	11	9 miles from Alternatives B, C	Confirmed (2)
	1986	43N	70W	30	1 mile from Alternatives B, C	Possible/Probable (1)
	1987	45N	71W	23	5.5 miles from Alternative C	Possible/Probable (1)
Converse, WY	1972	41N	69W	21	<1 mile from Alternative B	Possible/Probable (1)
	1979	41N	70W	32	<1 mile from Alternatives B, C	Positive, Skull (1, 3)
	1983	39N	71W	SE¼	10 miles from Alternatives B, C	Possible/Probable (1)
Crook, WY	1930	Four Horse Ck, south of Moorcroft			6-15 miles from Alternative D	Positive (3)
	1971	Middle-Osage Comm. Pasture			> 10 miles from Alternative D	Positive (3)
	1973	3 miles east Crook Co. line, 8 mile north I-90			8 miles from Alternative D	Probable (3)
	1977	Hwy 14 near Keyhole Res.			8 miles from Alternative D	Not Rated (1)
Niobrara, WY	1976	36 mi N. Lusk, Hwy 85			12 miles from Alternatives B, C	Confirmed (2)
Weston, WY	1895	Newcastle			0-5 miles from Alternative D	Positive, Skin (3)
	1910	Newcastle			0-5 miles from Alternative D	Positive, Skull (3)
	1930	18 mi. southwest of Upton on Deep Water Ck			18 miles from Alternative D	Positive (3)
	1920-1935	46N	65W	22/23	8 miles from Alternative D	Not Rated (1)
	1972	45N	62W	SE¼	0-3 miles from Alternative D	Not Rated (1)
	1972	5 mi. south of Hwy 16 on South Dakota border			2 miles from Alternative D	Positive (3)
Custer, SD	1984	6S	9E	17-20	1 mile from Alternatives B, C	Probable (2)
	1988	55N	5E	26	13 miles from Alternative C	Probable (2)
Fall River, SD	1980	near Edgemont			<2 miles from Alternative B	Probable (2)
	1983	9S	3E	07	<1 mile from Alternative B	Confirmed (2)
Pennington, SD	1921	3S	12E	17	1 mile from Alternatives B, C	Not Rated (4)
	1927	2S	9E	08	11 miles from Alternative C 6 miles from Alternative D	Not Rated (4)

Notes on Observational Ratings:
1 = Ratings of Possible/Probable not differentiated by Kinter and Martin, 1992.
2 = Ratings of Confirmed or Probable provided by USFWS 1981 and update (Jobman and Anderson, 1991).
3 = Ratings of Positive or Probable from Clark, 1980
4 = Information with no observation ratings from South Dakota Natural Heritage Database, 1999

Interior least terns nest in colonies on sand islands and sandbars in rivers; a key factor for nest site selection is continuous exposure of the site above water for at least 100 days during the nesting period from mid-May to the end of August (Smith and Renkin, 1991). Terns excavate shallow scrapes in sand, soil or gravel (Carreker, 1985) but may select specific sites if there is an object present, such as a rock or driftwood (Dirks *et al.*, 1993b). Apparently suitable nesting habitat has been created at pits dug for sand and gravel mining operations adjacent to the Platte River, in Nebraska (Sidle and Kirsch, 1993). Once natural vegetation regrowth or reclamation occurs on abandoned pits, their suitability for nesting by least terns diminishes (Sidle and Kirsch, 1993).

Because nests are on the ground near water level, with very little (less than 10 percent) vegetation, less than 4 inches tall (Dirks *et al.*, 1993b), they are vulnerable to flooding following natural precipitation pulses but also during hydroelectric dam operational water releases. Nests are also susceptible to avian and mammal predators and human disturbance (Rimmer and Deblinger, 1992; Mayer, 1993; Kruse *et al.,* 1993; Schwalbach *et al.*, 1993; Smith and Renken, 1993). Least terns also nest on alkaline flats where they are exposed to similar impacts (flooding, predators, human disturbance) as nests on river sand and gravel bars (Koenen *et al.*, 1996). Initiation of nesting in South Dakota may be dependent on water levels, occurring earlier during years with low water levels in May; nesting begins in late May and chicks fledge by mid-July (Schwalbach *et al.,* 1993).

In addition to the presence of suitable nesting substrate, nesting sites are selected for presence of food fish such as shiners, suckers, killifish, gizzard shad and sunfish (Erwin, 1983; Carreker, 1985). Nesting success depends, in part, on proximity to food sources (Schweitzer and Leslie, 1996). Suitable nesting sites and foraging areas apparently occur along the Cheyenne River near the confluence with the Missouri River at Lake Oahe (Dirks *et al.* 1993a), upstream from Pierre. Two records of least terns on the Missouri River in the vicinity of Pierre, Hughes County and Fort Pierre, Stanley County were provided by SDNHDB (1998) but there were no records from that source in the vicinity of the alternatives. Biologists with BGNG conducted a search for interior least terns along 20 miles of the Cheyenne River in Custer and Pennington counties in 1994 but no evidence was found (Hetlet, 1994). However, least terns were observed nesting on an island in the Cheyenne River in 1986, approximately midway between the confluence with Rapid Creek and Wasta (Melius, 1999) where proposed routes for Alternative B and Alternative C closely parallel the river. From 1988 through 1997, least terns have nested along the Cheyenne River in Pennington County several miles downstream from where the river is crossed by Alternative D (SDNHDB, 1999). There are sand and gravel bars in the Cheyenne River where it parallels Alternatives B and C upstream from the Alternative D crossing but most are small and some partially covered with vegetation and may not be suitable for nesting (Hetlet, 1994).

A survey for interior least terns and piping plovers was conducted along approximately 28 miles of the Cheyenne River between Spring Creek and Wasta. None of either species were seen. During the survey, USGS water flow data on the river at Wasta (see Table 3-80) indicated flows of 2,300 cubic feet per second (cfs). Many of the sand and gravel bars in the survey area had been under water several days prior to the survey, probably on June 22 when flows reached 3,500 cfs. Comparisons of flows on the June 26 survey date with flows recorded at the Wasta USGS gauging station and other stations downstream on the Cheyenne River indicate much lower water flows on dates when least terns had been observed nesting in the past (Table 3-80). Thus, it is not surprising that least terns were not seen during the June 26, 1999 survey: water levels had been too high for nesting to be initiated or sustained successfully.

Least terns require approximately 54 to 61 days with continuous exposure of a nesting island or sand bar to be above water. That time duration for successful nesting is based on 14 to 21 days between courtship and egg laying, 20 days of egg incubation, and 20 days of chick development through to fledging (data from Erwin, 1983). Calculations based on river flow data collected at Wasta indicate there have been 12 years between 1985 and 1998 when sand bars or islands in the Cheyenne River would have been exposed above water during the nesting season. During those years, no river flows exceeded 2,500 cfs for at least 54 consecutive days between May 20 and July 31. Consequently, interior least terns may nest on the Cheyenne River within the project area during some time in the future.

Pallid Sturgeon. Records of pallid sturgeon were provided by SDNHDB (1998); all were from the Missouri River in the vicinity of Pierre, Hughes and Stanley counties (Lake Sharpe) between 1967 and 1989. The sturgeon is native to the Missouri and Mississippi rivers and persists in Lake Sharpe, South Dakota (Dryer and Sandvol, 1993). Its occurrence upstream from Oahe Dam in Lake Oahe and tributaries has also been reported during the 1960s. Most collections in reservoirs on the Missouri River are from the upstream ends (below dams) indicating sturgeons' preference for swifter moving water (Kallemeyn, 1983). Since pallid sturgeons prefer main channels of large, turbid rivers where they feed on fish and aquatic insects along the bottom (Kallemeyn, 1983), suitable habitat does not exist in the vicinity of the alternatives paralleling the Cheyenne River. No evidence from any surveys exists for their occurrence in the Cheyenne River (Hampton, 1998; USFWS, 1993a).

Table 3-80 River Flow Data at 3 USGS Gauging Stations on the Cheyenne River, South Dakota in Vicinities Where Interior Least Terns Were Observed Actually Nesting Compared to River Flows Recorded Before, During and After a Survey for Nesting Interior Least Terns and Piping Plovers Conducted on June 26, 1999			
Interior Least Tern Observed Nesting Date	River Flows (Cubic Feet per Second) at Gauging Stations (With USGS Station Numbers) on the Cheyenne River, South Dakota		
	06423500 - Downstream from Wasta, Pennington County	06438500 - Near Plainview, Ziebach County	06439300 - Near Cherry Creek, Ziebach County
June 7, 1986 (1)	150	no data	486
June 1986 (2)	1338 (June 1986 average)	no data	2,022 (June 1986 average)
August 4, 1987 (1)	77	no data	339
June 26, 1988 (3)	82	no data	204
June 30, 1995 (3)	1,120	2,500 (estimated value)	no data
June 26, 1997 (3)	876	no data	no data
June 27, 1997 (3)	841	no data	no data
This Survey, Before and After:			
June 22, 1999	3,500 (350 = median for date)	7,500 (925 = median for date)	no data
June 26, 1999	2,300 (250 = median for date)	4,250 (700 = median for date)	no data
June 28, 1999	1,880 (300 = median for date)	3,780 (675 = median for date)	no data

1 = data from South Dakota Ornithologists' Union, 1991, nesting on lower Cheyenne River near mainstem of Missouri River.
2 = observation reported by Michael Melius, Hermosa, SD nesting on Cheyenne River island between Rapid Creek and Wasta, Pennington County.
3 = data from SDNHDB, 1999, nesting on Cheyenne River in northern Pennington County near Haakon County.

Topeka Shiner. The Topeka shiner was recently listed as endangered.[17] The species' distribution appears restricted to the Missouri, Mississippi, and Arkansas river drainages including southeastern South Dakota and southern Minnesota (Lee *et al.*, 1980). It inhabits small, clear streams that drain upland prairies where it is found in quiet, open pools with mostly gravel bottoms (Minckley and Cross, 1959 and Lee *et al,* 1980). Inhabited streams often become intermittent during summer and survival during periods without flowing water depends on pools fed by springs or percolation through gravel bottoms (Minckley and Cross, 1959). Recent collections of Topeka shiners in Nebraska were in a low gradient stream, surrounded by grasslands used for livestock grazing, with pool bottoms layered with detritus (Michl and Peters, 1993)

Recent collections of Topeka shiners have been made in the Big Sioux River watershed in Brookings and Beadle counties of eastern South Dakota (USFWS, 1999a and 1998a). The shiner has been found in 5 streams crossed by the existing railroad in Brookings County and 3 streams crossed in Beadle County. Also in South Dakota, there is one report of the species collected in the late 1960s from the Cheyenne River embayment at Lake Oahe (USFWS, 1999a).

No Topeka shiners were sampled near any of the alternatives in South Dakota from the Cheyenne River (Hampton, 1998; USFWS, 1994; USFWS, 1993a), Cottonwood Creek (tributary to the Cheyenne River in Fall River County - Simpson and Chapman, 1993), Horsehead Creek (tributary to the Cheyenne River in Fall River County - Cunningham *et al*, 1995), Battle Creek (tributary to the Cheyenne River in Custer County - Cunningham *et al*, 1995), Spring Creek and Rapid Creek (tributaries to the Cheyenne River in Pennington County - USFWS, 1994; Cunningham *et al*, 1995) or the Bad River (tributary to the Missouri River, originating near Interstate-90, Jackson County - USFWS, 1993a).

American Burying Beetle. This largest species of carrion beetle was found throughout eastern North America but elimination of climax forests, with deep litter, humus and soils has been theorized as factors responsible for the species' decline (Anderson, 1982). The beetle feeds on carrion as an adult and larva; adults lay eggs adjacent to carcasses they bury and provide parental care to the young (Creighton *et al.*, 1993). Carcasses used for breeding are small vertebrates but

[17] See Federal Register, December 15, 1998, 63(240):69008-69021.

those selected by American burying beetles tend to be larger bird and mammal carcasses than carcasses selected by other, smaller carrion beetle species (Lomolino and Creighton, 1996 and Holloway and Schnell, 1997).

Oak-hickory forests in western Arkansas and eastern Oklahoma are inhabited by American burying beetles and, in some respects, have characteristics of other inhabited sites: there was little undergrowth (Creighton *et al*, 1993), the roots of which inhibit beetles from burying carcasses (Anderson, 1982). Grasslands are seldom used as breeding habitats because litter is nearly absent and grassland soils are often compacted, making carcass burial difficult (Lomolino and Creighton, 1996). American burying beetles have also been found in the Sandills of northcentral Nebraska where there are sufficient carrion, even though sandy soils may make carcass burial difficult (Ratcliffe and Jameson, 1992). And, one specimen was collected in 1994 near Jamison, Rock County, Nebraska just south of the South Dakota border (Backlund and Marrone, 1997).

The American burying beetle was collected in 1945 at several locations in Union and Brookings counties, eastern South Dakota (Backlund and Marrone, 1997); one of the sites near Brookings was within 1 mile of the existing railroad (SDNHDB, 1998). There is also an historic record but with no date of specimens collected near Nowlin, Haakon County (Backlund and Marrone, 1997; Lomolino *et al*, 1995). That collection site is the most western extension of the beetle in South Dakota and was apparently within the immediate vicinity of the existing DM&E railroad in the Bad River floodplain. Since 1990, efforts to relocate the beetle in those areas have been unsuccessful. Although there have been no recent collections made in the project area and vicinity, numerous specimens were collected in 1995 in the southern South Dakota, Tripp and Gregory counties, north of the 1994 record from Rock County, Nebraska. There, American burying beetles were captured in riparian areas, grasslands, and grasslands with interspersed stands of cottonwoods (Backlund and Marrone, 1997). Further, beetles were found on hilltops and in valleys. Consequently, any habitat in South Dakota with significant humus and/or topsoil suitable for burying carrion is considered potential beetle habitat (USFWS, 1998a).

Although the alternatives are farther west than the known range of the species (recent searches in Badlands National Park and Wind Cave National Park were unsuccessful - Backlund, 1999), each alternative would affect herbaceous rangeland, forested (cottonwood) wetlands, croplands and pastures in varying amounts. Soils in the project area that could potentially be used by American burying beetles include dry soils with sand and/or loamy sand textures that are subject to wind erosion and prime farmland soils with relatively deep topsoil except where those soils are irrigated and/or cultivated. Specific locations of where these soil types occur can be determined for each alternative but coincidental information on potential carrion availability is totally lacking.

Piping Plover. Nesting habitats used by piping plovers appear identical to those described above for interior least terns. Likewise, nests of piping plovers are subject to similar threats including inundation, predation and human disturbance (Mayer, 1993; Schwalbach *et al*, 1993; Kruse *et al.*, 1993). Piping plovers do appear to select nest sites closer to objects and/or taller vegetation than least terns (Dirks *et al.*, 1993b). Unlike piscivorous least terns, piping plovers' eat invertebrates including worms, insects, crustaceans and mollusks (Dinsmore, 1983). Their nesting chronology is similar to least terns with nest initiation in late May through early June and chicks fledge by mid-July (Schwalbach *et al.*, 1993)

Piping plovers have been recorded near Pierre on islands or sandbars in the Missouri River (SDNHDB, 1998) and their distribution on the Cheyenne River does not appear to extend upstream from the confluence with the Belle Fourche River in Meade County, South Dakota (South Dakota Ornithologists' Union, 1991). Searches for piping plovers along the Cheyenne River and Lake Oahe revealed their presence, but none were found nesting on sandbars in the Cheyenne River during 1986 and 1987 (Dirks *et al.*, 1993a).

Searches were conducted for least terns and piping plovers along 20 miles of the Cheyenne River in Custer and Pennington counties in 1994 but no evidence for either species was found (Hetlet, 1994). Likewise, no piping plovers were observed during a survey conducted along approximately 28 miles of the Cheyenne River between Spring Creek and Wasta on June 26, 1999. Water flow rates measured at a USGS gauging station downstream of Wasta (see Table 3-80) indicated that suitable nesting habitat for piping plovers was unavailable on this section of the river in 1999.

Since they begin nesting earlier than least terns, usually by May (Dinsmore, 1983), USGS flow rate data indicates that suitable nesting habitats on sand bars and islands on the Cheyenne River have probably been submerged and/or scoured during the month of May in 10 out of 15 years between 1983 and 1998. However, a male piping plover was observed defending a territory in late May, 1981 along the south shore of Angostura Reservoir in Fall River County (SDNHDB, 1999). Other than this single record, piping plover nesting observations on the upper and middle reaches of the Cheyenne River are non-existent.

Bald Eagle. Critical to bald eagle reproductive success is their overwinter survival which is dependent, in

large part, on adequate food supplies (Steenhof, 1978). Specific food items consumed by wintering bald eagles vary by geographic area and availability of items (Steenhof, 1978). In western Wyoming, bald eagles consume carcasses of mule deer and domestic livestock (Jenkins, 1982) including big game killed by trains and vehicles (Reeve, unpublished data). Importance of big game and livestock carrion to wintering bald eagles in the Powder River Basin of northeast Wyoming have also been documented by Anderson and Patterson (1988). Ice that prevents bald eagles from feeding on fish, waterfowl or aquatic mammals can be a principal factor in their use of diverse winter food sources that can include garbage and offal (Ewins and Andress, 1995).

In western Oregon, substantial portions of the diet of wintering bald eagles were carrion of domestic sheep and afterbirth; maximum numbers of eagles were observed to coincide with lambing (DellaSala *et al.*, 1989). Anderson and Patterson (1988) likewise observed that wintering eagles and eagle roosts were closely associated with sheep ranches in northeastern Wyoming. Carrion of smaller mammals, specifically jackrabbits, may be a significant food source such as described for wintering bald eagles (Platt, 1976). On bald eagle winter ranges in the midwest, fish and waterfowl are principal prey sources (Steenhof *et al.*, 1980; Griffin *et al.*, 1982; Griffin and Baskett, 1985; Lingle and Krapu, 1986).

Perching sites in the vicinity of food sources are important components of bald eagle habitats (Steenhof, 1978 and Chandler *et al.*, 1995). At several locations where food availability coincides with waterbodies, bald eagles perch on a variety of substrates that border lake shores or riverbanks but demonstrate strong preferences for trees (Knight *et al.*, 1979; Steenhof *et al.*, 1989; Fielder and Starkey, 1986; Reynolds *et al.*, 1985). Selectivity of diurnal perches by bald eagles appears to be for dead trees and deciduous trees having substantial horizontal branches (Stalmaster and Newman, 1979 and Steenhof *et al.*, 1980).

Communal roosts used by wintering bald eagles at night provide relatively optimum shelter from wind (Buehler *et al.*, 1991) and low ambient temperatures (Steenhof *et al.*, 1980; Anthony *et al.*, 1982; Stalmaster and Gessaman, 1984; Anderson and Patterson, 1988). Apparent preferences for mature and old-growth conifers with open branch structures have been described for roosts in the northwest (Anthony *et al.*, 1982; Keister and Anthony, 1983; Stalmaster and Gessaman, 1984; Isaacs and Anthony, 1987; Stohlgren, 1993). Similar to tree characteristics selected as diurnal perch sites, roost trees provide openness and visibility but also provide significant canopy cover (Anthony *et al.* 1982 and Stohlgren 1993) that probably minimizes heat loss at roosting sites during the night.

Coniferous habitats provide warmer nocturnal temperatures and attenuated wind velocities than snags or deciduous forests during winter (Stalmaster and Newman, 1979 and Stalmaster and Gessaman, 1984). Where deciduous forests are used for nocturnal roosts, bald eagles select sites that provide maximum protection from winds (Steenhof *et al.*, 1980). And, use of roosts in snags and large ponderosa pines with open structures were found to be protected from winds by ridges (Anderson and Patterson 1988). Because suitable roosting areas may not be proximate to food sources, bald eagles will travel significant distances daily between the two (Swisher, 1964; DellaSala *et al.*, 1989) and may conserve more energy doing so than if they roosted in less thermally protected sites that were closer to foraging areas (Stalmaster and Gessaman, 1984).

Results of field surveys for wintering bald eagles conducted in February 1999 along Alternatives B and C are provided in Table 3-81. Most observations were of single eagles perched in deciduous cottonwood trees adjacent to rivers. All eagles that were observed along creeks and rivers were associated with stretches of ice-free water; no bald eagles were seen where water was frozen. The Black Thunder South and North Antelope West mine loops would be within 0.5 mile of potential wintering habitats along Antelope Creek and Little Thunder Creek for approximately 3.2 miles.

Communal roosts in the vicinity of alternatives have been documented on TBNG by the Forest Service (T. Byer, Forest Service, TBNG. Unpublished data). Many of these have also been documented on the WGFD Wildlife Observation System (WOS) as well as other observations of bald eagle winter concentration areas (see Table 3-82). With few exceptions, habitats associated with those sites are coniferous woodlands, consistent with results of studies that demonstrate the thermal protection provided by conifers such as ponderosa pine.

Biologists with BGNG have conducted ground surveys for bald eagles wintering along the Cheyenne River in South Dakota since 1994 (Hetlet, 1995b, 1996a, 1997a, 1998). Those survey results are provided in Table 3-83 and indicate considerable variation between years. However, distributions of bald eagles recorded in December of each year, 1994-1997, generally coincide with bald eagles observed during aerial surveys reported here for February, 1999.

Available data indicates that bald eagles vacate the middle reaches of the Cheyenne River in South Dakota, at least between Edgemont and Wasta, by late March. The USFWS conducted an aerial survey of the Cheyenne River on March 26, 1998 (J. Peterson, USFWS, Lake Andes National Wildlife Refuge, Lake Andes, South Dakota. Unpublished data). Bald eagles were seen near Angostura Reservoir and on the lower reach of the

Table 3-81
Observations of Bald Eagles During 1999 Winter Bald Eagle Survey of Alternatives B and C in Wyoming and South Dakota

Observation Date	Number/Age Seen	Habitat	State	County	Quadrangle	Twp Rng Sec ¼ ¼ ¼	Latitude & Longitude	Nearest Alternative
2/13/99	1 adult	cottonwood riparian-Antelope Creek	WY	Converse	Dugout Creek	41N 70W 33 NE SW SW	43°28.70′N 105°16.76′W	C
	1 adult	cottonwood riparian-HA Creek	WY	Campbell	Piney Canyon NW	43N 69W 04 SE SW SW	43°43.56′N 105°09.57′W	B
	1 adult	cottonwood riparian-Robbers Roost Creek	WY	Niobrara	Riverview	40N 61W 09 SW SE NE	43°27.55′N 104°11.24′W	C
	1 adult	cottonwood riparian-Cheyenne River	WY	Niobrara	Twentyone Divide	40N 60W 20 NE NE NE	43°26.14′N 104°05.04′W	B&C
	1 adult	Ponderosa pine woodland	SD	Fall River	Rumford	9S 4E 27 NW NW SW	43°14.28′N 103°38.47′W	C
2/14/99	1 immature 2 adults	riparian bluff-Cheyenne River	SD	Custer	Red Shirt NE	4S 11E 16 SE NW NE	43°42.36′N 102°48.27′W	B
	1 adult	cottonwood riparian-Cheyenne River	SD	Pennington	Red Shirt NE	4S 11E 10 NE SW NW	43°42.98′N 102°47.48′W	B
	1 adult	cottonwood riparian-Cheyenne River	SD	Custer	Red Shirt SW	5S 10E 18 NE NE SE	43°37.05′N 102°58.05′W	B
	3 adults	cottonwood riparian-Cheyenne River	SD	Custer	Red Shirt SW	5S 9E 13 SW NE SW	43°36.68′N 102°59.96′W	B
	2 adults	cottonwood riparian-Cheyenne River	SD	Custer	Fairburn SE	5S 9E 22 NW SW SE	43°35.79′N 103°01.97′W	B
	1 adult	cottonwood riparian-Cheyenne River	SD	Custer	Fairburn SE	5S 9E 28 NE NW NE	43°35.52′N 103°03.06′W	B
	1 immature 2 adults	cottonwood riparian-Bad River	SD	Jones	Capa NW	2N 27E 17 NW SE SE	44°07.68′N 100°53.42′W	Existing

Table 3-82 Bald Eagle Winter Roosts and Concentration Sites With 5 or More Eagles Seen During Winter in Wyoming							
Observation Date	Number Seen	Twp	Rng	Sec	¼ or ¼ of ¼	Habitat (WGFD Code)	Approximate Distance to Nearest Alternative
2/4/83	12	40N	69W	13		not recorded	3.6 miles from Alternative B >8 miles from Alternative C
1/15/88	16	41N	68W	06	NW	1.40-Ponderosa pine savannah	2.0 miles from Alternative B 3.4 miles from Alternative C
2/21/83	6	41N	68W	34	SW of NE	5.11-Basin big sagebrush	3.0 miles from Alternative B 6.5 miles from Alternative C
1/18/83 2/4/83 3/27/85 1/5/88 1/9/89	10 15 10 7 17	41N	69W	01	NW	not recorded not recorded not recorded 1.40-Ponderosa pine savannah 1.80-Pine-juniper	2.5 miles from Alternative B 3.2 miles from Alternative C
3/5/79 3/11/79 2/5/80 1/19/82 1/10/83	5 9 12 16 8	41N	70W	25	NW of SW	not recorded 1.40-Ponderosa pine savannah 1.81-Pinyon pine-juniper 1.80-Pine-juniper not recorded	0.2 mile from Alternative B 1.8 miles from Alternative C
3/1/79	12	41N	70W	25	SE	not recorded	0.1 mile from Alternative B 2.5 miles from Alternative C
1/30/81 1/19/82 1/9/85	9 3 8	42N	69W	05	NE of NE	not recorded 1.80-Pine-juniper 1.40-Ponderosa pine savannah	>8 miles from Alternative B 1.1 miles from Alternative C
11/7/90	6	42N	69W	24		1.40-Ponderosa pine savannah	3.6 miles from Alternative B 3.8 miles from Alternative C
12/3/80 1/18/83 3/27/85	1 22 2	43N	69W	01	SW	4.11-Basin big sagebrush not recorded not recorded	0.2 mile from Alternative B 4.0 miles from Alternative C
1/30/83	10	43N	70W	26		not recorded	1.5 miles from Alternative B 1.0 mile from Alternative C
1/9/85	6	43N	71W	25	NW of NE	4.12-Wyoming big sagebrush	2.5 miles from Alternative B 2.5 miles from Alternative C
3/2/79 2/23/80	5 7	47N	70W	21	NW of SW	1.40-Ponderosa pine savannah 1.81-Pinyon pine-juniper	1.5 miles from Alternative B 1.5 miles from Alternative C
Source: WGFD WOS							

Cheyenne River near its confluence with the Missouri River but none were observed on the middle reach. Similarly, the Forest Service conducted surveys in May, 1996 and 1997 along the same portions of the Cheyenne River that were included in December surveys, but no bald eagles were seen either year (Hetlet 1996b and 1997b). Together, these observations indicate the importance of the Cheyenne River corridor in South Dakota and the TBNG in Wyoming to wintering bald eagles. Communal nocturnal roosts, diurnal perch sites, and feeding areas are all key winter habitat components that are proximate to the alternatives.

Bald eagles have attempted to nest on TBNG at least twice in the past, but both nests were unsuccessful (T. Byer, Forest Service, TBNG. Unpublished data). Aerial surveys for nesting bald eagles and other raptors were conducted from April 11-13, 1999 along Alternatives B and C. Only one pair of bald eagles was seen perched near a nest on private land along the Cheyenne River in Weston County, Wyoming on April 11. No follow-up survey was conducted but, given the relatively late date, the pair probably did not actively nest. The site was more than 1 mile from any of the alternatives.

Ute Ladies'-tresses. Known distributions of this rare orchid includes the front range of Colorado, southeastern Wyoming, northwestern Nebraska as well as Utah, Idaho and Montana (WNDDB. Unpublished data). Populations closest to the alternatives include the Niobrara River in Platte County, Nebraska and Van Tassel Creek in southeast Niobrara County, Wyoming. The orchid

Table 3-83
Observations of Bald Eagles During Winter Surveys Conducted by BGNG Along the Cheyenne River in South Dakota from 1994 through 1997

December, 1997			December, 1996			December, 1995			December, 1994		
Number Seen (1)	Twp Rng Sec ¼	Distance to Nearest Alternative (2)	Number Seen (1)	Twp Rng Sec ¼	Distance to Nearest Alternative (2)	Number Seen (1)	Twp Rng Sec ¼	Distance to Nearest Alternative (2)	Number Seen (1)	Twp Rng Sec ¼	Distance to Nearest Alternative (2)
1 ad	3S 12E 08 SE	1.9 mi - A	1 imm	4S 11E 31 NW	0.2 mi - B	1 imm	4S 11E 21 SW	0.5 mi - B	1 imm	3S 12E 19 NE	2.1 mi - A
1 imm	3S 12E 19 NE	2.0 mi - A	4 ads	5S 9E 27 NW	0.6 mi - B	1 ad	4S 10E 36 NE	0.6 mi - B	1 ad	4S 11E 29 NE	0.2 mi - B
1 imm	3S 12E 19 NW	2.0 mi - A	2 ads	6S 9E 16 NW	1.8 mi - B	2 ads	4S 9E 13 SE	0.5 mi - B	1 imm	4S 11E 32 NW	0.2 mi - B
1 ad	4S 11E 21 NW	0.4 mi - B				2 ads	5S 9E 27 NW	0.4 mi - B	1 ad	5S 10E 18 NW	0.1 mi - B
2 ads	4S 11E 21 SW	0.5 mi - B				1 imm	5S 9E 27 NW	0.4 mi - B	2 imm	5S 9E 13 SW	0.2 mi - B
1 imm	4S 11E 28 SW	0.5 mi - B				1 ad	5S 9E 28 NE	0.3 mi - B	1 ad	5S 9E 22 NE	0.1 mi - B
1 ad	4S 11E 28 SW	0.4 mi - B				3 imm	5S 9E 28 SW	0.1 mi - B	1 imm	5S 9E 33 SW	0.4 mi - B
1 ad	4S 11E 32 NE	0.2 mi - B				1 ad	5S 9E 33 NE	0.5 mi - B	1 ad	6S 9E 21 SW	2.2 mi - B
1 ad	4S 11E 31 NW	0.3 mi - B				1 ad	5S 9E 33 NW	0.1 mi - B	1 imm	6S 9E 21 SW	2.2 mi - B
3 ads	5S 9E 23 NW	0.2 mi - B									
1 imm	5S 9E 22 NE	0.1 mi - B									
1 ad	5S 9E 22 NE	0.1 mi - B									
2 ads	5S 9E 22 NW	0.1 mi - B									
1 ad	5S 9E 27 NW	0.5 mi - B									
1 imm	5S 9E 33 NW	0.1 mi - B									
1 imm	5S 9E 31 SW	0.1 mi - C									
1 ad	6S 9E 36 SE	0.1 mi - C									
1 imm	6S 8E 01 NE	0.1 mi - C									

1 = ad = adult eagle, imm = immature eagle
2 = Alternatives routes are A = both, B = Alternative B, C = Alternative C

inhabits moist soils, in wet meadows, riparian and palustrine habitats from 4,000 to 7,000 feet elevation (USFWS, 1996). In eastern Wyoming and Nebraska the species was found in moist cut banks of saline meadows, abandoned river channels and alluvial terraces adjacent to creeks in association with white sweetclover, arrow-grass, creeping bentgrass, and baltic rush (Hazlett, 1996; Fertig, 1998; Intermountain Ecosystems, 1998).

Positive identification of Ute ladies'-tresses is only possible when it is flowering, from late July to early or mid September (USFWS, 1996). Difficulties in locating populations are compounded by the species' tendency to bloom every 3 to 5 years (Intermountain Ecosystems, 1998). Pollinators include bumblebees, anthophorid bees, and tiphiid wasps (Larson and Larson, 1990 and Sipes and Tepedino, 1995).

Searches for Ute ladies'-tresses along Alternatives B and C were conducted in Wyoming and South Dakota in September, 1998. Because access to potential sites on private lands was restricted, only 22 sites could be adequately evaluated. Four of those were considered potential habitat for the species and 2 others had low habitat potential (Intermountain Ecosystems, 1998) The 4 sites were in Wyoming at Lodgepole Creek and School Creek (Weston County), and South Dakota at Hay Canyon South and Dry Creek (Fall River County, see Table 3-84).

Proposed and Candidate Species

Mountain Plover. Mountain plovers have been associated with prairie dog towns where vegetation has been reduced (Knowles *et al.*, 1982; Olson-Edge and Edge, 1987; Knopf and Miller, 1994). They nest in areas of low herbaceous vegetation, reduced shrub cover, and near prominent objects such as cow-manure piles or similar-sized rocks (Graul ,1975; Prellwitz, 1993; Knopf and Miller, 1994). Results of a study conducted in northeast Wyoming showed that mountain plovers nested at sites with low or absent shrub growth and where grasses and forbs were also short (Parrish *et al.*, 1993). In that study, mountain plovers seldom nested on prairie dog colonies but adults with broods were seen on colonies (Parrish *et al.*, 1993).

Surveys have been conducted on TBNG since 1992 and 14,302 acres have been identified as occupied by mountain plovers. Surveys for occurrence of mountain plovers on black-tailed prairie dog colonies were conducted on the TBNG in 1997. A total of 26 adults and 20 juvenile plovers were seen within approximately 4,900 acres prairie dog colonies surveyed (T. Byer, Forest Service, TBNG. Unpublished data). Too, mountain plovers were seen on one National Biological Survey (NBS) breeding bird survey route (Newcastle) in Wyoming, but none were reported on breeding bird survey routes in South Dakota. And, their historical nesting occurrence in southwest South Dakota in the vicinity of Edgemont has been noted (South Dakota Ornithologists' Union, 1991). Mountain plovers have also been documented in annual wildlife monitoring reports on coal mines and vicinities in Campbell County, near all alternatives in Wyoming.

Sturgeon Chub. This member of the minnow family is found in the Missouri River and western tributaries where it inhabits shallow sand or gravel bottom zones in areas with strong currents in warm and highly turbid medium to large rivers (Lee *et al.*, 1980). Their greatest abundance is in gravel riffle zones (USFWS, 1993b and Hesse, 1994). Populations have existed in the Powder River drainage in Wyoming (USFWS, 1993b) and recent sampling efforts documented its continued presence in the mainstem of the Powder River as well as Crazy Woman Creek, a small tributary stream (Patton *et al.*, 1998). None were found in the Belle Fourche River or its tributaries in Wyoming (Patton *et al.*, 1998).

Sturgeon chubs have been repeatedly documented in the Cheyenne River in Pennington County (Hampton, 1998; Cunningham *et al*, 1995; USFWS, 1993a and 1993b) and in Custer County (SDNHDB, 1998 and Cunningham *et al*, 1995). Recent surveys conducted in 1997 indicate sturgeon chubs were collected at multiple sampling sites in the Cheyenne River between Angostura Dam and Lake Oahe by researchers from South Dakota State University (Hampton, 1998). In that study, sturgeon chubs were found in the upper reaches of the Cheyenne River, several miles upstream from the confluence with Rapid Creek and at several middle and lower reach locations, downstream from Wasta (Hampton, 1998). No sturgeon chubs were collected during surveys of tributaries to the Cheyenne River in 1994 (Cunningham *et al*, 1995) that included Spring Creek, Rapid Creek, Battle Creek, Horsehead Creek, streams that would be crossed by some of the alternatives.

Surveys of streams tributary to the Cheyenne River which would be crossed by Alternatives B and C in South Dakota were completed in October, 1999. No chubs were found in the vicinity of the alternatives. However, suitable habitat was identified on Rapid Creek and the species may be present in the creek during portions of the year. Though still classified as a candidate species, USFWS is preparing documents that will recommend the species for listing as endangered (USFWS, 1999b).

Sicklefin Chub. These minnows are mostly restricted to large rivers, including the Missouri River where it was collected in 1952 near Pierre, South Dakota (SDNHDB, 1998). This species is even more adapted to highly turbid waters than sturgeon chubs (Lee *et al*, 1980 and Hesse, 1994) and dams constructed along the Missouri River have been held responsible, in part, for the

Table 3-84 Sites Examined Where Potentially Suitable Habitat Exists for Ute Ladies'-tresses					
Site Name	**USGS Quadrangle Legal Description**	**NWI Wetland Classification**	**Plant Association**	**Direct Access to Alternative**	**Potentially Suitable Habitat**
Hay Canyon South	Smithwick NW, South Dakota T. 8 S., R. 8 E., Section 2	PEMA, PUBH	cattails, bulrush, cordgrass	No	Yes
Dry Creek	Lone Well Creek West, South Dakota T. 9 S., R. 6 E. , Section 29	PEMA	cattails, cordgrass, threesquare bulrush	Yes	Yes
Lodgepole Creek	The Nose East, Wyoming T. 42 N., R. 64 W., Section 32	PEMC	baltic rush, threesquare bulrush, cordrush	Yes	Yes
Little Thunder Creek	Piney Canyon NW, Wyoming T. 43 N., R. 69 W., Section 30	PEMA, PABFH	cordgrass	No	Low
School Creek	Piney Canyon NW, Wyoming T. 42 N., R. 69 W. , Section 6	PABFH	cordgrass	Yes	Yes
Black Thunder Creek	Open A Ranch, Wyoming T. 44 N., R. 70 W., Section 14	PABFH	sagebrush	No	Low
Source: Intermountain Ecosystems, 1998					

species' decline since much of the rivers' sediment flows have been reduced by the dams (Hesse, 1994). Sicklefin chubs are now believed to be extirpated in the Missouri River between Lake Sakakawea in North Dakota to Sioux City, Iowa (USFWS, 1999b). It is highly unlikely that they ever inhabited the Cheyenne River near any of the alternatives. Though still classified as a candidate species, USFWS is preparing documents that will recommend the species for listing as endangered (USFWS, 1999b).

Swift Fox. The swift fox, a candidate for listing as endangered or threatened under the Endangered Species Act, is found in short grass and midgrass prairies over much of the Great Plains where their dens were mostly near hill tops in undulating terrain covered by midgrass and shortgrass prairie (Uresk and Sharps, 1986). In northeastern Colorado, this fox appears to be most abundant in areas with relatively flat to gently rolling terrain (Cameron, 1984 and Loy, 1981) and rare in terrain that is highly eroded with gullies, washes and canyons (Fitzgerald, 1994). These apparent habitat preferences are contrary to many observations made in Wyoming where swift fox were found on short and mixed grasslands, sagebrush-grasslands, and greasewood-sagebrush vegetation with topography varying from flat to eroded badlands (Woolley *et al.*, 1995). In many areas, cottontails and jackrabbits constitute a bulk of their diet (Cameron, 1984; Zumbaugh *et al.,* 1985) and Fitzgerald (1994) noted that swift fox population will decline during periods of low rabbit densities. In South Dakota, swift foxes consumed a variety of vertebrate and invertebrate prey items but mostly they fed on thirteenlined ground squirrels (Uresk and Sharps, 1986). Covell and Rongstad (1990) have suggested that high coyote densities may serve to limit swift fox numbers. That, and the fact that they are quite easy to trap, undoubtedly contributes to their mortality.

In Wyoming, recent surveys conducted in central and eastern Wyoming included sites in Weston, Campbell and Converse counties. Swift foxes were found in Converse and Weston counties, roughly coinciding with distributions reported by trappers and Forest Service observations on TBNG (Woolley *et al.*, 1995). And, they have recently been found in Campbell County. There are also records of swift fox from the vicinity of the alternatives in Custer and Fall River counties (SDNHDB, 1998) and on the Wall and Fall River Ranger Districts, BGNG (Hetlet and Hodorff, 1997). All observations in northeastern Wyoming and southwestern South Dakota indicate that the species is likely to occur in the vicinity of all alternatives.

Black-tailed Prairie Dog. USFWS recently identified the black-tailed prairie dog as a candidate species throughout its range that includes Wyoming and South Dakota. Although once extensively distributed throughout the Great Plains from southern Saskatchewan to Texas and northern Mexico, black-tailed prairie dogs have declined throughout their range. Conversion of rangelands to agriculture and urbanization, poisoning programs aimed at controlling colonies, unregulated recreational shooting and disease, specifically sylvatic plague, have contributed to the species' decline (USFWS, 1999c).

Black-tailed prairie dog colonies occur throughout the project area in Wyoming and South Dakota. Black-tailed prairie dog colonies were mapped along Alternative C from black-and-white aerial photographs (1:2,400) extending to approximately 1,000 feet on each side of the alternative's centerline. Additional colonies have been

mapped by Forest Service and the WGFD mapped some colonies during the late 1980's. Maps of colonies on private lands have been provided by county weed and pest control district agents in Wyoming and South Dakota. These data are compiled in Table 3-85 and show that all alternatives would affect prairie dog colonies but that Alternative C would cross the most colonies, a function of mapping effort conducted along that alternative.

The current activity status of each prairie dog colony is unknown: some colonies have become inactive due to sylvatic plague epizootics (in Wyoming only) and others have been poisoned by county weed and pest control agents and/or private land owners. For most of the colonies that have been mapped there are no additional data about the areal extent or geographic proximity of other colonies that would form a local colony complex.

Other Species With Special Status

Many species are known to occur or potentially occur in the vicinity of the alternatives that have been designated with special status, whether by the USFWS, Forest Service, BLM, WGFD, SDGFP, WNDDB, and/or SDNHDB. These species are listed in Table 3-86. Species listed as Federal threatened, endangered, proposed or candidate species under the Endangered Species Act are not included in Table 3-86. Some species included in the table are also Management Indicator Species (MIS), designated by the Forest Service on TBNG and BGNG.

Animal Species with Special Status. Of the 14 species of mammals listed in Table 3-86 with special status and that potentially occur in the project area, only small-footed myotis, fringed myotis, spotted bat, big brown bat, Townsend's big-eared bat, river otter and eastern spotted skunk have been documented in at least one county coinciding with at least one of the alternatives in Wyoming and/or South Dakota. However, 30 of the 31 bird species have been documented by at least one source as occurring in a county through which one of the project alternatives passes. In addition, there are at least 2 species of amphibian, 3 species of reptiles and 5 species of special status fish that occur in the area, whether in specific counties or drainages.

Plant Species with Special Status. Thirty-eight plant species are included in Table 3-86, most of them found in Wyoming where site descriptions are provided by WNDDB and Dorn (1992). Most occur on NFS lands within TBNG. Where full descriptions are given, most of the plant species are on sites that have been grazed by livestock and are in sandy soils, often associated with ponderosa pine woodlands, on eastern plains grasslands, or in riparian zones.

3.18 Wildlife and Aquatic Resources

3.18.1 Impact Analysis Area. Wildlife resources are generally described at the herd unit or county level. Aquatic resources are described for the streams and rivers which would be affected.

3.18.2 Affected Environment. Grasslands, sagebrush steppe, forested riparian zones, woody shrub-dominated draws and coniferous woodlands contribute to diverse vegetation in the vicinity of the alternatives in Wyoming and South Dakota. Along with varying topography, these vegetation types provide habitats for a diverse array of wildlife species including big game, upland game birds, waterfowl, furbearing mammals, raptors, non-game mammals and birds, reptiles and amphibians.

Big Game. Four big game species are known to inhabit the counties which would be crossed by the alternatives in Wyoming. These are pronghorn, mule deer, white-tailed deer and elk. Mountain lions, classified as trophy game animals in Wyoming but are protected as a threatened species in South Dakota, may occasionally be present as they disperse from more distant population centers. In the vicinity of the alternatives in South Dakota there are mule deer, white-tailed deer and pronghorns. Wild turkeys are classified as big game in South Dakota but are designated as upland game birds in Wyoming.

Pronghorn. Pronghorn are the most abundant big game animal in the vicinity of the alternatives which, in Wyoming, would pass through or be adjacent to 5 population areas or Antelope Herd Units: North Black Hills, South Black Hills, Highlight, Thunder Basin and Lance Creek. The South Black Hills, Thunder Basin and Lance Creek Herd Units are managed by biologists in the WGFD's Casper District and cover portions of southern Crook, Weston, Niobrara, southeast Campbell, and eastern Converse counties. The North Black Hills and Highlight Antelope herd units are managed by the WGFD Sheridan District and cover portions of eastern Campbell County (Highlight) and Crook County (North Black Hills). Pronghorn seasonal ranges in the vicinity of the alternatives in Wyoming are shown on Figure 3-25.

Alternatives B and C pass through the Lance Creek, Thunder Basin and Highlight herd units. The majority of land in the Lance Creek Herd Unit is privately owned (80 percent). The remainder is on Federally - (Forest Service and BLM) and state-owned lands (Kroger, 1998a). Sagebrush interspersed with short grass prairie is the primary vegetation cover although there are cottonwood riparian zones along several drainages, ponderosa pine woodlands, and croplands. Similarly, most land (70 percent) within the Thunder Basin Herd Unit is privately owned and is covered with sagebrush steppe and low hills with ponderosa pine woodlands (Anderson, 1998a).

Table 3-85 Miles of Each Alternative Which Would Intersect Black-tailed Prairie Dog Colonies in Wyoming and South Dakota						
Alternative	State	Miles of Prairie Dog Town Crossed by Land Ownership				
		Forest Service	BLM	State	Private	Total
B (1)	Wyoming	1.8	0	1.5	4.9	8.2
	South Dakota	0.2	0	0	3.2	3.4
	Total	2.0	0	1.5	8.1	11.6
C (2)	Wyoming	1.7	0	1.6	9.1	12.4
	South Dakota	0	0	0.2	4.9	5.1
	Total	1.7	0	1.8	14.0	17.5
D (3)	Wyoming	0.3	0	0.1	2.8	3.3
	South Dakota	0	0	0.0	2.8	2.9
	Total	0.3	0	0.1	5.6	6.2

1 = Prairie dog colonies mapped from aerial photographs where Alternative B coincides with Alternative C, by USFS on TBNG, and by WGFD.
2 = Prairie dog colonies mapped from aerial photographs, by USFS on TBNG, and by WGFD.
3 = Prairie dog colonies mapped from aerial photographs where Alternative D coincides with Alternative C, by USFS on TBNG, and by WGFD.

Pronghorns probably move between the Lance Creek and Thunder Basin Herd Units by crossing State Highway 450, their common border (Kroger, 1998a). There is little public land in the Highlight Herd Unit and a portion of the private land in the Herd Unit (90 percent privately owned) has been mined for coal, some of which is reclaimed while other land is used for alfalfa croplands (Oedekoven, 1997).

In Wyoming, Alternative D would follow the dividing line between the South Black Hills and Thunder Basin antelope herd units (U.S. Highway 16) and the dividing line between the North Black Hills and Highlight antelope herd units (I- 90). In the project area, the South Black Hills Herd Unit is covered with sagebrush steppe; ponderosa pine covers hills and ridgelines. Most land is privately owned, much of it cultivated for alfalfa and winter wheat (Anderson, 1998b). Likewise, most of the North Black Hills Herd Unit is privately owned which affects the ability of WGFD to effectively manage the population (Oedekoven, 1998a).

Alternatives B and C would cross one Hunt Area in each of the Highlight and Thunder Basin antelope herd units but would cross 3 hunt areas in the Lance Creek Herd Unit (Table 3-87). Alternative D would cross through 2 hunt areas in the South Black Hills Herd Unit, 2 Hunt Areas in the North Black Hills Herd Unit, and 1 Hunt Area in the Highlight Herd Unit. Management for pronghorn harvest in each population is made difficult by hunter access on private lands although populations in the Highlight and Thunder Basin Herd Units appear to be slightly decreasing while the others are slightly increasing.

In Wyoming, the alternatives would cross pronghorn ranges that are used throughout the year (yearlong range, YRL) with some habitats classified as winter-yearlong range (WYL) to which additional animals migrate during winter and winter (WIN) ranges that are used primarily in winter. In the Lance Creek Herd Unit there are severe winter relief (SWR) ranges along Antelope Creek in northeastern Converse County that are documented as survival areas, used occasionally during extremely severe winters (see Table 3-82). The Black Thunder North, Black Thunder South, North Antelope East and North Antelope West mines loops would be within the Highlight and Lance Creek pronghorn herd units. The loops would pass through WYL ranges for 11.6 miles (5.1 miles through the Highlight Herd Unit and 6.5 miles through the Lance Creek Herd Unit) and through YRL range in the Lance Creek Herd Unit for 3.9 miles.

Alternative B would directly affect WYL and YRL seasonal ranges in the Highlight and Thunder Basin herd units as well as SWR, WYL and YRL ranges in the Lance Creek Herd Unit (Table 3-88). Alternative C would only affect the Highlight and Lance Creek herd units (Table3-89) but Alternative D would pass through all 5 antelope herd units in the region: North Black Hills, Highlight, Thunder Basin, South Black Hills and Lance Creek (Table 3-90), albeit adjacent to an existing heavy haul railroad.

Pronghorns in these populations have been impacted by fences (livestock and highway rights-of-way), oil and gas developments, coal mining and livestock grazing. Numerous studies have documented dietary overlap between pronghorns and domestic livestock (Taylor, 1975; Olsen and Hansen, 1977; Severson *et al.*, 1980; Schwartz and Ellis, 1981; Lauenroth *et al.*, 1994). Pronghorn survival depends on different habitat components in different seasons. Topographic diversity that provides thermal shelter and shrub cover are two key

Table 3-86
Vertebrate and Plant Species with Special Status that are Known to Occur or Potentially Occur in the Vicinity of the Alternatives

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats in Wyoming and South Dakota	Source
Mammals				
Dwarf Shrew *Sorex nanus*	USFS R2-S WGFD-SSC3	SDNHDB record - SD county	coniferous forests, mountain-foothills shrublands	Luce *et al.*, 1997 SDNHDB, 1999
Western Small-footed Myotis *Myotis ciliolabrum*	USFWS-SC WGFD-SSC3	USFS record - WY county	basin-prairie shrublands, sagebrush-grasslands	Luce *et al.*, 1997
Long-eared Myotis *Myotis evotis*	USFS R2-S USFWS-SC WGFD-SSC2	unknown	cottonwood-riparian, basin-prairie shrublands, sagebrush-grasslands	Luce *et al.*, 1997
Keen's Myotis *Myotis keenii*	WGFD-SSC2	unknown	ponderosa pine/mixed deciduous forests	Luce *et al.*, 1997
Little Brown Myotis *Myotis lucifugus*	WGFD-SSC3	unknown	riparian shrub, sagebrush-grasslands near water	Luce *et al.*, 1997
Fringed Myotis *Myotis thysanodes*	USFS R2-S USFWS-SC WGFD-SSC2	WNDDB record-WY county SDNHDB record-SD county	basin-prairie shrublands	Luce *et al.*, 1997; WNDDB, 1999 SDNHDB, 1999
Long-legged Myotis *Myotis volans*	USFWS-SC WGFD-SSC2	unknown	prairie and mountain-foothills shrublands	Luce *et al.*, 1997
Big Brown Bat *Eptesicus fuscus*	WGFD-SSC3	USFS record - WY county	basin-prairie shrublands, grasslands, urban areas	Luce *et al.*, 1997
Spotted Bat *Euderma maculatum*	USFS R2-S USFWS-SC WGFD-SSC2	WNDDB record-WY county	cliffs near water, juniper shrublands, desert sagebrush-grasslands	Luce *et al.*, 1997 WNDDB, 1999
Townsend's Big-eared Bat *Plecotus townsendii*	USFS R2-S USFWS-SC WGFD-SSC2	WNDDB record-WY county	desert grasslands, basin-prairie shrublands	Luce *et al.*, 1997 WNDDB, 1999
Black-tailed Prairie Dog *Cynomys ludovicianus*	WGFD-SSC3 MIS-TBNG	USFS record-SD county USFS record-WY county	shortgrass and midgrass grassland	Luce *et al.*, 1997 USFS-TBNG, BGNG
Black Bear *Ursus americanus*	SDGFP-ST	SDGFP record-SD county	coniferous forest, aspen, riparian shrub, montain-foothills grasslands	Ashton & Dowd, 1991
Eastern Spotted Skunk *Spilogale putorius*	USFWS-SC	SDNHDB record-SD county	ponderosa pine, juniper, cottonwood-riparian, native hay meadows, rural developments, near streams	Luce *et al.*, 1997 SDNHDB, 1999
River Otter *Lutra canadensis*	SDGFP-ST	SDNHDB record-SD county observation record	lakes, streams, aquatic habitats: cottonwood-riparian, willow shrub riparian, marsh-swamp grasslands	Ashton & Dowd, 1991 SDNHDB, 1999 Reeve, 1999
Mountain Lion *Felis concolor*	SDGFP-ST	SDGFP record-SD county	habitats where deer occur - remote areas	Ashton & Dowd, 1991

Table 3-86 Continued				
Common Name/Scientific Name	**Status (1)**	**Local Occurrence (2)**	**Expected Habitats in Wyoming and South Dakota**	**Source**
Birds				
Common Loon *Gavia immer*	USFS R2-S USFWS-SC WGFD-SSC1	WNDDB record-WY county	lakes lower than 6,000 feet elevation during migration	Luce *et al.*, 1997 WNDDB, 1999
American White Pelican *Pelicanus erythrorhynchos*	WGFD-SSC3	WNDDB record-WY county	rivers, lakes, ponds	Luce *et al.*, 1997 WNDDB, 1999
American Bittern *Botaurus lentiginosus*	USFS R2-S USFWS-SC WGFD-SSC3	NBS/BBS record-SD county	marshes	Luce *et al.*, 1997 Sauer *et al.*, 1997
Great Blue Heron *Ardea herodias*	WGFD-SSC4	NBS/BBS record-SD county NBS/BBS record-WY county SDNHDB record-SD county	cottonwood riparian	Luce *et al.*, 1997 Sauer *et al.*, 1997 SDNHDB, 1999
Black-crowned Night-Heron *Nycticorax nycticorax*	WGFD-SSC3	NBS/BBS record-SD county	willow shrubs, marshes	Luce *et al.*, 1997 Sauer *et al.*, 1997
Northern Harrier *Circus cyaneus*	USFWS-SC	NBS/BBS record-WY county NBS/BBS record-SD county	basin-prairie shrublands, grasslands, marshes	Luce *et al.*, 1997 Sauer *et al.*, 1997
Ferruginous Hawk *Buteo regalis*	USFS R2-S USFWS-SC WGFD-SSC3 MIS-TBNG	NBS/BBS record-WY county NBS/BBS record-SD county WNDDB record-WY county SDNHDB record-SD county	basin-prairie shrublands, rock outcrops, cottonwood-riparian	Luce *et al.*, 1997 Sauer *et al.*, 1997
Merlin *Falco columbarius*	USFS R2-S WGFD-SSC3	NBS/BBS record-WY county WNDDB record-WY county	moist habitats below 8,500 feet	Luce *et al.*, 1997 Sauer *et al.*, 1997 WNDDB, 1999
Snowy Plover *Charadrius alexandrinus*	USFS R2-S USFWS-SC	WNDDB record-WY county	shorelines, aquatic areas	Luce *et al.*, 1997 WNDDB, 1999
Upland Sandpiper *Bartramia longicauda*	USFS R2-S USFWS-SC WGFD-SSC4 MIS-TBNG	NBS/BBS record-WY county NBS/BBS record-SD county WNDDB record-WY county	eastern Great Plains grassland	Luce *et al.*, 1997 Sauer *et al.*, 1997 WNDDB, 1999
Long-billed Curlew *Numenius americanus*	USFS R2-S USFWS-SC WGFD-SSC3 MIS-TBNG	NBS/BBS record-WY county NBS/BBS record-SD county WNDDB record-WY county SDNHDB record-SD county	sagebrush-grasslands; wet-moist meadow grasslands, irrigated native hay meadows	Luce *et al.*, 1997 Sauer *et al.*, 1997 WNDDB, 1999 SDNHDB, 1999

Table 3-86
Continued

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats in Wyoming and South Dakota	Source
Black Tern *Childonias niger*	USFS R2-S USFWS-SC WGFD-SSC3	NBS/BBS record-SD county	marshes with emergent vegtation	Luce *et al.*, 1997 Sauer *et al.*, 1997
Yellow-billed Cuckoo *Coccyzus americanus*	USFS R2-S WGFD-SSC2	NBS/BBS record-SD county WNDDB record-WY county	cottonwood riparian below 7,000 feet, urban areas	Luce *et al.*, 1997 Sauer *et al.*, 1997 WNDDB, 1999
Barn Owl *Tyto alba*	USFWS-SC	SDNHDB record-SD county	basin-prairie shrublands, grasslands, agricultural areas	Luce *et al.*, 1997 SDNHDB, 1999
Burrowing Owl *Athene cunicularia*	USFS R2-S USFWS-SC WGFD-SSC4	NBS/BBS record-WY county NBS/BBS record-SD county WNDDB record-WY county SDNHDB record-SD county	grasslands, basin-prairie shrublands, agricultural areas	Luce *et al.*, 1997 Sauer *et al.*, 1997 WNDDB, 1999 SDNHDB, 1999
Short-eared Owl *Asio flammeus*	USFWS-SC	NBS/BBS record-WY county NBS/BBS record-SD county	basin-prairie shrublands, grasslands, marshes, irrigated native hay meadows	Luce *et al.*, 1997 Sauer *et al.*, 1997
Black Swift *Cypseloides niger*	USFWS-SC	NBS/BBS-SD county	steep narrow cliffs, near waterfalls	Wassink, 1991 Sauer *et al.*, 1997
Lewis' Woodpecker *Melanerpes lewis*	USFS R2-S WGFD-SSC3	WNDDB record-WY county	cottonwood-riparian below 8,500 feet	Luce *et al.*, 1997 WNDDB, 1999
Red-headed Woodpecker *Melanerpes erythrocephalus*	USFWS-SC MIS-TBNG	NBS/BBS record-WY county NBS/BBS record-SD county	cottonwood-riparian	Luce *et al.*, 1997 Sauer *et al.*, 1997
Black-backed Woodpecker *Picoides arcticus*	USFS R2-S WGFD-SSC4	NBS/BBS record-SD county	lodgepole pine, Douglas fir, Englemann spruce-subalpine fir (especially burned)	Luce *et al.*, 1997 Sauer *et al.*, 1997
Veery *Catharus fuscescens*	USFWS-SC WGFD-SSC4	NBS/BBS record-WY county	cottonwood-riparian forests below 9,000 feet	Luce *et al.*, 1997 Sauer *et al.*, 1997
Loggerhead Shrike *Lanius ludovicianus*	USFS R2-S USFWS-SC	NBS/BBS record-WY county NBS/BBS record-SD county SDNHDB record-SD county	greasewood flats, prairie and mountain-foothills shrublands	Luce *et al.*, 1997; Sauer *et al.*, 1997
Orange-crowned Warbler *Vermicorva celata*	WGFD-SSC4	unknown	cottonwood-riparian	Luce *et al.*, 1997
American Redstart *Seophaga ruticilla*	WGFD-SSC4	NBS/BBS record-WY county NBS/BBS record-SD county	cottonwood-riparian, riparian shrub	Luce *et al.*, 1997 Sauer *et al.*, 1997
Common Yellowthroat *Geothlypis trichas*	WGFD-SSC4	NBS/BBS record-WY county NBS/BBS record-SD county	willow and marshes below 8,000 feet	Luce *et al.*, 1997 Sauer *et al.*, 1997

Table 3-86
Continued

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats in Wyoming and South Dakota	Source
Dickcissel *Spiza americana*	USFWS-SC	NBS/BBS record-WY county NBS/BBS record-SD county	eastern Great Plains grasslands	Luce *et al.*, 1997 Sauer *et al.*, 1997
Brewer's Sparrow *Spizella breweri*	USFWS-SC MIS-TBNG	NBS/BBS record-WY county NBS/BBS record-SD county SDNHDB record-SD county	basin-prairie sagebrush shrublands	Luce *et al.*, 1997 Sauer *et al.*, 1997 SDNHDB, 1999
Lark Bunting *Calamospiza melanocorys*	USFWS-SC	NBS/BBS record-WY county NBS/BBS record-SD county	basin-prairie shrublands, basin-foothills grasslands	Luce *et al.*, 1997 Sauer *et al.*, 1997
Baird's Sparrow *Ammodramus bairdii*	USFS R2-S USFWS-SC WGFD-SSC4 SDGFP-R	NBS/BBS record-WY county	shortgrass eastern Great Plains grasslands	Luce *et al.*, 1997 Sauer *et al.*, 1997
Grasshopper Sparrow *Ammodramus savannarum*	USFWS-SC WGFD-SSC4	NBS/BBS record-WY county NBS/BBS record-SD county WNDDB record-WY county	basin-prairie shrublands, wet-moist meadow grasslands	Luce *et al.*, 1997 Sauer *et al.*, 1997 WNDDB, 1999
Chestnut-collared Longspur *Calcarius ornatus*	USFWS-SC	NBS/BBS record-WY county NBS/BBS record-SD county	basin-prairie shrublands, agricultural area	Luce *et al.*, 1997 Sauer *et al.*, 1997
Bobolink *Dolichonyx oryzivorus*	WGFD-SSC4	NBS/BBS record-SD county	eastern Great Plains grasslands, basin-prairie shrublands	Luce *et al.*, 1997 Sauer *et al.*, 1997
Amphibians and Reptiles				
Tiger Salamander *Ambystoma tigrinum*	USFS R2-S	TBNG record - WY	most habitats with non-flowing water nearby	Luce *et al.*, 1997
Northern Leopard Frog *Rana pipiens*	USFS R2-S	WNDDB record-WY county	swampy cattail marshes, beaver ponds on plains, foothills to 9,000 feet elevation	Luce *et al.*, 1997 WNDDB, 1999
Spiney Softshell Turtle *Apalone spinifera*	SDGFP-ST	SDNHDB record-SD county	mud flats, sandbars, soft sandy-muddy bottoms with aquatic vegetaion in lakes, rivers, ponds, streams	Ashton & Dowd, 1991 SDNHDB, 1999
Eastern Short-horned Lizard *Phrynosoma douglassi breviriostre*	USFWS-SC SDGFP-R	SDNHDB record-SD county	grasslands, sagebrush communities	Ashton & Dowd, 1991 SDNHDB, 1999
Black Hills Redbelly Snake *Storeria occipitomaculata pahasapae*	USFS R2-S	WNDDB record-WY county	moist woodlands, near water, found under rocks, logs, other objects	Luce *et al.*, 1999 WNDDB, 1999

Table 3-86
Continued

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats in Wyoming and South Dakota	Source
Fish				
Flathead Chub *Platygobio gracilis*	USFS R2-S	drainage record-WY drainage record-SD	turbid, flowing waters in main channels of large rivers, shallow to deep water over mud, rocky bottoms	Lee *et al.*, 1980 Patton *et al.*, 1998 USFWS, 1993a
Sicklefin Chub *Machrybopsis meeki*	USFS R2-S SDGFP-ST	drainage record-SD	consistent heavily turbid, warm waters; shallows in strong currents in Missouri River	Lee *et al.*, 1980 SDNHDB, 1998
Finescale Dace *Phoxinus neogaeus*	SDGFP-ST	drainage record-WY WNDDB record-WY county	small boggy creeks and lakes, beaver ponds	Lee *et al.*, 1980 Patton *et al.*, 1998 WNDDB, 1999
Longnose Sucker *Catostomus catostomus*	SDGFP-ST	drainage record-SD	common in clear, cold waters	Lee *et al.*, 1980 USFWS, 1993a
Plains Topminnow *Fundulus sciadicus*	USFS R2-S SDGFP-ST	drainage record-WY drainage record-SD SDNHDB record-SD county	small to medium size clear, sandy-rocky bottom streams with moderate to rapid flow; quiet pools and backwaters	Lee *et al.*, 1980 Patton *et al.*, 1998 USFWS, 1993a Simpson/Chapman 1993 SDNHDB, 1999
Plants				
American Trailplant *Adenocaulon bicolor*	USFS R2-S WNDDB-S1 BLM-SC	WNDDB record-WY county	moist woods and ravines in Crook County	WNDDB, 1999 Dorn, 1992
Slender False-Foxglove *Agalinis tenuifolia* var. *parviflora*	WNDDB-S1 NPS-SC	WNDDB record-WY county	woods and canyons, peripheral in WY	WNDDB, 1999 Dorn, 1992
Tall Hairy Groovebur *Agrimonia gryposepala*	WNDDB-S1	WNDDB record-WY county	woods and canyons in Crook County	WNDDB, 1999 Dorn, 1992
Virginia Anemone *Anemone virginiana*	WNDDB-S1	WNDDB record-WY county	meadows and thickets in Crook County	WNDDB, 1999 Dorn, 1992
Small-flower Columbine *Aquilegia brevistyla*	WNDDB-S1 BLM-SC	WNDDB record-WY county	woods and streambanks, Weston County	WNDDB, 1999 Dorn, 1992
Laramie Columbine *Aquilegia laramiensis*	USFS R2-S BLM-SC WNDDB-S2	WNDDB record-WY county	granite rock crevices, endemic to WY-Converse County	WNDDB, 1999 Dorn, 1992
Prairie Three-awn *Aristida oligantha*	USFS-SC WNDDB-S1S2	WNDDB record-WY county	sandy or shaley areas in Weston County; peripheral in WY, on TBNG	WNDDB, 1999 Dorn, 1992
Whorled Milkweed *Asclepias verticillata*	WNDDB-S1	WNDDB record- WY county	plains and open woods in Crook County	WNDDB, 1999 Dorn, 1992

Table 3-86
Continued

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats in Wyoming and South Dakota	Source
Barr's Milkvetch *Astragalus barrii*	WNDDB-S3 SDNHDB-S3	WNDDB record-WY county SDNHDB record-SD county	on clay hills on northeast WY, endemic in WY; present in Custer and Shannon counties, SD	WNDDB, 1999 SDNHDB, 1999 Dorn, 1992
Long-stalked Racemose Milkvetch *Astragalus racemosus* var. *longiseta*	BLM-SC WNDDB-S1	WNDDB record-WY county	plains and hills in Niorbrara County, peripheral in WY	WNDDB, 1999 Dorn, 1992
Bun Milkvetch *Astragalus simplicifolius*	WNDDB-S3	WNDDB record-WY county	barren hills and ridges in northeastern and central-eastern WY, endemic to WY	WNDDB, 1999 Dorn, 1992
Dissected Bahia *Bahia dissecta*	USFS-SC WNDDB-S1S2	WNDDB record-WY county	gravelly hills, peripheral in WY	WNDDB, 1999 Dorn, 1992
Hairy gramma *Bouteloua hirsuta* var. *hirsuta*	BLM-SC WNDDB-S1	WNDDB record-WY county	plains and hills, peripheral in WY	WNDDB, 1999 Dorn, 1992
Fox-tail Sedge *Carex alopecoidea*	USFS R2-S SDNHDB-S2	unknown-SD WY county	wet meadows in Crook Count, WY; historical presence in Brookings County, SD	SDNHDB, 1998 Dorn, 1992
Emory's Sedge *Carex emoryi*	WNDDB-S1	WNDDB record-WY county	wet places in Crook County	WNDDB, 1999 Dorn, 1992
Smooth Goosefoot *Chenopodium subglabrium*	BLM-SC WNDDB-S2	WNDDB record-WY county	sandy places, peripheral in WY	WNDDB, 1999 Dorn, 1992
Wyoming Dodder *Cuscuta plattensis*	BLM-SC WNDDB-S1	WNDDB record-WY county	forbs and shrubs in Converse County, regional endemic in WY	WNDDB, 1999 Dorn, 1992
Red-root Flatsedge *Cyperus erythrorhizos*	BLM-SC WNDDB-S1	WNDDB record-WY couny	wet areas in Crook County	WNDDB, 1999 Dorn, 1992
Nine-anther Prairie-clover *Dalea enneandra*	BLM-SC WNDDB-S1	WNDDB record-WY county	plains, hills and roadsides in Crook, Weston counties; peripheral in WY	WNDDB, 1999 Dorn, 1992
Sim-leaf Witchgrass *Dichanthelium linearifolium*	USFS-SC WNDDB-S1	WNDDB record-WY county	disjunct population in WY	WNDDB, 1999
Interrupted Wildrye *Elymus diversiglumis*	WNDDB-S1	WNDDB record-WY county	hills and open woods in Crook County	WNDDB, 1999 Dorn, 1992
Slender Wildrye *Elymus villosus*	WNDDB-S1	WNDDB record-WY county	woods and canyons in Crook County	WNDDB, 1999 Dorn, 1992
Dwarf Scouring Rush *Equisetum scirpoides*	USFS R2-S BLM-SC WNDDB-S1	WNDDB record-WY county	moist, often wooded areas in Crook County	WNDDB, 1999 Dorn, 1992
Dakota vervain *Glandularia bipinnatifida*	WNDDB-S1 BLM-SC	WNDDB record-WY county	plains and hills in Crook County	WNDDB, 1999 Dorn, 1992
Plains Frostweed *Helianthemum bicknellii*	WNDDB-S1	WNDDB record-WY county	sandy hills and open woods in Crook County	WNDDB, 1999 Dorn, 1992

Table 3-86
Continued

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats in Wyoming and South Dakota	Source
Sidesaddle Bladderpod *Lesquerella arenosa* var *argillosa*	BLM-SC USFS-SC WNDDB-S1	WNDDB record-WY county	in Crook, Weston counties; regional endemic in WY	WNDDB, 1999 Dorn, 1992
Great Blue Lobelia *Lobelia siphilitica*	WNDDB-S1	WNDDB record-WY county	wet places, peripheral in WY	WNDDB, 1999 Dorn, 1992
Texas Spreading Loeflingia *Loeflingia squarrosa* var *texana*	BLM-SC WNDDB-S1 SDNHDB-SU	WNDDB record-WY county SDNHDB record-SD county	local disjunct population on sandy plains in Crook, Weston counties	WNDDB, 1999 SDNHDB, 1999 Dorn, 1992
Treelike Clubmoss *Lycopodium dendroideum*	USFS R2-S WNDDB-S1	WNDDB record-WY county	wood and moist places in Crook County	WNDDB, 1999 Dorn, 1992
Spring Forget-me-not *Myosotis verna*	WNDDB-S!	WNDDB record-WY county	open sandy areas in Crook County	WNDDB, 1999 Dorn, 1992
Cut-leaved Evening-primrose *Oenothera laciniata*	WNDDB-S1	WNDDB record-WY county	sandy places in Crook County	WNDDB, 1999 Dorn, 1992
Alpine Fever-few *Parthenium alpinum*	USFS R2-S WNDDB-S3	WNDDB record-WY county	regional endemic to WY	WNDDB, 1999
Crown-seed Fetid-marigold *Pectis angustifolia*	USFS-SC WNDDB-S1	WNDDB record-WY county	scoria hills and sandy places; peripheral in WY, on TBNG	WNDDB, 1999 Dorn, 1992
Whorled Milkwort *Polygala verticillata*	BLM-SC WNDDB-S1	WNDDB record-WY county	hills and woods, northeast WY	WNDDB, 1999 Dorn, 1992
Cottongrass Bulrush *Scirpus atrocinctus*	USFS R2-S BLM-SC WNDDB-S1	WNDDB record-WY county	wet places in Crook County	WNDDB, 1999 Dorn, 1992
Waxleaf Meadow-rue *Thalictrum revolutum*	WNDDB-S1	WNDDB record-WY county	disjunct population in Crook, Weston counties	WNDDB, 1999 Dorn, 1992
Prairie Violet *Viola pedatifida*	WNDDB-S1	WNDDB record-WY county	plains, hills and open woods in Crook County	WNDDB, 1999 Dorn, 1992

Table 3-86
Concluded

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats in Wyoming and South Dakota	Source

1 = Status: USFWS-SC: US Fish and Wildlife Service Species of Concern.
USFS R2-S: US Forest Sevice, Region 2: Sensitive Species.
MIS-TBNG: US Forest Service Management Indicator Species on Thunder Basin National Grassland.
WGFD-SSC1, 2, 3 or 4: Wyoming Game and Fish Department Species of Special Concern (Oakleaf *et al.,* 1996
Priority 1: populations greatly restricted or declining-extirpation appears possible.
Priority 2: populations are declining or restricted in numbers and/or distribution-extirpation not imminent.
Priority 3: species is widely distributed; population status and trends are unknown but are suspected to be stable.
Priority 4: populations are stable or increasing and not restricted in numbers and/or distribution.
SDGFP-SE: South Dakota Department of Game, Fish and Parks State Endangered Species.
SDGFP-ST: South Dakota Department of Game, Fish and Parks State Threatened Species.
SDGFP-R: South Dakota Department of Game, Fish and Parks State Rare Species.
BLM-SC: BLM sensitive species/species of concern.
WNDDB and/or SDNHDB-S1, S2, S3: Wyoming Natural Diversity Database and/or South Dakota Natural Heritage Database State Ranks:
S1 - Critically imperiled in WY and/or SD because of extreme rarity (5 or fewer occurrence, or very few remaining individuals) or because of some factor of its biology making it especially vulnerable to extinction (critically endangered in state).
S2 - Imperiled in WY and/or SD because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extinction throughout its range (endangered in state).
S3 - Rare in WY and/or SD (on the order of 20+ occurrences) (threatened in state).

2 = Local Occurrence: unknown - indicates the species range overlaps in the degree block encompassing the project (Luce *et al.*, 1997) but no specific occurrences are known.
WNDDB record - records from Wyoming Natural Diversity Database indicate species is in Campbell, Converse, Niobrara and/or Weston Counties.
SDNHDB record- records from South Dakota Natural Heritage Databse indicte species is in Custer, Fall River, and/or Pennington Counties.
NBS/BBS record - records that species occurs on at least one National Biological Survey, Breeding Bird Survey Route in one of the counties, above.

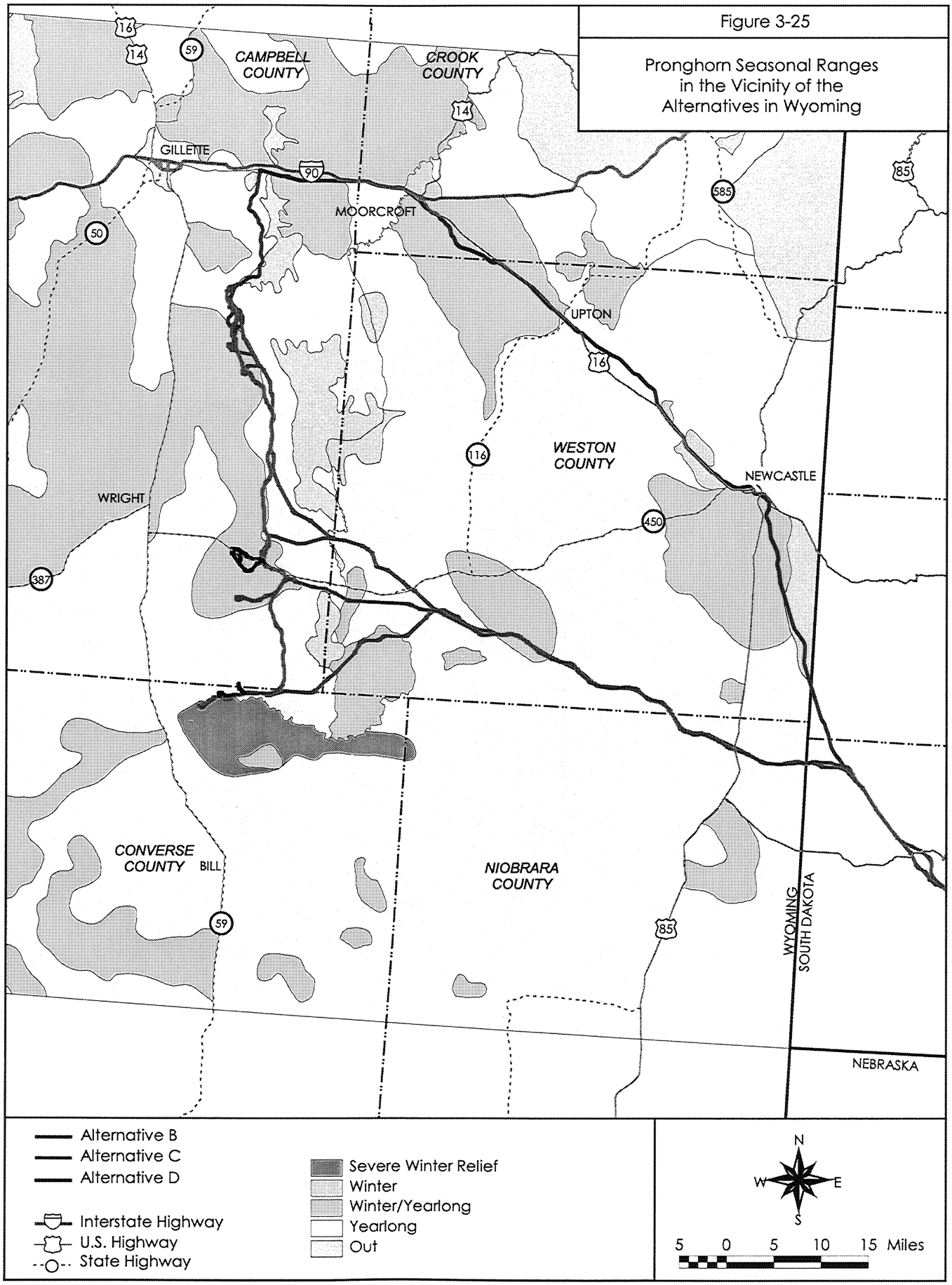

Figure 3-25

Pronghorn Seasonal Ranges in the Vicinity of the Alternatives in Wyoming

Table 3-87
Big Game Populations, Hunt Area Harvest and Occupied Seasonal Ranges Which Would be Crossed by the Alternatives in Wyoming

Big Game Species	Population Herd Unit	1998 Post-Harvest Population Objective	1997 Post-Harvest Population Estimate	Apparent Population Trend	Hunt Area	1997 Harvest in Hunt Area	Seasonal Ranges in Hunt Area Coinciding with the Project (1)	Authority
Pronghorn	North Black Hills	14,000	10,255	Increasing	3	320	WIN	Oedekoven, 1998a
					19	625	WIN, WYL	
	Highlight	11,000	9,281	Decreasing	24	361	YRL, WYL	Oedekoven, 1998b
	Thunder Basin	8,000	5,890	Decreasing	7	718	YRL, WYL	Anderson, 1998a
	South Black Hills	3,000	1,760	Increasing	4	117	WYL	Anderson, 1998b
					5	154	YRL. WIN	
	Lance Creek	27,000	22,994	Increasing	6	369	YRL, WYL	Kroger, 1998a
					8	590	YRL, SWR	
					27	385	YRL, WYL, SWR	
Mule Deer	Thunder Basin	13,000	13,969	Increasing	7	177	YRL, WYL	Anderson, 1998c
					8	309	YRL, WYL	
					9	148	YRL, WYL	
					10	135	YRL, WYL	
					11	295	YRL, WYL	
					21	241	YRL	
	Black Hills	20,000	15,351	Increasing	3	232	YRL	Anderson, 1998d
					5	122	YRL	
					6	240	WYL, Crucial WYL	
	Powder River	52,000	40,711	Increasing	18	1,025	YRL	Oedekoven, 1998c
White-Tailed Deer	Black Hills	40,000	21,090	Increasing	3	156	YRL	Anderson, 1998e
					5	86	YRL	
					6	61	WYL, Crucial WYL	
	Thunder Basin	1,750	no data	unknown	7	0	YRL	Kroger, 1998b
					8	4	YRL	
					9	15	YRL	
					10	19	YRL	

Table 3-87
Concluded

Big Game Species	Population Herd Unit	1998 Post-Harvest Population Objective	1997 Post-Harvest Population Estimate	Apparent Population Trend	Hunt Area	1997 Harvest in Hunt Area	Seasonal Ranges in Hunt Area Coinciding with the Project (1)	Authority
White-Tailed Deer	Thunder Basin	17,50	no data	unknown	11	105	YRL	Kroger, 1998b
					21	24	YRL	
Elk	Rochelle Hills	400	371	Increasing	113	0	YRL, WYL, Crucial WIN, PAR	Oedekoven, 1998d
					123	0	YRL, WYL, Crucial WIN, PAR	
	Black Hills	500	no data	unknown	117	68	none	Anderson, 1998f

Notes:
1 = Any ranges designated as crucial by WGFD are those areas which determine whether a population maintains and reproduces itself at or above the WGFD population objective over the long term (Wildlife Society, 1990):
YRL: Yearlong ranges, used by a population or portion in suitable habitats on a year-round basis, except perhaps under extreme conditions (i.e. winter).
WYL: Winter-yearlong ranges are occupied throughout the year but during winter they are utilized by additional animals that migrate from other seasonal ranges.
WIN: Winter ranges are used by substantial numbers of animals only during the winter period (11/15 - 4/30).
SWR: Severe winter relief ranges are documented survival ranges, crucial or non-crucial, used in occasionally extremely severe winters but may lack habitat characteristics that would make them attractive or capable of supporting major portions of the population during years with normal conditions.
PAR: Parturition areas used by more than a few females of the population for giving birth.
OUT: The area is not occupied by animals during any time of year.

Table 3-88
Miles of Seasonal Ranges Used by Big Game Populations in Wyoming Which Would be Crossed by Alternative B

Big Game Species and Herd Unit	Seasonal Range Affected (1)	Miles Crossed by Land Ownership				
		Forest Service	BLM	State	Private	Total
Pronghorn North Black Hills Herd Unit - 339	not affected	--	--	--	--	--
Pronghorn Highlight Herd Unit - 316	WYL	2.4	1.1	0.7	12.1	16.3
	YRL	3.8	0.3	1.6	32.4	38.1
Pronghorn Thunder Basin - 741	WYL	0	0	0	0	0
	YRL	3.2	0	0	8.5	11.7
Pronghorn South Black Hills Herd Unit -740	not affected	--	--	--	--	--
Pronghorn Lance Creek - 742	SWR	1.8	0	0	0.5	2.3
	WYL	14.3	0	0.6	8.4	23.3
	YRL	10.1	1.0	4.5	43.9	59.5
Pronghorn Totals		35.6	2.4	7.4	105.8	151.2
Mule Deer Thunder Basin - 752	WYL	4.8	0	0	6.2	11.0
	YRL	27.5	1.5	7.4	87.1	123.5
Mule Deer Black Hills - 751	not affected	--	--	--	--	--
Mule Deer Powder River - 319	not affected	--	--	--	--	--
Mule Deer Totals		32.3	1.5	7.4	93.3	134.5
White-Tailed Deer Black Hills - 706	not affected	--	--	--	--	--
White-Tailed Deer Thunder Basin - 702	WYL	0	0	0	0	0
	YRL	1.0	0	0	2.7	3.7
White-Tailed Deer Totals		1.0	0	0	2.7	3.7
Elk Rochelle Hills - 344	Crucial WIN	0.3	0	0	0.1	0.4
	WYL	2.9	0	0	6.8	9.7
	YRL	12.5	0	0.4	8.9	21.8
Elk Totals		15.7	0	0.4	15.8	31.9

1 = Any ranges designated as crucial by WGFD are those areas which determine whether a population maintains and reproduces itself at or above the WGFD population objective over the long term (Wildlife Society, 1990):
YRL: Yearlong ranges, used by a population or portion in suitable habitats on a year-round basis, except perhaps under extreme conditions (ie. winter).
WYL: Winter-yearlong ranges are occupied throughout the year but during winter are utilized by additional animals that migrate from other seasonal ranges.
WIN - Winter ranges are used by substantial numbers of animals only during the winter period (11/15 - 4/30).
SWR - Severe winter relief ranges are documented survival ranges, crucial or non-crucial, used in occasionally extremely severe winters but may lack habitat characteristics that would make them attractive or capable of supporting major portions of the population during years with normal conditions.

elements of pronghorn winter ranges (Cook and Irwin, 1984). Several studies conducted in Wyoming have revealed the influence of water on pronghorn distribution during winter (Irwin *et al.*, 1984) and especially during summer (Sundstrom, 1969 and Alldredge and Deblinger, 1988). These and other studies also emphasized the importance of shrubs, especially sagebrush, in pronghorn diets throughout the year (Severson *et al.*, 1968 and Alldredge and Deblinger, 1988).

In South Dakota, pronghorns are managed mostly on a county-by-county basis. The counties which would be crossed by the alternatives are divided into Hunt Units which are managed for pronghorn harvest (Table 3-91). By far the largest antelope harvest in 1997 was in Fall River County Hunt Unit 127A which covers the western half of the county and extends into southwest Custer County. Although no seasonal ranges have been formally defined, SDGFP biologists have mapped pronghorn use areas intersected by Alternatives B and C in Custer

Table 3-89
Miles of Seasonal Ranges Used by Big Game Populations in Wyoming Which Would be Crossed by Alternative C

Big Game Species and Herd Unit	Seasonal Range Affected (1)	Miles Crossed by Land Ownership				
		Forest Service	BLM	State	Private	Total
Pronghorn North Black Hills Herd Unit - 339	not affected	--	--	--	--	--
Pronghorn Highlight Herd Unit - 316	WYL	3.1	0	1.8	16.3	21.2
	YRL	0.2	0.1	0.6	19.3	20.2
Pronghorn Thunder Basin - 741	not affected	--	--	--	--	--
Pronghorn South Black Hills Herd Unit -740	not affected	--	--	--	--	--
Pronghorn Lance Creek - 742	SWR	2.1	0	0	0.3	2.4
	WYL	9.4	0	1.9	8.0	19.3
	YRL	18.0	1.4	5.3	43.4	68.1
Pronghorn Totals		32.8	1.5	9.6	87.3	131.2
Mule Deer Thunder Basin - 752	WYL	2.5	0	0.7	5.8	9.0
	YRL	26.3	1.4	8.2	67.5	103.4
Mule Deer Black Hills - 751	not affected	--	--	--	--	--
Mule Deer Powder River - 319	not affected	--	--	--	--	--
Mule Deer Totals		28.8	1.4	8.9	73.3	112.4
White-Tailed Deer Black Hills - 706	not affected	--	--	--	--	--
White-Tailed Deer Thunder Basin - 702	WYL	0	0	0	0	0
	YRL	0.2	0	0	1.2	1.4
White-Tailed Deer Totals		0.2	0	0	1.2	1.4
Elk Rochelle Hills - 344	Crucial WIN	2.3	0	0	0.2	2.5
	WYL	3.7	0	0	1.0	4.7
	YRL	12.0	0	1.7	7.7	21.4
Elk Totals		18.0	0	1.7	8.9	28.6

1 = Any ranges designated as crucial by WGFD are those areas which determine whether a population maintains and reproduces itself at or above the WGFD population objective over the long term (Wildlife Society, 1990):
YRL: Yearlong ranges, used by a population or portion in suitable habitats on a year-round basis, except perhaps under extreme conditions (ie. winter).
WYL: Winter-yearlong ranges are occupied throughout the year but during winter are utilized by additional animals that migrate from other seasonal ranges.
WIN - Winter ranges are used by substantial numbers of animals only during the winter period (11/15 - 4/30).
SWR - Severe winter relief ranges are documented survival ranges, crucial or non-crucial, used in occasionally extremely severe winters but may lack habitat characteristics that would make them attractive or capable of supporting major portions of the population during years with normal conditions.

County. Most of Alternative B, a portion of Alternative C, and the W G Flat Variation of Alternative C where they parallel the Cheyenne River and Spring Creek, Custer County, are used by pronghorns in the winter and on a yearlong basis (Tables 3-87, 3-92 and 3-93). Portions of Alternative C and the W G Flat Variation west of Spring Creek pass through areas used by pronghorns yearlong (Table 3-94) and scattered pronghorn annual use is expected along Alternative D (Table 3-96), in western Pennington County (Chambers, 1999). The Phiney Flat Variation of Alternative C avoids most of the pronghorn winter range associated with Spring Creek (Table 3-95). Scattered pronghorn may also occur along Alternative D where it parallels Box Elder Creek east of Rapid City (Tietsort, 1999). No pronghorn seasonal use areas were mapped by SDGFD biologists in Fall River County but some portions of the route alternatives are within winter and yearlong pronghorn ranges (Rice, 1999).

Mule Deer. Alternative B and C in Wyoming coincides with the Thunder Basin Mule Deer Herd Unit, managed by the Casper WGFD District, and would cross

Table 3-90
Miles of Seasonal Ranges Used by Big Game Populations in Wyoming Which Would be Crossed by Alternative D

Big Game Species and Herd Unit	Seasonal Range Affected (1)	Miles Crossed by Land Ownership				
		Forest Service	BLM	State	Private	Total
Pronghorn North Black Hills Herd Unit - 339	WYL	0	0	0	8.3	8.3
Pronghorn Highlight Herd Unit - 316	WYL	3.1	0	2.1	19.0	24.2
	YRL	0.1	0.3	2.3	40.9	43.6
Pronghorn Thunder Basin - 741	WYL	2.6	1.1	1.4	16.4	21.5
	YRL	0	0	0	2.7	2.7
Pronghorn South Black Hills Herd Unit -740	WIN	0	0	0	5.2	5.2
	YRL	3.7	0	1.3	15.5	20.5
Pronghorn Lance Creek - 742	SWR	2.2	0	0	0.3	2.5
	WYL	5.5	0.3	0	14.0	19.8
	YRL	9.5	0	0	8.0	17.5
Pronghorn Totals		26.7	1.7	7.1	130.3	165.8
Mule Deer Thunder Basin - 752	WYL	2.6	0	0	8.5	11.1
	YRL	16.4	1.6	6.8	82.5	107.3
Mule Deer Black Hills - 751	WYL	3.7	0	1.3	20.7	25.7
Mule Deer Powder River - 319	YRL	0	0	0	1.0	1.0
Mule Deer Totals		22.7	1.6	8.1	112.7	145.1
White-Tailed Deer Black Hills - 706	WYL	3.7	0	1.3	20.7	25.7
White-Tailed Deer Thunder Basin - 702	WYL	0	0.3	0	1.7	2.0
	YRL	0.2	0	0.3	9.2	9.7
White-Tailed Deer Totals		3.9	0.3	1.6	31.6	37.4
Elk Rochelle Hills - 344	Crucial WIN	2.3	0	0	0.2	2.5
	WYL	3.7	0	0	1.0	4.7
	YRL	10.1	0	0	6.4	16.5
Elk Totals		16.1	0	0	7.6	23.7

1 = Any ranges designated as crucial by WGFD are those areas which determine whether a population maintains and reproduces itself at or above the WGFD population objective over the long term (Wildlife Society, 1990):
YRL: Yearlong ranges, used by a population or portion in suitable habitats on a year-round basis, except perhaps under extreme conditions (ie. winter).
WYL: Winter-yearlong ranges are occupied throughout the year but during winter are utilized by additional animals that migrate from other seasonal ranges.
WIN - Winter ranges are used by substantial numbers of animals only during the winter period (11/15 - 4/30).
SWR - Severe winter relief ranges are documented survival ranges, crucial or non-crucial, used in occasionally extremely severe winters but may lack habitat characteristics that would make them attractive or capable of supporting major portions of the population during years with normal conditions.

each of 6 hunt areas in the Herd Unit (Table 3-87). The population area covers southeast Campbell County, northern Niobrara County and Weston County with most of the habitats occupied by mule deer (71 percent) under private ownership (Anderson, 1998b). Habitats in the Herd Unit include sagebrush steppe in short grass prairie, ponderosa pine woodlands on rolling hills, drainages with decadent stands of cottonwoods, and alfalfa hay fields in which mule deer are likely to concentrate and cause crop damage (Anderson, 1998b). Seasonal mule deer ranges in the vicinity of the alternatives in Wyoming are shown on Figure 3-26.

Alternative D would cross through the Black Hills Mule Deer Herd Unit, managed by the Casper WGFD District, the Powder River Mule Deer Herd Unit, managed by the Sheridan WGFD District, and the Thunder Basin Herd Unit. Vegetation in those herd units is similar to vegetation in the Thunder Basin Herd Unit except more ponderosa pine and mountain shrub species are present.

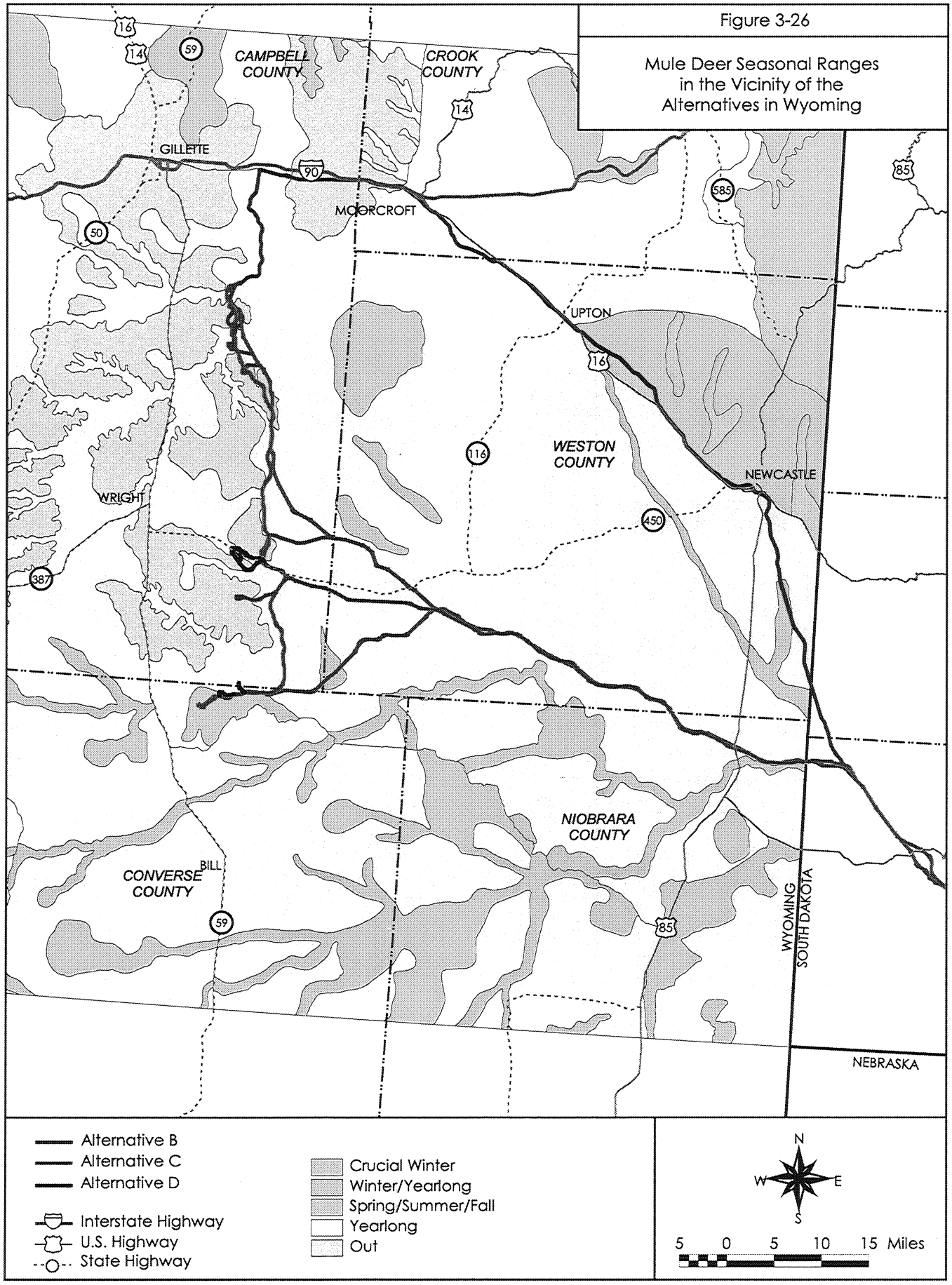
Figure 3-26
Mule Deer Seasonal Ranges in the Vicinity of the Alternatives in Wyoming
CAMPBELL COUNTY
CROOK COUNTY
GILLETTE
MOORCROFT
UPTON
WESTON COUNTY
NEWCASTLE
WRIGHT
NIOBRARA COUNTY
CONVERSE COUNTY
BILL
WYOMING
SOUTH DAKOTA
NEBRASKA
16
14
59
90
50
585
85
116
450
387
Alternative B
Alternative C
Alternative D
Interstate Highway
U.S. Highway
State Highway
Crucial Winter
Winter/Yearlong
Spring/Summer/Fall
Yearlong
Out
N
W
E
S
5 0 5 10 15 Miles

Table 3-91
Big Game Hunt Unit Harvest in Hunt Units Coinciding with the Project Area in South Dakota.

County	1997 Firearm Deer Harvest			1997 Youth Deer Harvest			1997 Deer Muzzle-loader Harvest			1997 Deer Archery Harvest			1997 Firearm Antelope Harvest		1997 Wild Turkey Harvest		
	Hunt Unit	White-Tailed	Mule Deer	Hunt Unit	White-Tailed	Mule Deer	Hunt Unit	White-Tailed	Mule Deer	Hunt Unit	White-Tailed	Mule Deer	Hunt Unit	Total	Hunt Unit	Spring Total	Fall Total
Pennington	302B	113	59	802B	2	0	902B	2	0	702B	4	0	102B	30	102A	112	85
	302C	35	75	802C	2	2	902C	1	1	702C	1	0	102C	103	102B	15	9
	302D	21	57	802D	63	18											
Custer	321A	41	88	821A	1	4	921A	2	0	721A	0	1	121A	148	121A	10	7
Fall River	327A	46	157	827A	2	9	927A	0	6	727A	1	0	127A	220	127A	84	101
	327B	339	473	827B	2	17	927B	0	8	727B	0	4	127B	176			

Source: McPhillips and Schlueter (1998)

Alfalfa hay and winter wheat are cultivated on privately owned, non-timbered lands, especially in the Black Hills Herd Unit (Anderson, 1998c). Alternative B would directly affect WYL and YRL seasonal ranges in the Thunder Basin mule deer herd unit (Table 3-88). Alternative C would also only affect the Thunder Basin herd unit but by 16.6 fewer miles than Alternative B (Table 3-89). Alternative D would pass through all 3 mule deer herd units in the region, Thunder Basin, Black Hills and Powder River (Table 3-90), albeit adjacent to an existing heavy haul railroad (BNSF).

The Thunder Basin Mule Deer population appears to be increasing and the 1997 population estimate indicates it is above the population objective set by WGFD (Anderson, 1998b). Most of Alternatives B and C would cross land occupied by mule deer on a year-long basis (Table 3-87). There are areas, mostly along river drainages (Black Thunder Creek, Beaver Creek, Cheyenne River), classified as winter-year-long (WYL) habitat where mule deer congregate, particularly in the winter. Mule deer in the Powder River and Black Hills herd units suffered winter losses during 1997 (Oedekoven, 1998c; Anderson, 1998c). Since then, both populations appear to be increasing. Alternative D would cross some crucial WYL range south of Newcastle, in Weston County. Although livestock grazing is the principal land use in the Herd Unit, oil fields, bentonite mining and coal mining have been developed in the past and continue to operate but land disturbances have not significantly increased in the past decade (Anderson, 1998b). All of the mine loops would be within the Thunder Basin Mule Deer Herd Unit. The loops would pass through WYL range for 2.1 miles and through YRL range for 8.0 miles. The mine loops would also be within the Rochelle Hills Elk Herd Unit. The loops would pass through WYL range for 0.1 mile and through YRL range for 3.6 miles.

As with pronghorn, there are no defined mule deer populations or seasonal use areas in South Dakota. SDGFP biologists have provided information about seasonal deer use in the vicinity of the project alternatives. In Fall River County, winter and summer use by mule deer and white-tailed deer are expected along the alternatives where they would follow the Cheyenne River, cross ponderosa pine-dominated topography east of Edgemont, Hat Creek west of Heppner, and Horsehead Creek. Mule deer and white-tailed deer also utilize Hay Canyon (Alternative C, Table 3-93) and areas along Sand Creek and the existing tracks (Alternative B, Table 3-92) from Smithwick to Oral during winter and summer (Meadows, 1999). The W G Flat Variation of Alternative C (Table 3-94) avoids Hay Canyon but crosses more deer yearlong range in Fall River County than either Alternative C or Alternative C with the Phiney Flat Route Variation. In Custer County, mule deer concentrate in the Cheyenne River valley during winter and are found year-round along Spring Creek and upland areas coinciding with Alternative C (Table 3-94). The Phiney Flat Variation of Alternative C (Table 3-95) avoids wintering areas associated with Spring Creek and reduces the route distance through deer wintering areas by 6 miles. Mule deer are also found in juniper woodlands in the vicinity of Wall Hill during the year (Tietsort, 1999).

Some year-round mule deer and white-tailed deer use is also expected along the existing track (Alternative D, Table 3-96) north of Oral, in Custer County (Chambers, 1999). White-tailed deer utilize the Box Elder Creek drainage where it parallels Alternative D east of Rapid City through out the year (Tietsort, 1999).

Mule deer and white-tailed deer are managed together on a county-by-county basis. The counties which would be crossed by alternatives are divided into Hunt Units which are managed for mule deer and white-tailed deer harvest, whether by firearms, archery, muzzle loading riffle, or special youth harvests (see Table 3-91). More mule deer and white-tailed deer are harvested than pronghorn in roughly the same geographic area. In the 3-county region, most white-tailed deer and mule deer harvest was in Fall River County Hunt Unit 327B (see Table 3-91) which covers most of the east and southern portion of the county, south of the Cheyenne River.

White-tailed Deer. Alternatives B and C in Wyoming would cross the Thunder Basin White-tailed Deer Herd Unit and would cross 6 of the 12 Hunt Areas in the Herd Unit (see Table 3-87). Except for the Black Hills in northeast Weston and Crook counties, the population area covers most of northeastern Wyoming including Campbell, Weston, Niobrara and eastern Converse counties with most of the area (76 percent) privately owned (Kroger, 1998b). Alternative D would coincide with the Thunder Basin and Black Hills white-tailed deer herd units. Habitats mostly used by white-tailed deer in northeast Wyoming include coniferous forests (ponderosa pine and juniper), cottonwood-dominated riparian zones and agricultural croplands in which they cause crop damage, especially in late summer and early autumn (Kroger, 1998b). Seasonal ranges for white-tailed deer in the vicinity of the alternatives in Wyoming are shown on Figure 3-27.

There are no population estimates for the Thunder Basin White-tailed Deer Herd Unit although there are indications that the population is increasing (Kroger, 1998b). The Black Hills Herd Unit population is estimated to be 21,090 in 1997 (Anderson, 1998e). Alternatives B and C would cross land occupied by white-tailed deer on a year-long basis (Tables 3-88 and 3-89) coinciding mostly with drainages including Antelope Creek, Black Thunder Creek, Beaver Creek, and Cheyenne River. Alternative D would cross YRL, and WYL white-tailed deer ranges in both herd units (Table 3-

Table 3-92
Miles of Seasonal Ranges Used by Big Game Populations in South Dakota Which Would be Crossed by Alternative B

Big Game Species and County	Seasonal Range Affected (1)	Miles Crossed by Land Ownership				
		Forest Service	BLM	State	Private	Total
Pronghorn Fall River	None Identified	--	--	--	--	--
Pronghorn Custer	Winter	1.4	0	0	10.8	12.2
	Yearlong	3.9	0	0	6.5	10.4
Pronghorn Pennington	Winter	1.8	0	0	0.6	2.4
	Yearlong	0	0	0	0	0
Pronghorn Totals		7.1	0	0	17.9	25.0
Mule Deer - White-tailed Deer Fall River	Winter	0	0	0	0	0
	Yearlong	0	1.2	0.5	33.7	35.4/2
Mule Deer - White-tailed Deer Custer	Winter	13.7	0	1.2	22.8	37.7
	Yearlong	13.7	0	1.2	25.5	40.4
Mule Deer - White-tailed Deer Pennington	Winter	1.5	0	0	0.6	2.1
	Yearlong	2.6	0.9	0	15.5	19.0
Mule Deer - White-tailed Deer Totals		31.5	2.1	2.9	98.1	134.6 (2)

1 = Seasonal ranges identified by SDGFP personnel in written and oral communications.
2 = Total does not include 0.3 mile through yearlong range on land owned by DOE.

Table 3-93
Miles of Seasonal Ranges Used by Big Game Populations in South Dakota Which Would be Crossed by Alternative C

Big Game Species and County	Seasonal Range Affected (1)	Miles Crossed by Land Ownership				
		Forest Service	BLM	State	Private	Total
Pronghorn Fall River	None Identified	--	--	--	--	--
Pronghorn Custer	Winter	0.4	0	0	11.4	11.8
	Yearlong	3.3	0	0	24.0	28.1
Pronghorn Pennington	Winter	1.6	0	0	0.8	2.4
	Yearlong	0	0	0	0	0
Pronghorn Totals		5.3	0	0.8	36.2	42.3
Mule Deer - White-tailed Deer Fall River	Winter	0	0	0	0.1	0.1
	Yearlong	0	1.6	0.5	22.6	24.7
Mule Deer - White-tailed Deer Custer	Winter	1.8	0	0.8	28.4	31.0
	Yearlong	2.7	0	0	23.2	25.9
Mule Deer - White-tailed Deer Pennington	Winter	1.4	0	0	0.8	2.2
	Yearlong	2.5	0.8	0	15.8	19.1
Mule Deer - White-tailed Deer Totals		8.4	2.4	1.3	90.9	103.0

1 = Seasonal ranges identified by SDGFP personnel in written and oral communications.

Table 3-94
Miles of Seasonal Ranges Used by Big Game Populations in South Dakota Which Would be Crossed by Alternative C With the W G Flat Route Variation

Big Game Species and County	Seasonal Range Affected (1)	Miles Crossed by Land Ownership				
		Forest Service	BLM	State	Private	Total
Pronghorn Fall River	None Identified	--	--	--	--	--
Pronghorn Custer	Winter	0.4	0	0	12.0	12.4
	Yearlong	3.3	0	0.8	24.0	28.1
Pronghorn Pennington	Winter	1.6	0	0	0.8	2.4
	Yearlong	0	0	0	0	0
Pronghorn Totals		5.3	0	0.8	36.8	42.9
Mule Deer - White-tailed Deer Fall River	Winter	0	0	0	0	0
	Yearlong	0	1.7	0.5	28.4	30.6
Mule Deer - White-tailed Deer Custer	Winter	1.8	0	0.8	28.6	31.2
	Yearlong	2.7	0	0	24.1	26.8
Mule Deer - White-tailed Deer Pennington	Winter	1.4	0	0	0.8	2.2
	Yearlong	2.5	0.8	0	15.8	19.1
Mule Deer - White-tailed Deer Totals		8.4	2.5	1.3	97.7	109.9

1 = Seasonal ranges identified by SDGFP personnel in written and oral communications.

Table 3-95
Miles of Seasonal Ranges Used by Big Game Populations in South Dakota Which Would be Crossed by Alternative C With the Phiney Flat Route Variation

Big Game Species and County	Seasonal Range Affected (1)	Miles Crossed by Land Ownership				
		Forest Service	BLM	State	Private	Total
Pronghorn Fall River	None Identified	--	--	--	--	--
Pronghorn Custer	Winter	0	0	0	4.2	4.2
	Yearlong	3.3	0	0.8	31.6	35.7
Pronghorn Pennington	Winter	1.2	0	0	0.8	2.0
	Yearlong	0	0	0	0	0
Pronghorn Totals		4.5	0	0.8	36.6	41.9
Mule Deer - White-tailed Deer Fall River	Winter	0	0	0	0.1	0.1
	Yearlong	0	1.6	0.5	22.6	24.7
Mule Deer - White-tailed Deer Custer	Winter	1.4	0	0.8	22.5	24.7
	Yearlong	2.2	0	0	24.5	26.7
Mule Deer - White-tailed Deer Pennington	Winter	1.0	0	0	1.0	2.0
	Yearlong	2.0	0.8	0	16.1	19.0
Mule Deer - White-tailed Deer Totals		6.6	2.4	1.3	86.8	97.2

1 = Seasonal ranges identified by SDGFP personnel in written and oral communications.

Table 3-96 Miles of Seasonal Ranges Used by Big Game Populations in South Dakota Which Would be Crossed by Alternative D						
Big Game Species and County	Seasonal Range Affected (1)	Miles Crossed by Land Ownership				
		Forest Service	BLM	State	Private	Total
Pronghorn Fall River	None Identified	--	--	--	--	--
Pronghorn Custer	Winter	0	0	0	0	0
	Yearlong	0	0	0.2	24.8	25.0
Pronghorn Pennington	Winter	0	0	0	0	0
	Yearlong	0	0	0	0	0
Pronghorn Totals		0	0	0.2	24.8	25.0
Mule Deer - White-tailed Deer Fall River	Winter	0	0	0	0	0
	Yearlong	0	0.8	0	19.6	20.4
Mule Deer - White-tailed Deer Custer	Winter	0	0	0	0	0
	Yearlong	0	0	0	0	0
Mule Deer - White-tailed Deer Pennington	Winter	0	0	0	0	0
	Yearlong	0	0	0	41.1	41.1
Mule Deer - White-tailed Deer Totals		0	0.8	0	60.7	61.5
1 = Seasonal ranges identified by SDGFP personnel in written and oral communications.						

90). All of the proposed mine loops would be within the Thunder Basin White-tailed Deer Herd Unit. The loops would pass through YRL range for 1.5 miles.

Although there are no defined white-tailed deer populations in South Dakota, SDGFD biologists have provided maps of where mule deer and white-tailed deer are expected. However, they did not distinguish between mule deer ranges and white-tailed deer ranges in all counties so both species were combined in Tables 3-92 through 3-96. White-tailed deer occur year-round along the Cheyenne River in Pennington, Custer and Fall River counties. They also inhabit riparian areas associated with Spring Creek, Battle Creek, Hay Canyon, Sand Creek, Horsehead Creek and Hat Creek (Meadows, 1999 and Chambers, 1999). The W G Flat Route Variation and Phiney Flat Route Variation of Alternative C would avoid white-tailed deer ranges in Hay Canyon and Spring Creek, respectively. Along Alternative D, white-tailed deer are commonly found in the riparian zone of Box Elder Creek, east of Rapid City (Tietsort, 1999).

Elk. Except for captive elk held on private lands east of Edgemont in Fall River County, none of the alternatives in South Dakota cross habitats that are occupied by elk (Meadows, 1999).

In Wyoming, Alternatives B and C would cross one elk population area, the Rochelle Hills Elk Herd Unit (Table 3-88 and Table 3-89) that is in southeast Campbell County, southwest Weston County, and north central Converse County (Oedekoven, 1998b). Elk were transplanted to the area nearly 50 years ago and the population has been growing slowly and now are estimated to be nearly 400 animals. Elk utilize ponderosa pine woodlands and savannah in the Rochelle Hills interspersed with sagebrush and short grass prairie. Most of the areas used by elk are on the TBNG (Oedekoven, 1998b). Alternative D would pass near a portion of the Black Hills Elk Herd Unit, crossing Hunt Area 117 southeast of Newcastle in Weston County but it would not affect any seasonal ranges in that herd unit (Table 3-90). Currently, WGFD is unable to estimate population size for this herd: elk tend to be widely dispersed during winter and occupy ranges where they are obscured by conifers (Anderson, 1998f). Seasonal ranges used by elk in the vicinity of the alternatives is shown on Figure 3-28.

In addition to year-long and winter-year-long ranges, Alternatives B and C would cross crucial winter ranges (Table 3-88, Table 3-89). Alternative B would cross elk parturition areas where cows congregate to give birth (see Figure 3-28). Occupied elk habitats have been affected by energy exploration and developments and there is concern about vehicle accidents, poaching and harassment during critical winter and calving periods (Oedekoven, 1998b).

Mountain Lion. In Wyoming, the alternatives would cross Mountain Lion Hunt Area 21 which covers nearly one-quarter of northeast Wyoming, excluding the Black Hills in Crook and northeastern Weston counties. In 1997, WGFD maintained a harvest quota of 2 mountain lions but none were killed (Rothwell, 1998a); one was harvested in 1996 (Rothwell, 1997). WGFD WOS indicate mountain lions have been seen occasionally in

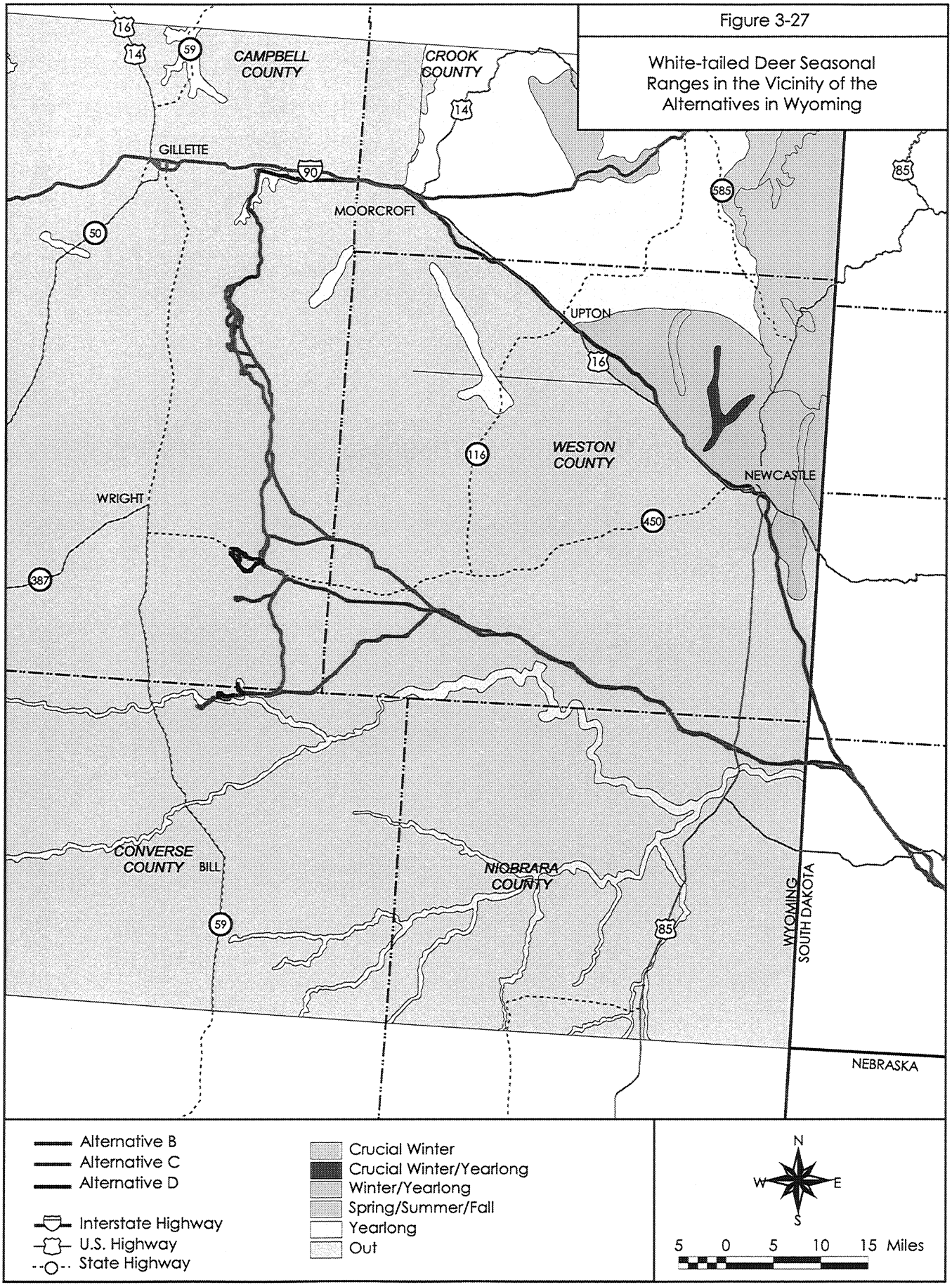

Figure 3-27

White-tailed Deer Seasonal Ranges in the Vicinity of the Alternatives in Wyoming

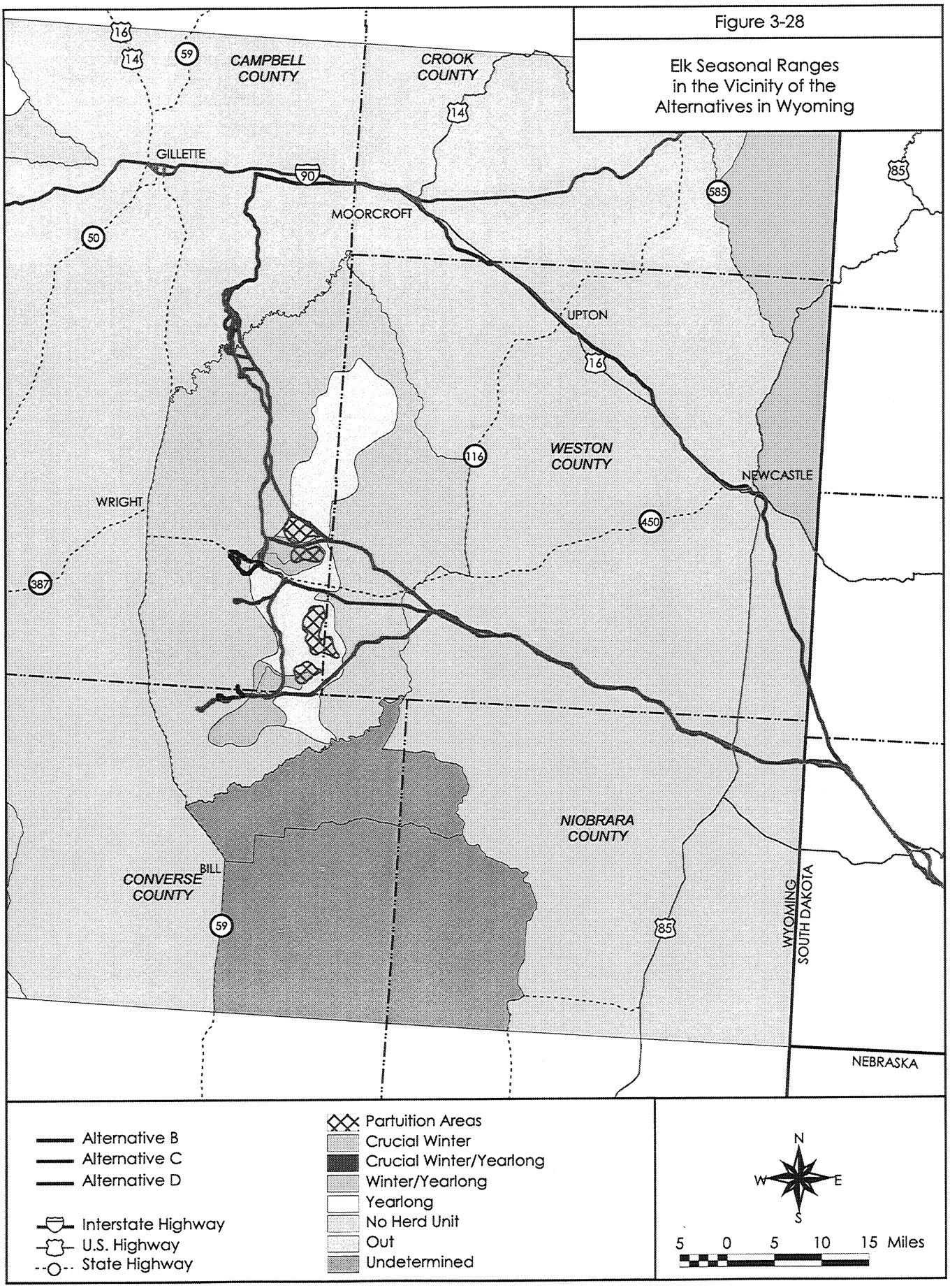

Figure 3-28

Elk Seasonal Ranges in the Vicinity of the Alternatives in Wyoming

the vicinity of Newcastle, northeastern Weston County and once in 1980 near coal mines in eastern Campbell County.

Waterfowl, Upland Game Birds, Furbearers, Small Game

Waterfowl. All alternatives in Wyoming would cross one WGFD Waterfowl Management Area, WFMA 1A (Rothwell, 1998b) for which harvest data on geese and ducks are documented (Table 3-97). This WFMA covers Weston and Crook counties and most of Campbell, Converse and Niobrara counties where the Cheyenne River and its tributaries serve as important nesting habitat and migratory/staging habitats, especially during fall. No waterfowl harvest data are available for the area which would be crossed by the alternatives in South Dakota.

Species of migratory waterfowl inhabiting the area which would be affected by the alternatives have been documented during breeding bird surveys coordinated through NBS (Sauer *et al.*, 1997) and provide data on species' occurrence and abundance during the spring breeding period for at least the past decade (Table 3-98). Data reported from 10 NBS breeding bird survey routes in Wyoming indicate the most common waterfowl species observed are green-winged teal, mallard, blue-winged teal, northern pintail, northern shoveler, gadwall, and American wigeon. Only rarely were Canada geese, cinnamon teal, common goldeneye, ruddy duck, common merganser and American coots reported.

Likewise, there are 7 breeding bird survey routes in South Dakota that suggest migratory waterfowl are more common there. Canada geese, green-winged teal, mallard, northern pintail, blue-winged teal, northern shoveler, gadwall, American wigeon, ruddy ducks and American coots were reported on most of the South Dakota routes. Cinnamon teal, redheads, lesser scaup and wood duck were observed less frequently. The Cheyenne River and its tributaries provide most of the nesting and staging habitat for waterfowl in the project area of South Dakota.

Upland Game Birds. In Wyoming, Alternatives B and C would cross 2 Upland and Small Game Management Areas - USGMA numbers 36 (Niobrara) and 39 (Belle Fourche). Alternative D would cross USGFMA numbers 44 (Black Hills) and 43 (Weston). Eight upland game bird species are harvested in those areas, combined, and include pheasant, chukar partridge and gray partridge, sage grouse, sharp-tailed grouse, ruffed grouse and mourning doves (Table 3-97). Wild turkeys in the Black Hills Hunt Area are also harvested in Wyoming. Mourning doves, also upland game birds, may occur near the alternatives and have been regularly observed in NBS surveys.

In South Dakota, turkeys are classified as big game species and, as in Wyoming, are harvested during spring and fall (see Table 3-91). Turkeys in South Dakota occur along the Cheyenne River, Spring Creek and Hay Canyon and have year-round roosts there, mainly in cottonwoods, as well as along Lame Johnny Creek, French Creek and Battle Creek (Chambers, 1999). During winters, turkeys tend to be more concentrated in roosts in those drainages (Rice, 1999). Turkeys also utilize juniper woodlands on Wall Hill and are found along Box Elder Creek (Tietsort, 1999). Gray partridge, pheasant, sage grouse, sharp-tailed grouse, mourning dove, common snipe and turkeys were upland game birds reported on at least 1 of 7 breeding bird survey routes in South Dakota (see Table 3-98). Pheasants were observed on 5 out of 7 routes and mourning doves have been regularly observed on all 7 NBS survey routes in South Dakota.

Turkeys in South Dakota are opportunistic feeders, eating a variety of insects as well as plant materials: acorns, corn, oats and grass seeds (Laudenslager and Flake, 1978). Hens with young depend heavily on insects but grazing by livestock reduces herbaceous plant cover with diminished abundance of invertebrates (Rumble and Anderson, 1993). As with other gallinaceous birds, turkeys nest on the ground and are dependent on dense brush and/or tall grass to conceal nests from predators (Schroeder, 1985).

Sage grouse are the most common and important game bird in most of Wyoming, but sage grouse populations - indicated by harvests - have declined throughout Wyoming over the past 20 years (Heath *et al.,* 1997). So too, have sage grouse harvests declined in 3 of the 4 USGMAs that would be crossed by the alternatives (Table 3-94).

Suitable sage grouse nesting habitats include areas within 0.5 to 3 miles from leks (Pyrah, 1971; Wallestad and Pyrah, 1974; Martin, 1976; Braun *et al.*, 1977), but sage grouse may nest up to 12 miles from the lek where they were captured (Heath *et al.*, 1997). Three important habitat components for sage grouse include strutting/nesting grounds, brood rearing areas, and wintering areas. Not every lek that has been identified in Wyoming is currently active or has been monitored within the past several years to determine current level of use. And, there may be some areas which would be crossed by the alternatives that have not been surveyed for leks recently and extensive searches for leks in South Dakota have, for the most part, not been conducted.

Sage grouse typically nest on the ground beneath sagebrush 15 to 22 inches tall (Braun *et al.*, 1977) and depend on sufficient sagebrush canopy cover for nest concealment (Pyrah, 1971). Sage grouse chicks consume insects and forbs (Peterson, 1970; Wallestad, 1975) and consumption of water is dependent on forb succulence

Table 3-97 Game Species Harvest in Waterfowl Management Areas and Upland and Small Game Management Areas that Would be Crossed by the Alternatives in Wyoming			
Game Species Category	**Management Area**	**Game Species**	**1997 Harvest of Species in Management Area**
Waterfowl	WFMA 1A - Missouri, Little Powder River	Geese	127
		Ducks	1,293
Upland Game Birds	USGMA 36 - Niobrara	Pheasant	212
		Chukar Partridge	42
		Sage Grouse	0
		Sharp-Tailed Grouse	14
		Mourning Doves	14
	USGMA 39 - Belle Fourche	Pheasant	56
		Gray Partridge	70
		Sage Grouse	70
		Sharp-Tailed Grouse	127
		Mourning Dove	318
	USGMA 43 - Weston	Gray Partridge	91
		Sharp-Tailed Grouse	275
		Mourning Dove	466
	USGMA 44 - Black Hills	Ruffed Grouse	106
		Sage Grouse	176
		Sharp-Tailed Grouse	190
		Mourning Dove	282
Wild Turkey	Hunt Area 1 - Black Hills	Spring Harvest	511
		Fall Harvest	64
Small Game	USGMA 36 - Niobrara	Cottontail	311
	USGMA 39 - Belle Fourche	Cottontail	685
		Squirrel	106
	USGMA 43 - Weston	Cottontail	14
	USGMA 44 - Black Hills	Cottontail	98
		Squirrel	70
Rothwell (1998b)			

(Wallestad, 1971). During summer, sage grouse tend to stay within 1.5 miles of water where meadow and/or riparian areas along intermittent and perennial streams and playas are important brood-rearing habitats (Hayden-Wing *et al.*, 1985). Recent studies have shown that limited herbaceous vegetative cover (grasses and forbs) is significantly related to nest failure, usually due to predators. These studies point to the influence of livestock grazing on sage grouse reproductive success (Gregg *et al.*, 1994; Heath *et al.*, 1997; Sveum *et al.*, 1998).

Harvests of other game bird species in the project area show varying trends (Table 3-99). In the past 8 years, pheasants were only harvested in 1997. Chukar partridge and gray partridge have been harvested intermittently. While mourning dove harvests in USGMA 39, 43 and 44 have been erratic, harvests in USGMA 36 have declined dramatically since 1995. Sharp-tailed grouse harvests have also been quite variable and in some years, no harvest occurred in some areas. Ruffed grouse have only been harvested in the Black Hills USGMA 44.

In Wyoming WGFD biologists have documented 14 sage grouse leks within 1 mile of Alternative B (Table 3-100), 10 sage grouse leks within 1 mile of Alternative C (Table 3-101), and 9 sage grouse leks within 1 mile of Alternative D (Table 3-102). There are no sage grouse leks within 2 miles of any of the proposed mine loops.

Table 3-98
Number of Bird Species Observed on Breeding Bird Survey Routes in Wyoming and South Dakota

County and State	Breeding Bird Survey Route and Number	Number of Species Observed in General Group or Habitat Category									
		Wading & Water Birds	Waterfowl	Shorebirds	Raptors	Upland Game Birds	Grassland Species	Shrubland Species	Riparian Shrub & Forest	Coniferous Woodland Species	Cliffs &- Canyon Species
Campbell WY	Piney-92047	1	3	2	8	3	9	10	9	6	2
	Highlight-92067	1	6	2	6	3	10	7	6	4	2
Converse WY	Bill-92013	0	4	1	6	2	9	6	7	3	2
Crook WY	Government Valley-92150	2	1	3	5	5	7	6	14	8	1
Niobrara WY	Redbird-92014	0	1	2	8	0	9	10	18	8	1
	Riverview-92068	2	10	2	10	2	7	7	11	4	2
Weston WY	Upton-92049	2	8	4	7	4	7	8	10	6	2
	Newcastle-92069	3	8	3	8	3	9	8	13	11	2
	Raven-92070	0	2	1	7	4	7	8	13	8	2
	Hampshire-92214	0	0	2	2	1	7	8	8	6	2
Custer SD	Hazelrodt-81905	0	1	2	4	4	9	7	17	24	3
	Pleasant Valley-81046	0	0	1	5	2	2	4	9	18	2
Fall River SD	Pioneer-81900	5	10	4	6	3	8	5	10	0	0
	Cottonwood-81901	4	12	6	9	1	7	7	12	2	1
Haakon SD	Ottumwa-81030	6	10	5	8	3	11	5	18	2	0
Pennington SD	Owanka-81026	4	13	3	8	7	10	7	20	8	3
	Badlands-81043	2	6	4	9	3	10	8	16	9	4

Table 3-99
Trends of Upland Game Bird Harvests in Upland and Small Game Management Areas Which Would be Crossed by the Alternatives in Wyoming

Upland and Small Game Management Area	Game Species	Harvest Trend							
		1990	1991	1992	1993	1994	1995	1996	1997
USGMA 36 Niobrara	Pheasant	0	0	0	0	0	0	0	212
	Chukar Partridge	0	0	21	0	0	13	0	42
	Sage Grouse	3161	381	113	32	165	60	22	0
	Sharp-tailed Grouse	0	36	0	0	89	86	0	14
	Mourning Dove	1103	1661	606	1373	1077	1626	378	14
USGMA 39 Belle Fourche	Pheasant	0	0	0	0	0	0	0	56
	Gray Partridge	0	0	25	0	0	0	36	70
	Sage Grouse	244	360	186	90	96	35	15	70
	Sharp-tailed Grouse	0	0	37	23	31	46	0	127
	Mourning Dove	713	89	215	38	173	443	302	318
USGMA 43 Weston	Gray Partridge	0	20	12	0	0	0	0	91
	Sage Grouse	207	401	184	88	129	4	30	0
	Sharp-tailed Grouse	51	95	92	6	38	32	70	275
	Mourning Dove	441	463	270	100	231	86	119	466
USGMA 44 Black Hills	Ruffed Grouse	113	146	107	42	140	46	4	106
	Sage Grouse	160	234	188	41	16	155	45	176
	Sharp-tailed Grouse	110	89	117	86	96	118	84	190
	Mourning Dove	144	361	202	360	5	683	497	282

Table 3-100
Number of Known Sage Grouse and Sharp-tailed Grouse Leks Within 1 Mile of Alternative B in Wyoming

Upland and Small Game Management Area	Grouse Species	Number of Leks by Land Ownership				
		Forest Service	BLM	State	Private	Total
USGMA 36 Niobrara	Sage Grouse	1	0	1	1	3
	Sharp-tailed Grouse	0	0	0	0	0
	Total	1	0	1	1	3
USGMA 39 Belle Fourche	Sage Grouse	2	0	1	8	11
	Sharp-tailed Grouse	0	0	0	0	0
	Total	2	0	1	8	11
USGMA 43 Weston	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Total	0	0	0	0	0
USGMA 44 Black Hills	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Total	0	0	0	0	0

Source: Wyoming Game and Fish Department Data, District 3 and District 7

Table 3-101 Number of Known Sage Grouse and Sharp-tailed Grouse Leks Within 1 Mile of Alternative C in Wyoming						
Upland and Small Game Management Area	Grouse Species	Number of Leks by Land Ownership				
		Forest Service	BLM	State	Private	Total
USGMA 36 Niobrara	Sage Grouse	2	0	0	1	3
	Sharp-tailed Grouse	0	0	0	0	0
	Total	2	0	0	1	3
USGMA 39 Belle Fourche	Sage Grouse	0	0	0	7	7
	Sharp-tailed Grouse	0	0	0	0	0
	Total	0	0	0	7	7
USGMA 43 Weston	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Total	0	0	0	0	0
USGMA 44 Black Hills	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Total	0	0	0	0	0
Source: Wyoming Game and Fish Department Data, District 3 and District 7						

Table 3-102 Number of Known Sage Grouse and Sharp-tailed Grouse Leks Within 1 Mile of Alternative D in Wyoming						
Upland and Small Game Management Area	Grouse Species	Number of Leks by Land Ownership				
		Forest Service	BLM	State	Private	Total
USGMA 36 Niobrara	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Total	0	0	0	0	0
USGMA 39 Belle Fourche	Sage Grouse	0	0	0	9	9
	Sharp-tailed Grouse	0	0	0	0	0
	Total	0	0	0	9	9
USGMA 43 Weston	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Total	0	0	0	0	0
USGMA 44 Black Hills	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Total	0	0	0	0	0
Source: Wyoming Game and Fish Department Data, District 3 and District 7						

No sharp-tailed grouse leks in Wyoming are within 1 mile of any alternative. Sharp-tailed grouse on the Great Plains inhabit brushy grasslands often in oak savannahs or early successional stages of mixed (coniferous-deciduous) forests (Prose, 1987). Such habitats appear less common in Wyoming than in South Dakota where short and mixed grass prairies are interrupted by woody draws in tributaries and ravines leading to the Cheyenne River, undoubtedly providing important cover as well as winter food (Prose, 1987).

In South Dakota, some active sharp-tailed grouse leks have been documented along the Cheyenne River in Custer and Pennington counties (Hetlet, 1995a) and Fall River County (Meadows, 1999). Forest Service biologists also provided locations of with leks on BGNG. In all there are 5 sage grouse leks and 9 leks of unidentified grouse species within 1 mile of Alternative B in South Dakota (Table 3-103). Within 1 mile of Alternative C there are 6 sage grouse and 14 leks of unidentified grouse species (Table 3-104) and nearly the same numbers for the

Table 3-103 Number of Known Sage Grouse and Sharp-tailed Grouse Leks Within 1 Mile of Alternative B in South Dakota						
County	Grouse Species	Number of Leks by Land Ownership				
		Forest Service	BLM	State	Private	Total
Fall River	Sage Grouse	0	0	0	5	5
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	0	0	0	0	0
	Total	0	0	0	5	5
Custer	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	1	0	0	1	2
	Total	1	0	0	1	2
Pennington	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	6	0	0	1	7
	Total	6	0	0	1	7
Source: SDGFP and Forest Service, BGNG						

Table 3-104 Number of Known Sage Grouse and Sharp-tailed Grouse Leks Within 1 Mile of Alternative C in South Dakota						
County	Grouse Species	Number of Leks by Land Ownership				
		Forest Service	BLM	State	Private	Total
Fall River	Sage Grouse	0	0	0	6	6
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	0	0	0	0	0
	Total	0	0	0	6	6
Custer	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	2	0	0	4	6
	Total	2	0	0	4	6
Pennington	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	7	0	0	1	8
	Total	7	0	0	1	8
Source: SDGFP and Forest Service, BGNG						

Phiney Flat and W G Flats Variations of Alternative C (Table 3-105 and Table 3-106). No information about leks for either species is available where Alternative D (Table 3-107) deviates from Alternatives B and C in Custer and Pennington counties.

Small Game. Desert cottontails are probably the most abundant small game species in the project area although Nuttall's cottontails and eastern fox squirrels have been harvested within some of the USGMAs (see Table 3-97). Desert cottontails inhabit all vegetation types in the area but the highest populations are expected in greasewood and sagebrush drainages. Nuttall's cottontails are most likely to be in the western part of the project area, in Campbell County, but they tend to be found at higher elevations in riparian willows, aspen and other shrubby vegetation (Clark and Stromberg, 1987). The desert cottontail is a common food source for golden eagles, ferruginous hawks and other raptor species. In the Wyoming portion of the project area, fox squirrels are

Table 3-105
Number of Known Sage Grouse and Sharp-tailed Grouse Leks Within 1 Mile of Alternative C With the Phiney Flat Route Variation in South Dakota

County	Grouse Species	Number of Leks by Land Ownership				
		Forest Service	BLM	State	Private	Total
Fall River	Sage Grouse	0	0	0	6	6
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	0	0	0	0	0
	Total	0	0	0	6	6
Custer	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	3	0	0	4	7
	Total	3	0	0	4	7
Pennington	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	6	0	0	1	7
	Total	6	0	0	1	7

Source: SDGFP and Forest Service, BGNG

Table 3-106
Number of Known Sage Grouse and Sharp-tailed Grouse Leks Within 1 Mile of Alternative C With the W G Flat Route Variation in South Dakota

County	Grouse Species	Number of Leks by Land Ownership				
		Forest Service	BLM	State	Private	Total
Fall River	Sage Grouse	0	0	0	5	5
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	0	0	0	0	0
	Total	0	0	0	5	5
Custer	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	2	0	0	4	6
	Total	2	0	0	4	6
Pennington	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	7	0	0	1	8
	Total	7	0	0	1	8

Source: SDGFP and Forest Service, BGNG

Table 3-107
Number of Known Sage Grouse and Sharp-tailed Grouse Leks Within 1 Mile of Alternative D in South Dakota

County	Grouse Species	Number of Leks by Land Ownership				
		Forest Service	BLM	State	Private	Total
Fall River	Sage Grouse	0	0	0	6	6
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	0	0	0	0	0
	Total	0	0	0	6	6
Custer	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	0	0	0	0	0
	Total	0	0	0	0	0
Pennington	Sage Grouse	0	0	0	0	0
	Sharp-tailed Grouse	0	0	0	0	0
	Unidentified Grouse	0	0	0	0	0
	Total	0	0	0	0	0

Source: SDGFP and Forest Service, BGNG

Table 3-108
Number of Known Raptor Nests Within 0.5 Mile of the Alternatives

Alternative	State	Number of Known Raptor Nests by Land Ownership				
		Forest Service	BLM	State	Private	Total
B (1)	Wyoming	13	2	2	54	71
	South Dakota	1	1	0	10	12
	Total	14	3	2	64	83
C (1)	Wyoming	19	1	3	44	67
	South Dakota	0	1	0	11	12
	Total	19	2	3	55	79
Phiney Flat Route Variation	South Dakota	1	1	0	12	14
W G Flat Route Variation	South Dakota	0	1	0	10	11
D (2)	Wyoming	18	1	1	46	66
	South Dakota	0	1	0	6	7
	Total	18	2	1	52	73

1 = Raptor nest locations from aerial nesting surveys conducted during Spring 1999 and records obtained from Wyoming Department of Environmental Quality, Land Quality Division, annual reports (Appendix D-9) submitted by coal mines in the Powder River Basin, Wyoming.
2 = Raptor nest locations limited to records obtained from Wyoming Department of Environmental Quality, Land Quality Division, annual reports (Appendix D-9) submitted by coal mines in the Powder River Basin, Wyoming except where Alternative D coincides with Alternatives B and C where aerial surveys were conducted in 1999.

most common in the Black Hills, probably associated with deciduous cottonwoods along streams (Clark and Stromberg, 1987).

Furbearers. Beaver, muskrat, mink, badger, striped skunk, red fox, bobcat, ermine and long-tailed weasels are expected to occur locally in the Wyoming portion of the project area. These species would be expected to occur throughout most of the wildlife habitat types present. Harvest of furbearers in Wyoming is not summarized for different WGFD management areas and consequently not included in Table 3-97.

Non-Game Wildlife

Raptors. Raptors nesting within the project area have been documented by several sources including WGFD, Forest Service, BLM records, WNDDB, SDNHDB, annual surveys conducted on coal mines in the Thunder Basin, and NBS breeding bird surveys. Raptor surveys on coal mines indicate there are 18 ferruginous hawk nests, 3 red-tailed hawk nests, 2 golden eagle and 1 great horned owl nest within 0.5 mile of the proposed mine loops. Raptor nesting surveys were conducted in the Spring of 1999 along Alternatives B and C in South Dakota and Wyoming and a portion of Alternative D in Wyoming. Those data have been summarized in Table 3-108 which indicates the number of known raptor nests, active or inactive, that are within 0.5 mile of each alternative. However, that data also reflects the levels of effort that have been applied to surveying nests along each route.

At least 13 species of nesting raptors have been observed in the project area including bald and golden eagles, turkey vultures, ferruginous hawk, red-tailed and Swainson's hawks, northern harrier, prairie falcon, merlin, American kestrel, great horned owl, burrowing owl, and short-eared owl. Osprey, Cooper's hawk, sharp-shinned hawk, northern goshawk, rough-legged hawk, barn owl, snowy owl, northern pygmy owl, long-eared owl and northern saw-whet owls have been observed in the region within Wyoming (Luce *et al.,* 1997) but there are no reports of their nesting. Observations of these species have been infrequent and mostly coincide with spring and/or fall migrations. Rough-legged hawks are winter residents.

In South Dakota, red-tailed hawks have been seen on every breeding bird survey route (see Table 3-98). Other species commonly observed include northern harriers, Swainson's hawk, ferruginous hawk, golden eagle, American kestrel, great horned owl, burrowing owl and short-eared owl. Turkey vultures and prairie falcons were observed on rare occasions.

Rocky knobs, cliffs, and low rock outcrops provide suitable nesting substrates for ferruginous hawks, prairie falcons, and kestrels. Nesting by merlins, red-tailed hawks, great horned owls and Swainson's hawks is most likely restricted to the cottonwood riparian zones along the Cheyenne River and tributaries. Golden eagles are likely to nest in a variety of substrates but nests are concentrated in riparian cottonwoods. Burrowing owls nest in burrows excavated by prairie dogs or other fossorial mammals and short-eared owls nest on the ground, often in low vegetation (Johnsgard, 1988).

During spring, peregrine falcons migrate through South Dakota from March through late May and fall migrations occur between September and November, most in late September (South Dakota Ornithologists' Union, 1991). No reintroduction efforts have been made in the vicinity of the alternatives and no suitable or potential nesting habitat exists along any alternative in Wyoming and South Dakota. Young peregines were placed at a release site in the Black Hills in 1979 but they did not return in subsequent years (Burnham *et al.*, 1988). One peregrine nest record in 1945 was within the Black Hills in Pennington County and another in 1976 along the Cheyenne River in Haakon County, South Dakota are the only breeding records found for the project area vicinity (South Dakota Ornithologists' Union, 1991). Peregrine falcons may pass near the alternatives during migrations but available information indicates their occurrence is infrequent and unpredictable.

According to the WGFD's WOS, only one record of a peregrine falcon exists in the vicinity of the alternatives: one was seen in June, 1984 near Riverview in northeast Niobrara County. No records of peregrine falcons were provided by the South Dakota Natural Heritage Data Base (SDNHDB) although they have been occasionally observed in the Black Hills, Pennington County, during summers and migrations (Ashton and Dowd, 1991; South Dakota Ornithologists' Union, 1991).

Nongame Wildlife Species. A variety of nongame mammals, birds, and herpetofauna are likely to inhabit the project area. Nongame mammals known or expected include Merriam's shrew, little brown myotis, long-legged myotis, big brown bat, silver haired bat, and hoary bat (Priday and Luce, 1997), white-tailed jackrabbit, black-tailed jackrabbit, least chipmunk, yellow-bellied marmot, thirteen-lined ground squirrel, black-tailed prairie dog, northern and plains pocket gophers, olive-backed and silky pocket mice, Ord's kangaroo rat, plains and western harvest mice, bushy-tailed wood rat, deer mouse, northern grasshopper mouse, southern red-backed vole, prairie, meadow and sagebrush voles, porcupine, and coyote.

Riparian zones associated with the Cheyenne River and its tributaries provide habitats for and generally support the greatest variety of bird species in Wyoming and South Dakota. NBS breeding bird survey data (Table 3-98) indicates that these habitats and associated riparian croplands support several species of shorebirds (killdeer, avocet, willet, spotted sandpiper, upland sandpiper, long-billed curlew, black tern), downy woodpecker and red-shafted flicker, flycatchers (willow, least, cordilleran), magpie, Cassin's kingbird, blackbirds (yellow-headed, red-winged, Brewer's), brown-headed cowbird, common yellowthroat, yellow-breasted chat, sparrows (white-crowned, chipping, song), a variety of swallows (tree, violet-green, bank, cliff, barn), yellow warbler and Wilson's warbler. Many of these species undoubtedly nest in the cottonwood-willow riparian zone in tree cavities or tree-shrub substrates and some undoubtedly occur in coniferous woodlands, as well. Great blue heron rookeries are scattered where cottonwoods are present.

Native short and mixed grass prairies, sagebrush, greasewood, and rock outcrop habitats present within the project area support numerous non-game bird species. The predominant passerine in the area is the horned lark, a year-long resident. Common summer visitors in local shrub-dominated habitats include Brewer's sparrow, vesper sparrow, sage sparrow, lark bunting, green-tailed towhee, and sage thrasher. Rock wrens, cliff swallows, bank swallows and Say's phoebes have been seen in rocky draws or along rock outcrops. Grasslands in the area support species such as bobolink, grasshopper sparrows, chestnut-collared longspurs, McCown's longspur, western meadowlark, and lark bunting. The National Partners-In-Flight program has identified and assigned a numeric rating with regards to the importance of TBNG and BGNG.

Some species are found only in ponderosa pine woodlands that are most extensive in South Dakota. Those species observed include spotted towhee, solitary and warbling vireos, mountain chickadee, red- and white-breasted nuthatches, Townsend's solitaire, Swainson's thrush, pine grosbeak, red crossbill, and pine siskin.

Tiger salamanders, Woodhouse's toad, Great Plains toad, and northern leopard frogs probably occur in emergent wetlands in the project area of Wyoming (WNDDB, 1999; Baxter and Stone, 1980; Luce *et al.*, 1997). Woodhouse's toad and leopard frogs have been observed along the Cheyenne River in South Dakota (Hetlet, 1994) as well as spiny softshell turtle and unidentified garter snake. Other reptiles likely to be found in the vicinity of the project in South Dakota include short-horned lizard and six-lined racerunner (SDNHDB, 1999). In Wyoming, grasslands, sagebrush, greasewood and rock outcrops are suitable habitats for the eastern short-horned lizard, northern sagebrush lizard, prairie rattlesnake, bullsnake, and plains hognose snake. Eastern yellowbelly race is common in woodlands in the Black Hills. Wandering and red-sided garter snakes might occur in upland grassland and sagebrush habitats but is more closely associated with permanent water (Baxter and Stone, 1980; Luce *et al.*, 1997).

Fisheries

In Wyoming, the alternatives would not cross streams that can support game fisheries although there are some ponds and reservoirs in the region that support rainbow trout and largemouth bass (BLM, 1998). Fish species recently sampled in the Cheyenne River and Wyoming tributaries (Beaver Creek, Stockade Creek, Lance Creek and Indian Creek) include common carp, fathead minnow, flathead chub, longnose dace, plains minnow, sand shiner, river carpsucker, white sucker, black bullhead, plains killifish, and green sunfish (Patton *et al.*, 1998). Samples taken in the upper reaches of the Belle Fourche River include common carp, common shiner, fathead minnow, longnose dace, plains minnow, red shiner, sand shiner, white sucker, black bullhead, and green sunfish (Patton *et al.*, 1998)

The only fishery in the South Dakota that would be crossed by the alternatives is the Cheyenne River. However, the principal game species there is channel catfish (USFWS, 1993a). Recent (1996 and 1997) samples taken in the upper reach of the Cheyenne River - Wasta to Angostura Reservoir - included many of those found in Wyoming. Species reported only from the Cheyenne River in South Dakota include western silvery minnow, emerald shiner, shorthead redhorse, goldeye, freshwater drum, white bass, sturgeon chub, stonecat, and spottail shiner as most frequently sampled (8 or more captured). Infrequent species were sauger, smallmouth bass, largemouth bass, plains topminnow, spottail shiner, yellow bullhead, plains killifish, bluegill, creek chub, emerald shiner, northern pike and sturgeon chub, noted earlier (Hampton, 1998).

CHAPTER FOUR - ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

It has been a number of years since a new heavy haul railroad has been proposed for construction in the western United States. For the most part, existing railroad corridors in the western United States were established prior to the turn of the century and their routes were determined long before environmental regulations were adopted. Grade was a major factor in selecting the routes for the existing railroads - the flatter the route the less excavation which resulted in lower construction costs. Grade also affects the operating cost of a railroad. As a result, existing railroads were aligned in many places along the flood plains of major rivers and streams where grade was the least steep.

Although a century has passed, grade remains one of the primary considerations in selecting an acceptable route for DM&E's new railroad. Associated with the new railroad are a unique set of circumstances that are not typically encountered in other linear projects, such as pipelines and transmission lines. The new railroad has specific operable grade and curve limits. Feasible alternative routes for the new railroad are, to a large degree, limited to a grade of not more than 1 percent. According to DM&E, this why using their exiting Black Hills Subdivision Branch Line is not a feasible alternative - the grades are just too steep for a heavy haul railroad. This grade limitation reduces the number of feasible alternative routes between Wall and the SPRB coal mines to just a few and makes site-specific avoidance of natural resource conflicts very difficult or, in many cases, impossible. Additional information regarding the effects of grade on route suitability is contained in the 404(b)(1) showing prepared for the COE.

Like nearly a century ago, the feasible alternatives are still largely restricted to drainage ways where grade is the least steep. Construction outside of these drainage ways would necessitate moving so much dirt to achieve an operable grade, that construction of the new railroad would become cost prohibitive. Unfortunately, from an environmental perspective, sensitive natural resources in the West tend to be concentrated in drainage ways and along stream corridors. Consequently, impacts to sensitive natural resources are somewhat proportional to how closely the alternatives for the new railroad follow drainage ways.

Similar to Chapter Three, the impact discussion in this chapter is organized by resource and alternative. However, not all of the resource impacts are described individually for each alternative. In some cases, alternative impacts are essentially or nearly the same. In these cases, impacts are described for the alternatives together to avoid unnecessary repetition.

Significance criteria were developed for most of the impact analyses to measure the degree to which an impact would affect the human and natural environment. Developing significance criteria is difficult for a number of reasons. First, it is often difficult to quantify impacts for some resources. In these cases, a significance determination must be subjective and often rely on the professional opinion of the persons preparing and reviewing the impact analysis. Second, for the reader the significance of an impact is often framed in terms of personal experience. For instance, persons who benefit directly from the positive economic impacts of the new railroad are more likely to consider that positive impact more significant than someone who will not receive financial gain. Similarly, someone who recreates in the project area is likely to find conflicts with the new railroad much more severe than someone who recreates elsewhere. Finally, much design work for the new railroad remains to be completed. Many decisions made during final design of the new railroad will influence the significance of the impacts to the natural and human environment.

4.2 Socioeconomic Resources

Very little project design information is currently available to assess potential impacts (especially potentially adverse impacts) to socioeconomic resources. For instance, DM&E has determined that it would be necessary to establish mancamps for the new railroad construction crews. However, the locations, sizes and facilities provided at these mancamps are currently unknown. Similarly, the spatial and temporal needs for construction employment are not well defined at this point. To determine potential impacts from the construction workforce, including local hires and inmigrants, more precise estimates of manpower needs will be required. Evaluation of these types of potential socioeconomic impacts must be delayed until further design is completed.

However, information is currently available to allow general estimates of project-wide (not spread-specific) employment, earnings and tax revenues. Information presented below was summarized from a report prepared by Economic Policy & Analysis, Planning Information Corporation, and Charles E. Lamberton (hereafter, Economic Policy & Analysis, *et al.*) which describes the economic impact in Minnesota, South Dakota and Wyoming of the entire DM&E project.[1] It is important to note that information provided in this section was developed from projections made in late 1998 before a number of the current alternatives were developed. As such, the estimates are likely more reflective of the

[1] Portions of that report, including economic and fiscal estimates, have been posted on DM&E's web site (http://www.dmerail.com).

impacts associated with Alternative B, although impacts from Alternative C would be expected to differ only slightly. However, Alternative D is much longer and would affect counties not considered in the initial estimates provided by Economic Policy & Analysis, *et al.* Consequently, estimates of economic and fiscal impacts from Alternative D are not provided in this report.

The economic and fiscal impact estimates provided by Economic Policy & Analysis, *et al.* were based on very preliminary construction design plans prepared by DM&E outside engineering design consultants. These preliminary design plans identified expected labor, materials and project construction costs. Property (ad valorem) tax estimates were based on the preliminary total value of the new railroad (as determined by the engineering design consultants) in each state and local taxing district. DM&E provided estimates of the number of direct DM&E operating jobs and the corresponding direct earnings using national railroad wage rates. Indirect jobs, earnings and tax revenues were also estimated by Economic Policy & Analysis, *et al.*

The engineering design studies for the project identified the cost of labor, materials, equipment, and other items for the new railroad and the type of work to be performed. Economic Policy & Analysis, *et al.* assumed that 30 percent of the estimated labor costs were not available for local spending. Economic Policy & Analysis, *et al.* calculated the number of direct construction jobs by dividing the remaining labor cost by an average construction annual labor cost of $45,000 per job year. They estimated additional indirect jobs created by using the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) job multipliers for the construction industry in South Dakota and Wyoming.[2] The direct and indirect jobs created would result from expenditures by construction workers on motels, restaurants, housing, recreation, service facilities, entertainment, etc. Indirect earnings were calculated by applying the corresponding Regional Input-Output Modeling System (RIMS) II construction earnings multiplier for each of the states.

4.2.1 Construction Impacts. Jobs and earnings were calculated for the direct construction jobs using the construction estimates described above. Indirect jobs and earnings were calculated using BEA multipliers. The direct and indirect jobs estimated reflect the amount of work to be performed - on average about 2 job years per job. However, it should be noted that the actual timing of the jobs may be of shorter duration. For instance, 30 jobs may be required for 1.5 years instead of 20 jobs for 2 years.

[2] These multipliers are published in the BEA's Regional Input-Output Modeling System Handbook.

As is shown on Table 4-1, Economic Policy & Analysis, *et al.* estimated that construction of the new railroad would create nearly 1,850 direct construction-related job years in Wyoming and South Dakota (excluding employment from construction of the yards which was not estimated). These job years would be spread over the 3 year construction period (about 600 job years provided annually during construction). Using the method described above for estimating indirect employment, Economic Policy & Analysis, *et al.* projected a total of over 1,900 indirect job years associated with construction of the new railroad. Like the direct employment, these job years would be spread over the 3 year construction period but, according to Economic Policy & Analysis, *et al.*, would also extend for 2 to 3 years beyond the end of construction. Direct job years would be about equally split between Wyoming and South Dakota while Economic Policy & Analysis, *et al.* suggested nearly twice as much indirect employment would be generated in South Dakota.

Projected earnings are also shown on Table 4-1 and, according to Economic Policy & Analysis, *et al.,* represent the total direct and indirect earnings (without fringes) for the entire construction period. Although estimated jobs are shown by county on Table 4-1, workers may actually reside elsewhere and their expenditures may take place elsewhere.

Economic Policy & Analysis, *et al.* estimated that the construction employment earnings associated with the new railroad in South Dakota and Wyoming would be about $124 million, excluding earnings from construction-related employment at the yards which was not estimated. A total of about $78 million in earnings would be generated in South Dakota and $48 million in Wyoming. Even though direct job years between the states are approximately equal, indirect jobs generated in South Dakota are expected to be about double of those generated in Wyoming.

Taxes were calculated by Economic Policy & Analysis, *et al.* based on the following:

- Excise taxes on contractor billing - excluding material purchased directly by the railroad.
- Sales and use taxes on material purchased directly by the railroad.
- Sales and use taxes generated from the spending by construction workers and indirect employment earnings.
- Income tax, where applicable, on the employment earnings.

Based on the above, Economic Policy & Analysis, *et al.* estimated that construction of the new railroad would generate nearly $15 million in tax payments including

Table 4-1 Summary of Direct and Indirect Construction Employment, Earnings and Tax Revenues from the New Railroad in South Dakota and Wyoming				
	Direct Job Years	Indirect Job Years	Earnings	Taxes
South Dakota				
Pennington	316	536	$30,844,800	$3,037,800
Custer	298	328	$20,585,500	$2,238,100
Fall River	378	418	$26,179,200	$3,011,900
South Dakota Total	992	1,282	$77,609,500	$8,287,800
Wyoming				
Niobrara	88	66	$4,965,000	$942,000
Weston	336	250	$18,867,000	$2,443,000
Converse	78	58	$4,351,000	$525,000
Campbell	350	260	$19,604,000	$2,687,000
Wyoming Total	852	634	$47,787,000	$6,597,000

about $8.3 million in South Dakota and $6.6 million in Wyoming (see Table 4-1).

4.2.2 Operations Impacts. In addition to the construction-related impacts to employment, earnings and revenues discussed above, Economic Policy & Analysis, *et al.* also provided estimates of operation impacts. In their report, they projected direct and indirect operations-related jobs by state. However, these estimates were made using very incomplete design information. As such, the estimates were based on ranges using "high" and "low" facility location cases. The high case represents the impact that would occur if all discretionary location decisions are made to locate facilities within that state. The low case represents the impact that would occur if all discretionary location decisions are made to locate the facility in another state. Another variable considered in the analysis was the amount of coal hauled annually on the new railroad. Two cases were studied: 40 and 100 million tons/year. Table 4-2 provides high and low estimates based on 40 million tons/year hauled and Table 4-3 provides estimates based on the 100 million tons/year case. As can be seen on the tables, the range of impact is significant. (It is important to note that the estimates in Tables 4-2 and 4-3 contain the entire project in South Dakota, including the new railroad and rebuild. Estimates provided by Economic & Policy Analysis, *et al.* did not distinguish between the new railroad and the rebuild.

4.2.2.1 40 Million Tons/Year. At what DM&E terms "start up", Economic & Policy Analysis, *et al.* estimated that approximately 505 DM&E jobs would be created system-wide (Minnesota to Wyoming). In addition, Economic Policy & Analysis, *et al.* estimated that 636 indirect jobs would be generated and that 45 new jobs would be created at Wyoming coal mines. In total, it was estimated 1,115 jobs would be created (direct and indirect). Direct jobs created in South Dakota (including the new railroad and rebuild) would range from 72 (low) to 462 (high), depending on final facility selection decisions. Indirect employment would result in 79 (low) to 506 (high) additional jobs (see Table 4-2). Wyoming direct jobs would range from 14 (low) to 309 (high). Economic & Policy Analysis, *et al.* projected 79 (low) to 405 (high) indirect jobs in Wyoming, some of which include indirect jobs created by 45 additional direct jobs at coal mines. DM&E employees in South Dakota would be expected to earn between $3.7 (low) and $26.9 (high) million annually while indirect earnings were estimated to range from $2.6 (low) to over $18 million (high). DM&E employees in Wyoming could earn between $606,000 (low) to as much as over $17 (low) million annually. Approximately $2.5 million in additional mining earnings would be expected to be generated by new mining jobs in Wyoming. Total tax revenue for both the high and low case is also provided on Table 4-2. In South Dakota, annual tax revenues generated by the operating railroad would be expected to range from $14.4 to $15.9 million. In Wyoming, total tax revenue would range from between $2.7 and $3.5 million. As can be seen on the table, the majority of the revenue would be generated by additional property tax.

4.2.2.2 100 Million Tons/Year. If the operating railroad reaches this level of traffic, Economic & Policy Analysis, *et al.* estimated total employment may reach as high as 4,020. Total DM&E employment in Wyoming could be as low as 14 (low) or as high as 711 (see Table 4-3). Direct new mining jobs could be nearly 600. South Dakota direct employment would range from 86 to 1,117 and indirect jobs could be as low as 94 or as high as 1,223.

Annual earnings of DM&E employees in Wyoming could be as low as $606,000 but could reach nearly $42 million. South Dakota DM&E employee earnings could be as low as $4.5 million and as high as nearly $69 million. As shown on Table 4-3, total tax revenue in Wyoming for this scenario is anticipated to be between $4.7 and $6.7 million. South Dakota total tax revenues could range from over $17 to nearly $22 million. The majority of the tax revenues would be from property tax except for the high

Table 4-2
Estimated Annual Jobs, Earnings and Annual Tax Revenues Generated in Wyoming and South Dakota
(40 million tons per year coal hauled)

	South Dakota (1)		Wyoming	
	High	Low	High	Low
Annual Jobs Created				
Direct Jobs	462	72	309	14
Mining Jobs			45	45
Indirect Jobs	506	79	405	86
Total Jobs Created	968	151	759	145
Annual Earnings Created				
Direct Earnings	$26,861,000	$3,755,000	$17,258,000	$606,000
Mining Earnings			$2,500,000	$2,500,000
Indirect Earnings	$18,401,000	$2,572,000	$12,981,000	$2,016,000
Total Earnings Created	$45,262,000	$6,327,000	$32,739,000	$5,122,000
Annual Tax Revenues Generated				
Sales/Use	$1,743,000	$244,000	$947,000	$148,000
Income Tax (2)				
Property Tax	$14,123,000	$14,123,000	$2,597,000	$2,597,000
Total Tax Revenues	$15,866,000	$14,367,000	$3,544,000	$2,745,000

1 = Includes both the rebuild and new railroad in South Dakota
2 = Excludes corporate income taxes

Table 4-3
Estimated Annual Jobs, Earnings and Annual Tax Revenues Generated in Wyoming and South Dakota
(100 million tons per year coal hauled)

	South Dakota (1)		Wyoming	
	High	Low	High	Low
Annual Jobs Created				
Direct Jobs	1,117	86	711	14
Mining Jobs			591	591
Indirect Jobs	1,223	94	1,707	953
Total Jobs Created	2,340	180	3,009	1,558
Annual Earnings Created				
Direct Earnings	$68,877,000	$4,446,000	$41,805,000	$606,000
Mining Earnings			$32,200,000	$32,200,000
Indirect Earnings	$47,187,000	$3,046,000	$48,766,000	$21,636,000
Total Earnings Created	$116,064,000	$7,492,000	$122,771,000	$54,442,000
Annual Tax Revenues Generated				
Sales/Use	$4,468,000	$288,000	$3,551,000	$1,575,000
Income Tax (2)				
Property Tax	$17,184,000	$17,184,000	$3,138,000	$3,138,000
Total Tax Revenues	$21,652,000	$17,472,000	$6,689,000	$4,713,000

1 = Includes both the rebuild and new railroad in South Dakota
2 = Excludes corporate income taxes

case for Wyoming for which sales and use tax would be nearly equal to property tax.

4.2.3 Proposed Yard Sites. Subsequent to the report prepared by Economic & Policy Analysis, et al., DM&E made final decisions regarding yards for the new railroad. DM&E has announced a major rail staging facility at the Western Yard. The facility is expected to include maintenance and minor repair facilities. At full operations DM&E expects the facilities at the Western Yard will cost in excess of $50 million and employ approximately 300 direct railroad employees. About 100 direct rail employees would be employed within its first year of operations. Support services required for the facility is expected to generate additional indirect employment which could be significant. According to DM&E, permanent railroad salary and benefit packages for direct employees at this yard will average from $60,000 to $90,000 annually.

The railroad also intends to construct a yard at Wall. At full operations the Wall Yard is expected to create 50 jobs. The Wall Yard will be coordinated with track maintenance facilities in Philip and Midland, South Dakota. It will serve as a staging yard for loaded and empty unit trains. It will also contain 2 marshaling tracks for use by manifest, grain, and way freight trains in serving local area customers.

Projections of employment have not been provided for the Edgemont Interchange Yard.

4.3 Environmental Justice

Over the last decade, attention to the impact of environmental pollution on low-income and minority segments of society has been steadily growing. Environmental justice is a concern because communities sometimes lack political clout, economic means, or awareness of rights and opportunities to participate in environmental decision making.[3] Generally, environmental justice means the fair treatment of people of all races and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should shoulder a disproportionate share of negative environmental impacts.

Concern that low-income and minority segments of society bear a disproportionate amount of adverse health and environmental effects, led President Clinton to issue Executive Order 12898 in 1994, focusing Federal agency attention on these issues. The purpose of the Executive Order is to achieve equal environmental protection so no segment of the population, regardless of race, ethnicity, culture or income bears an undue burden of environmental pollution and to ensure that the benefits of environmental protection are shared by everyone.

4.3.1 Significance Criteria. A significant impact is defined as a disproportionate share of environmental impacts from construction or operation of the new railroad on minority or low-income communities.

4.3.2 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). None of the alternatives are anticipated to result in a disproportionate share of the negative environmental impacts on minority or low-income communities. As was discussed in Section 3.3.5, Alternative B would pass near the Pine Ridge Indian Reservation in South Dakota (see Figure 1-1). EPA identified the Pine Ridge Indian Reservation as an Environmental Justice Focus Area because of poverty and the minority population. Although less than 1 mile from the reservation, Alternative B would not be constructed on the reservation. In fact, at its closest Alternative B would be constructed on NFS lands and would be separated from the reservation by the Cheyenne River.

All the alternatives and the North Antelope mine loops would be constructed in Census BNA 9561 in Converse County (see Figure 3-1) north of Bill. As was discussed in Section 3.3.5, 2 of the 6 block groups in BNA 9561 exceed 30 percent of the population below the poverty level and are therefore considered Environmental Justice Focus Areas by EPA. However, as can be seen on Figure 3-1, neither below poverty block group would be crossed by the alternatives or the mine loop options.

In summary, although 2 Environmental Justice Focus Areas are in close proximity to the alternatives, only one would be crossed by the alternatives. However, below poverty block groups in this focus area would not be crossed. Therefore, issues of environmental justice should not be a concern for the new railroad.

4.4 Transportation

Additional information regarding potential impacts to transportation are presented in the draft EIS. Included in the EIS are the types of crossings which would be provided (at grade or separated crossings) and a discussion of impacts to the traveling public's safety at the crossings. Other safety issues, such as the potential disruption of emergency response vehicle travel across occupied tracks, are also addressed in the draft EIS. This

[3] In 1982, in Warren County, North Carolina, the environmental justice movement grew out of a grassroots protest against the siting of a PCB landfill in a predominantly African-American community. This protest led to an investigation by the General Accounting Office which concluded that there was a correlation between the siting of hazardous waste landfills and race in the host communities.

section focuses primarily on impacts associated with construction-related traffic.

4.4.1 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). Potential impacts from all of the alternatives, except Alternative A, could include the following:

- Increased traffic volume on area highways and roads.
- Accelerated deterioration of public road surfaces.
- Increased road maintenance requirements because of increased traffic.
- Increased likelihood of traffic accidents, vehicle-person and vehicle-animal collisions.
- Increased speeding.

As was discussed in Section 2.5.4, preliminary design indicates that each construction spread would employ about 50 workers. Most construction traffic would travel along the construction rights-of-way, however public roads would be utilized to access construction sites. Although traffic volumes from the estimated 50 workers per spread have not been estimated, peak traffic on public roads from these workers is expected to occur during shift changes. Construction is planned to occur between 7 a.m. and midnight, therefore, 2 periods at about 7 a.m. and 4 p.m. could impact local traffic on public roads utilized to access construction sites. This impact is expected to be insignificant for several reasons. First, traffic from the estimated 50 workers should not cause noticeable increases in traffic volumes on area highways and roads. Secondly, construction activities would be occurring at numerous locations over the entire spread and added construction-related traffic would be dispersed throughout the area.

Many of the public roads in the project area are unpaved. Although traffic volumes are not expected to be significant, repeated use of these roads, frequent heavy equipment traffic (i.e., large trucks) and use during adverse weather conditions are expected to significantly impact these roads. Construction-related traffic is expected to accelerate the deterioration of these road surfaces and significantly increase the need for road maintenance.

Construction traffic is likely to affect road surfaces by generating wash boards, pot-holes, ruts, ponds or puddles. These impacts will require more frequent grading and resurfacing with gravel. If deteriorated road conditions are not mitigated, they may become safety hazards. Increased traffic on unpaved roads during dry periods will increase fugitive dust which can be a safety hazard and an annoyance to local residents. Dust abatement can be temporarily accomplished by watering the road or, for long-term remedies, by applying chemical binders to the road surface. Heavy equipment traffic could also damage road structures such as bridges and cattle guards. However, road deterioration impacts to paved roads in the project area are not generally anticipated.

Impacts from construction-related traffic would be considered a short-term impact because this traffic would only occur during construction of the new railroad which is expected to last approximately 3 years. The major road crossings listed in Tables 3-10 through 3-14 could be potential safety hazards from construction traffic merging onto the construction right-of-way or onto collector roads from the construction right-of-way. This hazard would depend on site distances at intersections and average daily traffic on those roads. Traffic controls, including warning signs, flag personnel, or turn-outs may be required during construction at those crossings to prevent accidents.

Each of the alternatives would cross grassland roads which are identified in Tables 3-15 through 3-17. These roads, as well as two track roads on the grasslands will require a commercial use permit if they are to be used by heavy equipment (i.e., greater the 33,000 pounds gross vehicle weight). Some of the roads may have a seasonal use restriction or may require upgrading if used out of season. All other two-track roads on NFS lands that would be used during construction would need to be identified with the proposed type and amount of traffic as well as the season of use. This information is currently unavailable.

Prior to project implementation, a transportation plan would be developed to allow for reasonable access by the public to the grasslands while reducing the number of grade crossings and subsequent train whistle noise impacts. The transportation plan would address any new roads that may be necessary to link the existing Forest Service road system to maintain public access along with the design standards that the roads would be constructed to. An objective of the plan would be to minimize the amount of new road miles that would be constructed on the grasslands to maintain reasonable public access to either side of the tracks. The plan would also address appropriate right-of-way fence standards to restrict or allow cattle passage at these crossings. In addition, the plan would address administrative needs for compliance oversight during construction or reconstruction of grassland roads to ensure that design standards are followed.

4.4.2 Alternative A (No Action). Implementation of this alternative would not increase traffic levels or cause any of impacts to area roads described above.

4.4.3 Alternative B (Proposed Action). As summarized in Table 3-10, this alternative would cross a total of 61 major roads in South Dakota and Wyoming. In

South Dakota, 35 major roads would be crossed including 8 in Pennington County, 6 in Custer County and 21 in Fall River County. In Wyoming, there would be 26 major roads crossed including 3 in Niobrara County, 8 in Weston County, 14 in Campbell County and 1 in Converse County. Most of these road crossings could provide access points to the construction right-of-way. Alternative B would cross 19 grassland roads with 11 of these crossings on BGNG and 8 crossings on TBNG (see Table 3-15).

4.4.4 Alternative C (Modified Proposed Action) and Route Variations. Alternative C would cross a total of 59 major roads in South Dakota and Wyoming (see Table 3-11). In South Dakota, 34 major roads would be crossed including 10 in Pennington County, 7 in Custer County and 17 in Fall River County. In South Dakota, Alternative C would cross the same roads as Alternative B but would have 1 less crossing. Compared to Alternative B, this alternative would not cross County Road 2G, County Road 14 or County Road 6E in Fall River, County. It would also cross County Road 2 two less times than Alternative B. However, this alternative would cross County Road 2C in Fall River County while Alternative B would not.

In Wyoming, this alternative would cross 25 major roads, one less than Alternative B. Crossings would include 3 in Niobrara County, 7 in Weston County, 12 in Campbell County and 3 in Converse County. Alternative C would cross the same roads in Niobrara County as Alternative B. In Weston County, this alternative would not cross the Rochelle Road or the Rochelle Hills Road but Alternative B would. Alternative C would cross State Highway 450 in Campbell County, while Alternative B would cross that highway in Weston County.

Alternative C would cross 16 grassland roads, 3 less than Alternative B. Ten of these roads would be crossed on BGNG and 6 would be crossed on TBNG.

Phiney Flat Route Variation. This route variation would cross the same roads in Wyoming as Alternative C. In South Dakota, this route variation would cross the same roads as Alternative C but would have an additional crossing of Creston Road in Pennington County and would cross Custer County Road 121 (Spring Creek Road) at 4 locations compared to 1 crossing by Alternative C (see Table 3-12).

W G Flat Route Variation. This route variation would cross the same roads at the same locations in Wyoming and Pennington and Custer counties, South Dakota as Alternative C. But in Fall River County, South Dakota, 8 additional county roads would be crossed (see Table 3-13).

4.4.5 Alternative D (Existing Corridors Alternative). This alternative would cross a total of 114 major roads in South Dakota and Wyoming, almost twice as many as Alternative C. There would be 68 major roads crossed in South Dakota with 41 of these roads crossed in Pennington County, 8 in Custer County and 19 in Fall River County. Most of the roads which would be crossed in Fall River County would be the same roads that would be crossed by Alternative C. Alternative D would impact many more roads in Pennington County than either Alternative B or C (33 more than Alternative B and 31 more than Alternative C). In addition to being routed through Rapid City, reconstruction of the main line and Black Hills Subdivision Branch Line would occur in Wall, Wasta, New Underwood, Box Elder, Hermosa, and Fairburn. Alternatives B or C would not be constructed through these communities. Many of the road crossings in Pennington County would occur in Rapid City where impacts to transportation could be significant. The draft EIS addresses these impacts.

If Alternative D was implemented, most agree it would be necessary to find alternative routes around Rapid City and perhaps some of the other towns along DM&E's existing main line and Black Hills Subdivision Branch Line. However, because DM&E would not implement this alternative (the company considers the alternative technically and economically unfeasible), no effort has been made to locate bypasses around these communities.

In Wyoming, a total of 46 road crossings would occur with 17 in Weston County, 5 in Crook County, 21 in Campbell County and 3 in Converse County. Unlike Alternatives B or C, Alternative D would run parallel to the existing BNSF railroad through Newcastle, Osage, Upton and Moorcroft and could compound existing traffic problems in these communities because of the additional train traffic. Questions have been raised about the feasibility of constructing a second railroad adjacent to BNSF's right-of-way through these Wyoming communities. If this alternative was selected, much additional evaluation would be necessary to determine whether bypasses would be required around these communities. Alternatives B and C would avoid communities in Wyoming.

Alternative D would cross the fewest number of grassland roads with only 6 crossed on TBNG (see Table 3-17). NFS lands would not be affected by Alternative D on BGNG.

4.4.6 Proposed Mine Loop Options. The Black Thunder South Mine Loop would only cross one state highway in Campbell County, State Highway 450, in the SW/NW Section 23, T. 43 N., R. 70 W. This option would

not cross any other county or grassland roads. The Black Thunder North mine loop option would not cross any state, county or grassland roads.

The North Antelope West Mine Loop would cross one major road, Irwin Road, in the NE/SW Section 33, T. 41 N., R. 70 W. in Converse County. No state, county or grassland roads would be crossed by the North Antelope East Mine Loop.

4.4.7 Proposed Yard Sites. The Wall Yard would cross Township Road which would also be crossed by Alternatives B and C. The Edgemont Interchange Yard would cross Fall River County Road 15 which would not be crossed by any of the alternatives. The Western Yard would not cross any major roads. Potential impacts to traffic on these roads are expected to be substantially greater because of the potential for delays. To mitigate these impacts, an alternate road or bypass may be required.

4.5 Land Use

4.5.1 Significance Criteria. A significant impact to land use would result if the following occurred:

- Other existing and legitimate land uses are degraded or precluded by the railroad.
- Degradation of the enjoyment or value of adjacent property occurs.
- Health risks or a nuisance or annoyance are introduced to an area where such risks, nuisance, or annoyance did not previously exist.

4.5.2 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). All the alternatives are expected to result in direct changes in current land use. This would occur through conversion of the existing land use to the railroad bed. Although this loss may be locally severe, on the overall landscape the loss would be relatively small and considered insignificant. Many land uses associated with natural process (such as wetlands) would be allowed to continue within the railroad right-of-way, whereas human activities (such as recreation, agriculture and grazing) would not. Direct land use changes are anticipated to be long-term.

Throughout South Dakota and Wyoming, the predominant direct land use conversions would occur in rangeland and cropland types (see Section 3.5). Generally, the conversion would consist of a long, relatively narrow strip of land. Landowners would be compensated for the loss of these areas and mitigation would be developed to insure that economic remnants of land are not created. Impacts associated with conversion of these land use types are not anticipated to be significant and would amount to about 12 to 25 acres per linear mile of new railroad.

However, direct land use conversion associated with the new railroad may not represent the most severe land use impacts. Based on the significance criteria listed above, all the alternatives are anticipated to result in significant direct and indirect adverse impacts to land use whether by degrading or precluding existing uses, affecting adjacent property, or by introducing health risks, nuisance or annoyance where none previously existed. The severity and extent of the impacts by the alternatives are expected to be very different. As discussed below, Alternative D is expected to significantly affect a large number of residences in nearly a dozen communities in South Dakota and Wyoming. Alternatives B and C are expected to have the least significant impact to land use. But, those 2 alternatives would preclude other existing and legitimate land uses, albeit within a narrow and very localized corridor.

Noise and activities produced during construction, followed by railroad operation noise and activity, would extend beyond the limits of the right-of-way corridor for all alternatives. Noise and human presence may degrade or preclude some existing land uses on adjacent lands (such as livestock grazing, recreation, wildlife habitat) and will most certainly be an annoyance to residents living in the project area. Estimates of instantaneous noise levels due to operating trains with and without whistle noise were given in Table 2-6. Existing noise throughout most of the project area for the alternatives is assumed to be 39 dBA during daytime and 32 dBA at night (based on EPA's "farm in valley" noise category). Distance estimates for train noise to attenuate to those background levels (see Table 2-6) clearly demonstrate the long-distance effects that the operating railroad would have on inhabitants in the project area. Health and safety risks, too, will be introduced where and if unauthorized people, pets, and/or livestock cross the tracks or travel within fenced railroad rights-of-way and are struck by trains or debris.

4.5.3 Alternative A (No Action). Implementation of this alternative would not result in any of the impacts described above.

4.5.4 Alternative B (Proposed Action). Changes from existing land uses to a transportation corridor use would be a long-term impact. Existing land uses and land cover that would be affected by Alternative B have been summarized in Table 3-18. In both states, herbaceous rangelands (grasslands) are by far the most affected. Impacts to livestock grazing and to wildlife habitats are expected from land use conversion in any rangeland category by Alternative B. Approximately 260 miles or 86

percent of Alternative B would affect rangelands in Wyoming and South Dakota.

The most significant impacts, however, are expected where the alternative route coincides with residential land uses. Although only 0.3 mile of the route would affect residential land in South Dakota (none in Wyoming), residences in Smithwick and east of Edgemont would be affected since there are several located within 0.1 mile or less of Alternative B. Impacts due to noise, health and safety risks, degradation of the enjoyment or value of these adjacent properties are expected to be significant.

4.5.5 Alternative C (Modified Proposed Action) and Route Variations. For Alternative C and the Phiney Flat and W G Flat route variations, all changes from existing land uses to a transportation corridor land use would be long-term impacts. Existing land uses and land cover in Wyoming and South Dakota that would be affected by Alternative C are summarized in Table 3-19. Similar to Alternative B, rangelands would be affected most with approximately 230 miles or 84 percent of the route crossing that land cover category. Impacts to livestock grazing and to wildlife habitats are expected from conversion of rangelands to railroad use.

Significant impacts are expected where the alternative route coincides with residential lands, but those are only affected at Smithwick. Noise, health and safety risks, degradation of the enjoyment or value of properties adjacent to Alternative C are expected to be significant impacts.

Phiney Flat Route Variation. This variation of Alternative C would affect the same residential areas at Smithwick but no additional residential lands would be affected. Most of the differences between land use and cover affected by the route variation and Alternative C involve croplands, pastures, and herbaceous rangelands, only in South Dakota (see Table 3-20). Land use impacts are expected to be nearly identical to those for Alternative C.

W G Flat Route Variation. Most of differences between land use and cover affected by the W G Flat Route Variation and Alternative C involve wetlands, croplands, pastures, and herbaceous rangelands, only in South Dakota (see Table 3-21). The route variation would affect the same residential areas as Alternative C and the Phiney Flat Route Variation and land use impacts are expected to be nearly identical to those alternatives.

4.5.6 Alternative D (Existing Corridors Alternative). All impacts expected from changes in existing land uses by Alternative D would occur over the long-term. Existing land uses and land cover that would be affected by Alternative D have been summarized in Table 3-22. Reconstructing the existing DM&E railroad would affect considerably more lands identified as residential, commercial or industrial, and mixed urban or built-up lands than any other alternative. By virtue of its total length, the route also passes through more rangeland, croplands and pastures than the other alternatives.

Construction and operation of Alternative D would significantly affect residential areas in South Dakota and Wyoming, more by far than any other alternative. In South Dakota the existing main line passes near residences in Wall, Wasta, New Underwood, Box Elder, near Ellsworth Air Force Base and subdivisions in Rapid City and suburbs, Hermosa, Fairburn, Smithwick, Edgemont, and Dewey. By following the BNSF in Wyoming, Alternative D would pass near residences in Newcastle, Osage, Upton, and Moorcroft. Details of each residential area affected were provided in Section 3.5.2. Impacts due to noise, health and safety risks, degradation of the enjoyment or value of these adjacent properties are expected to be highly significant for this alternative and much higher than the other alternatives. Many thousands of individuals could be adversely affected by this alternative.

4.5.7 Proposed Mine Loop Options. The proposed mine loop options would mostly cross rangeland. The Black Thunder North and South mine loops would also cross the strip mines, quarries and gravel pits category for 0.6 and 1.0 miles, respectively. These two mine loops would also cross a small portion of the industrial category (0.1 miles for Black Thunder North and 0.3 miles for Black Thunder South). The North Antelope East and West mine loops would cross cropland and pasture for 0.3 and 1.9 miles, respectively.

4.5.8 Proposed Yard Sites. The proposed yard site at Wall would mostly affect cropland and pasture. A portion of the site intersects the Transportation, Communication and Utility land use type at the I-90 corridor. Another portion will affect a mixed urban and built-up area adjacent to Wall. Residences in that area will be impacted by the industrial use associated with the yard.

The Edgemont Interchange Yard and Western Yard sites primarily affect herbaceous rangelands and limited cropland or pastureland at the Western Yard. No impacts to residential lands would occur at the Western Yard site in Wyoming, but the Edgemont Interchange Yard Site is proximate to a few scattered residences and within 0.5 mile of Dudley. However, that yard site would be adjacent to existing BNSF tracks and would probably not change the character of land use or noise levels very much from those already present.

4.6 Recreation Resources

Recreation opportunities in close proximity to the alternatives are located in parks, recreation sites and facilities (Badlands National Park, Angostura State Recreation Area, etc.) and on NFS lands on BGNG and TBNG. Most recreation use in the immediate vicinity of the alternatives is associated with NFS lands and consists primarily of dispersed recreation (hiking, hunting, driving, etc.). While it is difficult to accurately determine the actual displacement of dispersed recreationists from the area near the railroad construction and operations, a railroad will cause recreationists who value more primitive settings to look elsewhere for their recreational exper-iences. Construction and operation of the railroad would affect the quality of dispersed recreational experiences (e.g. hunting, camping, hiking, etc.) by increasing traffic and dust during construction, producing noise and night light during operations, and by adding facilities and other disturbances to the landscape. It is anticipated that an unknown number of dispersed recreation users would be displaced from the immediate vicinity of the new railroad.

4.6.1 Significance Criteria. A significant impact to recreation would occur if construction or operation of the alternatives resulted in:

- Introduction of noise, visual or night light pollution into national grasslands or state parks or monuments.
- The elimination of the wilderness eligibility of all or a portion of any area.
- The elimination of the wild and scenic river eligibility of all or a portion of any stream or river.

4.6.2 Parks, Recreation Sites and Facilities. Of all the parks, recreation sites and recreation facilities described in Section 3.6.3, only Badlands National Park has the potential to be adversely affected by the alternatives. All of the other parks, sites and facilities are located over 1.5 miles from the alternatives and would not be significantly affected by construction or operation of the alternatives.

The proximity of Alternative B to Badlands National Park is shown on Figure 3-8. At its closest, the alternative would be about 3,700 feet from the park. Some of the most striking qualities of Badlands is its wilderness character, quiet and solitude. Quiet contemplation is an important park experience. Operating a railroad in close proximity to the park would have an adverse impact on these qualities. Using estimates of noise provided by Burns & McDonnell (see Table 2-6), it is expected that visitors to portions of Badlands National Park shown on Figure 3-8 would be able to hear the railroad. Introducing noise from the operating railroad into the park would be a significant adverse impact.

4.6.3 National Forest System Lands. Table 3-25 lists the current ROS designation for all NFS lands which would be crossed by the alternatives. As can be seen on the table, the vast majority of the lands which would be crossed (including all lands on TBNG) are classified as roaded natural, rural or urban. The operating railroad would be compatible with these ROS designations. However, semi-primitive motorized lands would be crossed by Alternatives B (1.6 miles) and C (0.8 miles) and Alternative C with the W G Flat Route Variation (0.8 miles) and the Phiney Flat Route Variation (0.4 miles) on BGNG.

NFS lands designated as semi-primitive motorized are expected to be predominately natural or natural appearing. The operating railroad would not be compatible with such a designation. If Alternatives B or C are implemented, it would be likely that these lands (described in Section 3.6.2.1) would be degraded to a lower ROS designation. Alternative B would have the largest impact on semi-primitive motorized lands. Alternative B would cross a total of 1.6 miles of semi-primitive motorized lands in the Spring Creek drainage (0.4 miles) and in the Cheyenne River RARE II Area (1.2 miles).

Alternative C would eliminate the crossing of semi-primitive motorized lands in the Cheyenne River RARE II Area (see Figure 3-4). However, this ROS designation would still be crossed in the Spring Creek drainage. In addition, a small area (0.4 miles) of semi-primitive motorized lands would be crossed in the Dry Creek drainage in Custer County by Alternative C. These lands are located in the NW/NE of Section 4, T. 4 S., R. 9 E. This section is the very edge of a large block of NFS lands and Alternative C would directly impact only the northwest corner of this block. The new railroad would create a very small (about 20 acres) isolated parcel of NFS lands which the Forest Service would find extremely difficult to access and manage. This small remnant parcel may be a candidate for exchange.

Indirect impacts to the semi-primitive motorized lands in the Dry Creek drainage are of concern. The operating railroad would introduce sights and sounds over the northern and western edges of this large, contiguous block of NFS lands. As such, the ability of users to enjoy the relatively-primitive characteristics of this area would be diminished. If Alternative C is selected, it may be necessary to reevaluate the ROS designation of portions of the this parcel and select a designation which may be more appropriate for the sights and sounds that will be introduced by the operating railroad. There is one two-track road that would be crossed by Alternative C just north of this area. If it is necessary to use the locomotive

whistle at this crossing, the noise impacts on the semi-primitive motorized area to the south would be compounded.

The Phiney Flat Route Variation would further reduce impacts to semi-primitive motorized lands. This route variation would avoid 0.4 miles of NFS lands with this ROS designation in the Spring Creek drainage.

Although not crossed, Alternative B would be located in close proximity to lands currently managed by BGNG as semi-primitive non-motorized. The location of these lands are shown on Figure 3-6. In the NE of Section 16, T. 4 S., R. 11 E., semi-primitive non-motorized NFS lands would be separated from Alternative B only by the Cheyenne River. This ROS designation has also been applied to lands in Section 21, T. 4 S., R. 11 E. Again, only the Cheyenne River would separate Alternative B from semi-primitive non-motorized lands. Semi-primitive non-motorized lands are managed such that motorized use is not permitted to avoid impacts on recreation opportunities. The lands are managed for primitive recreation experiences where the sights and sounds of human activities are not typically present. Because of its close proximity, it is likely that noise from the operating railroad and visual perturbations along the Cheyenne River adjacent to this ROS designation would degrade the recreation experience of those enjoying the area's wilderness-like qualities. Because there are no roads which would be crossed in this area, exacerbated noise problems from the locomotive whistle should not be a problem. The impacts may require the ROS designation for some of these lands to be lowered.

Although an operating railroad would be compatible with the ROS designations of roaded natural, rural, or urban, the sights and sounds of an operating railroad will displace a number of recreationists from these ROS areas. Those who have enjoyed dispersed camping, wildlife watching, and viewing scenery in the area of the proposed rail line will most likely be displaced to other areas of the grasslands when the railroad is constructed and operating. Motorized recreationists and many hunters who use the grasslands are generally more tolerant of facility additions to the landscape, such as oil wells, stock watering developments, and to some degree, railroads. However, some of these types of recreationists often desire an experience in a more natural appearing setting than adjacent to a railroad, and will seek this experience elsewhere.

As dispersed recreationists are displaced from the vicinity of the railroad, they will seek experiences they desire elsewhere on the grasslands. This will cause an increase of use in areas already experiencing dispersed recreation use. Due to the individual user preferences for the locations and types of experiences they seek, it is difficult to speculate on exactly where use will increase and become more concentrated. However, it can be assumed that such use will increase in areas of current and past high use due to the scenic attractiveness of these areas, hunting opportunities, and other attractions to recreationists.

Construction workers may seek recreation activities on the grasslands. Such increased recreation use, both in the short-term during construction and long-term, from the West Yard workers, may create a need for the Forest Service to respond to providing more concentrated recreation use opportunities, and to protect natural resources by providing developed sites. The increased recreation use from railroad construction and operation workers, and associated persons, may result in a need for increased Forest Service law enforcement efforts. Such increase of use will occur near the railroad from railroad-related persons, as well as elsewhere on the grasslands from those displaced by the railroad construction and operations.

Some of the recreation benefits of the past land consolidation on the TBNG will be lost due to an operating railroad. This loss will be the greatest under Alternative B as the railroad would cross the areas of the greatest land consolidation success. This includes the Rosecrans and Cellars Loop areas. Alternative C will impact the past consolidations to a lesser degree, but it will still have the effect of displacing recreationists in the Cellars Loop area and the area west of the Darlington School. These lost benefits from a railroad and yard in the vicinity of the land consolidations include the loss of the improved long-term recreation potential the land exchanges created.

These direct and indirect impacts to recreationists will be due to the visual, noise, and night light pollution impacts from the nearby operating railroad and West Yard site. The operations of the proposed railroad will also degrade the current feelings of vastness and remoteness, solitude and quiet, and visual experiences that include night sky viewing and a landscape that appears natural and primitive from a background perspective.

4.6.4 Public Lands. As was stated in Section 3.6.2.2, there are few if any recreation opportunities on public lands in the project area. As such, no impacts on these lands are anticipated.

4.6.5 Wilderness and Inventoried Roadless Areas

4.6.5.1 Wilderness Areas. The alternatives would not impact designated wilderness or wilderness study areas. At their closest, Alternatives B and C would be located more than 6 miles north of the Sage Creek

Wilderness Area in Pennington County (see Figure 3-11). No impacts to this wilderness area are anticipated.

4.6.5.2 RARE II and Inventoried Roadless Areas. As was discussed in Section 3.4.6.2, currently there are no inventoried RARE II roadless areas on TBNG. However, 3 roadless areas were identified on BGNG during RARE II, including: Indian Creek RARE II Area; Red Shirt RARE II Area; and Cheyenne River RARE II Area. The locations of these RARE II areas are shown on Figure 3-12. All 3 would be significantly and adversely affected by Alternative B.

The proximity of Alternative B to the Indian Creek RARE II Area is shown on Figure 3-14. As can be seen on the figure, the RARE II area is separated from the alternative only by the Cheyenne River. Alternative B would pass through the southeastern edge of the Red Shirt RARE II Area (see Figure 3-15) near the Village of Red Shirt. In Custer County, the alternative would pass through the southern edge of the Cheyenne River RARE II Area (see Figure 3-17).

Alternative B would have a direct impact on the Red Shirt and Cheyenne River RARE II Areas. The railroad would eliminate portions of both areas from future consideration for inclusion in the National Wilderness System. Such a loss would be significant and may be prohibited by recent actions undertaken by the Clinton Administration.

In addition, indirect impacts from the operating railroad would adversely affect the wilderness-like qualities of all 3 RARE II areas. Many of the characteristics (i.e., solitude and quiet) which make these areas eligible for consideration as wilderness would be lost. These losses would occur over any portion of the RARE II areas adversely affected by noise or light pollution from the operating railroad.

The preferred alternative for the proposed BGNG grassland would recommend the Red Shirt Area (see Figure 3-16) for inclusion in the National Wilderness System. Once such a recommendation is made, the Forest Service would be prohibited from providing a permit for the railroad across this area.

Also shown on Figure 3-16 is the route for Alternative C in relation to the Red Shirt Area. Although not crossed by the alternative, noise impacts from the operating railroad would be expected in the area the Forest Service proposes to recommend for inclusion in the National Wilderness System. The impact to this area would not be as severe as Alternative B, but would still be considered significant. Introducing noise into this area would degrade the wilderness qualities that make it eligible for inclusion in the National Wilderness System.

On TBNG, Alternative B would be routed directly adjacent to the H A Divide Inventoried Roadless Area identified in the TBNG proposed grassland plan. Like BGNG, the sights and sounds introduced into the area would have a significant impact on the wilderness-like qualities of this area. Such an impact would be considered significant. However, unlike the Red Shirt Area, H A Divide is not recommended for inclusion in the National Wilderness System by the proposed grassland plan preferred alternative, but the HA Divide is recommended for inclusion to the wilderness system under another action alternative.

4.6.6 National Natural Landmarks. As was discussed in Section 3.6.5, there are no national natural landmarks in close proximity to any of the alternatives. No impacts to landmarks are anticipated.

4.6.7 Wild and Scenic Rivers. Currently, no rivers or streams which have been designated as wild and scenic are located eastern Wyoming or western South Dakota. However, as was discussed in Section 3.6.6, the Forest Service, during the recent plans revision reviewed the eligibility of all streams within 6th level watersheds on the grasslands. The Forest Service determined that about 8 miles of the Cheyenne River on BGNG is eligible under the scenic classification. However, for reasons not explained in the draft EIS for the plans revision, under the preferred alternative for the plans revision this stretch would not be nominated for inclusion in the national Wild and Scenic River System. The stretch identified as scenic is shown on Figure 3-20. The characteristics which were used to determine its eligibility included:

- significant fisheries and wildlife resources;
- scenic qualities; and
- recreation values.

Implementation of Alternative B would adversely affect many, if not all, of these characteristics and would likely change the setting of the river so dramatically that it would no longer be eligible for inclusion in the national Wild and Scenic River System. Of most concern would be potential impacts to the scenic qualities of this relatively unspoiled stretch of the Cheyenne. As can be seen of Figure 3-20, through this stretch the railroad would be located 0.5 miles or less on the north side of the river. In at least 4 locations, the alternative would be constructed directly adjacent to the north bank of the river. Although engineering studies have not been conducted for this alternative, it is likely that significant cuts would be required into the high banks above the river to accommodate the railroad bed. Slopes would need to be laid back to prevent slumping and landslides. In many areas it would be anticipated that significant bank

armoring would be required to keep the river from washing out the tracks.

All of these construction requirements would significantly affect the scenic qualities of the eligible stretch of the Cheyenne River. In fact, the 4 "pinch points" extend from the beginning of the 8-mile long scenic stretch to the end in such a manner that major construction perturbations would be evident to recreation users over the majority of the eligible stretch.

Recreation use of the area would be adversely affected by noise from the operating trains. State Highway 40 would be crossed directly adjacent to the eligible stretch of the river. If it would be necessary to blow the locomotive whistle at this crossing (i.e., a grade separation of the track and the road was not possible), noise would be expected to resonate up and down the river valley which would further degrade recreation opportunities in the area.

Alternatives C and D would not adversely affect eligible wild and scenic rivers.

4.7 Research Natural Areas

As was discussed in Section 3.7 of this report, there are currently no RNAs in close proximity to the alternatives on BGNG or TBNG. However, the plans revision proposes new RNAs on both grasslands. The Hay Canyon Pasture Potential RNA is located on BGNG about 7 miles northeast of Smithwick and about 1.1 miles southeast of Alternative C (see Figure 3-22). It was considered by the plans revision for designation as a RNA because of its botanical value (see Table SAD-1 in the plans revision draft EIS, Forest Service, 1999c). Alternative C of the new railroad would not adversely affect the characteristics for which this potential RNA was proposed in the plans revision. In addition, the preferred alternative in the plans revision would not designate the area as a RNA. It would only be designated under Alternative 4.

Similarly, the South Pasture (777) RNA was proposed because of botanical qualities. Even though Alternative C would be routed less than 0.7 miles from the RNA boundary, the qualities for which the RNA was nominated would not be adversely affected.

The Antelope Creek Potential RNA is located south of the southern legs of all the alternatives on TBNG (see Figure 3-21). It also was proposed for inclusion as an RNA because of its botanical qualities - it provides a reasonably good example of a plains stream ecosystem. At its closest, Alternative B would be located over 2.5 miles north of the potential RNA. The characteristics for which the area was recommended as an RNA would not be adversely affected by either construction or operations. Like Hay Canyon, this potential RNA would not be designated under the plans revision preferred alternative. It would only be designated under Alternative 4.

4.8 Visual Resources

4.8.1 Significance Criteria. A significant impact to visual resources on NFS lands would occur if implementation of an alternative would not meet the VQO for an area. All of the alternatives and the Black Thunder North and South mine loops would cross areas on NFS lands that have an existing VQO of partial retention. In these areas, railroad construction is expected to cause significant impacts to visual resources because management activities are required to be subordinate to the natural environment. The railroad would dominate the landscape in these areas, especially during railroad operation when trains are passing through.

Alternatives B and C would cross areas proposed for a high scenic integrity level (SIL) by the proposed grassland plans. Like the existing partial retention VQO, the introd-uction of an operating railroad into these landscapes would result in a significant impact to the visual setting of the area and would likely result in the need to lower the SIL for the areas impacted.

4.8.2 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). Impacts to visual resources to a large extent would depend on the distance of the activity or facility to the observer. Construction of the railroad would be a dominant feature on the landscape. Once operational, trains would be highly visible because, in general, there is little obscuring vegetation or topography. And, coal trains are expected to be from 1.2 to 1.5 miles long. Trains would probably be heard for long distances depending on intervening topography, vegetation and local weather conditions. Furthermore, the 1 percent design grade for the railroad would require large cuts and fills in many areas that will likely create an obvious visual contrast. Visual impacts of the railroad on the landscape would be considered a long-term impact. As indicated above, where the railroad would be constructed in areas with a VQO of partial retention or a high SIL, the impact would be considered significant. Significant visual impacts are not expected in areas with a VQO of modification because management activities in areas are allowed to dominate the landscape. Although these impacts would not be considered significant in the modification VQO's, the railroad would still substantially dominate the foreground and middleground of the landscape, and be obvious in the background viewpoints. This would result

in a substantial and long-term, change in the scenic qualities of these areas.

Implementation of the alternatives would cause an irreversible and irretrievable commitment of visual resources for the life of the railroad. The railroad would be a permanent aboveground structure. Development of the railroad in areas that provide a landscape of vastness and expansiveness would change the visual character of the landscape by adding a high use railroad to areas that have experienced little human development.

4.8.3 Alternative A (No Action). Implementation of this alternative would not result in impacts to visual resources.

4.8.4 Alternative B (Proposed Action). Approximately 44 miles of this alternative would cross NFS lands with a VQO of modification and 7.5 miles would cross lands that have a VQO of partial retention. On BGNG, Alternative B would cross 2.6 miles of NFS lands with a VQO of partial retention, where significant impacts to visual resources would occur. The alternative would affect 4.9 miles of land with a VQO of partial retention on TBNG. Based on the proposed grassland plans for BGNG and TBNG, 4.7 miles of land would be crossed that have a high SIL, defined as areas managed so that human activity is not scenically evident (see Table 3-27). This would be nearly twice as much as would be crossed by Alternative C.

4.8.5 Alternative C (Modified Proposed Action) and Route Variations. Alternative C would cross a total of 33.8 miles of NFS lands with a VQO of modification and 5.1 miles with a VQO of partial retention. On BGNG, Alternative C would crosse 0.7 miles of land with a VQO of partial retention but would affect 4.4 miles of land with a VQO of partial retention on TBNG (see Table 3-27).

Based on the new scenic management system in the proposed grassland plans for BGNG and TBNG, 2.4 miles of Alternative C would cross NFS lands that have a high SIL. In these areas, construction is anticipated to cause significant impacts to visual resources because the railroad would be scenically evident (see Table 3-27).

Phiney Flat Route Variation. In Wyoming, this route variation would have the same impact to visual resources as Alternative C. On BGNG, the route variation would affect lands with a VQO of partial retention by 0.3 miles less than Alternative C.

W G Flat Route Variation. This route variation would have the same impact to visual resources as Alternative C (see Table 3-27).

4.8.6 Alternative D (Existing Corridors Alternative). This alternative would not cross any NFS lands in South Dakota so there would be no impacts to visual resources on BGNG. Alternative D would cross 22.7 miles of lands with a VQO of modification and 4.0 miles with a VQO of partial retention on TBNG. Based on the TBNG proposed grassland plan, no areas with a high SIL would be affected by Alternative D (see Table 3-27).

Because this alternative would be constructed adjacent to or would replace an existing railroad, impacts to visual resources would be greatly reduced compared to Alternatives B and C. In areas near existing railroads, human activities are obvious and the general types of visual intrusions from the project would be similar to those already present.

4.8.7 Proposed Mine Loop Options. The Black Thunder North Mine Loop would cross 0.6 miles of lands with a VQO of modification and less than 0.1 miles with a VQO of partial retention on TBNG. The Black Thunder South Mine Loop would cross 2.7 miles of lands with a VQO of modification and 0.4 miles with a VQO of partial retention on TBNG. No areas with a high SIL would be affected by the Black Thunder mine loops. The North Antelope mine loops do not cross NFS lands.

4.8.8 Proposed Yard Sites. The only yard that would affect NFS lands is the Western Yard. All NFS lands that would be affected by this yard have a VQO of modification. The Western Yard will be a major rail staging facility and is expected to include maintenance and minor repair facilities. Consequently, the yard will be a dominate landscape feature, changing the landscape setting to an industrial use.

4.9 Cultural and Historic Resources

Potential impacts to cultural and historic resources are being evaluated in the draft EIS. Please refer to that document and the technical reports prepared by STB for full disclosure of potential impacts to these resources.

4.10 Air Quality

Potential impacts to air quality are currently being modeled by STB for inclusion in the draft EIS. The impacts to air quality will be fully disclosed in a technical report being prepared to support the EIS. Please refer to that technical report for additional information.

4.11 Geology and Paleontological Resources

4.11.1 Significance Criteria. Significant impacts due to geological hazards and to paleontological resources would occur if:

- Landslides or slumps result from project activities.
- Project facilities are damaged by landslides.
- Important fossils, which could substantially add to scientific understanding of paleontological resources, are destroyed during project construction.

4.11.2 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). Construction of any of the alternatives should have a significant positive impact on the mineral resource industry in Wyoming. This positive impact would result from the construction of a new rail system that would allow mineral resources to be shipped to new markets or to existing markets on a more efficient and cost-effective system. The new railroad would provide the coal mining industry in the SPRB with an additional transportation network to haul coal to new markets or to existing markets on a more efficient route. Furthermore, local sand and gravel operations would likely benefit from the proposed project since large quantities of aggregate would be required for construction activities.

Earthquakes. According to seismic risk maps (International Congress of Building Officials, 1994 and Case, 1986), all alternatives are located within seismic risk zone 1 which predicts only slight earthquake damage to structures and a low hazard to people. Nearly all of the earthquakes in Wyoming have been due to movements of faults (Case, 1997). The alternatives would not cross any suspected active faults in Wyoming or South Dakota (Case *et al.*, 1995) although the alternatives in Wyoming and South Dakota would cross inactive faults systems near the Wyoming - South Dakota border south of Newcastle near Morrisey (Love and Chrstiansen, 1985). Only 2 earthquake epicenters have been mapped in the immediate vicinity of the alternatives or route variations (Hammond, 1993 and Case *et al.*, 1995). Two epicenters have been mapped adjacent to Alternative D, but these epicenters were associated with low intensity earthquakes with a modified Mercalli scale of VI or less. Based on this information, the potential for impacts by earthquakes to any of the alternatives does not appear to be significant.

Liquefaction. During liquefaction, materials composed primarily of water-saturated sands and silts lose their strength and behave as viscous fluids. Seismic waves passing through saturated materials may compact them, raising the pore water pressure. When the pore water pressure rises to the pressure of the weight of the overlying materials, liquefaction occurs. Because seismic activity is low for the project area, the potential for this phenomenon to occur is low for all of the alternatives. Furthermore, none of the alternatives in Wyoming would cross areas prone to liquefaction (Case, 1986a).

Landslides. In both Wyoming and South Dakota, portions of the alternatives cross the Pierre Shale and Fort Union formations which have a high landslide susceptibility (Redbrush-Hall *et al.* 1976). The clay-mineral content of these rocks is moderate to high, so that they are susceptible to slumps and earth flows. The weak and erodible rocks have generally low to moderate relief, with some buttes and badlands; slopes are generally moderate to steep along drainage courses. Areas of moderate and high incidence of landslides are confined mostly to valley walls of the Cheyenne River and its major tributaries. In these areas, cutting or loading of slopes or unusually high precipitation may cause landsliding. Flatter areas are also susceptible to landslides if slopes are steepened by construction activities. The potential for slumping along Alternatives B and C where these alternatives are immediately adjacent to the Cheyenne River have been observed on-site and are evident through photo interpretation of low level aerial photos.

To compare the potential landslide susceptibility of each alternative, crossing lengths of the Pierre Shale and Fort Union formations were determined. In addition, soils mapping units that are identified by NRCS as prone to slumping and landslides (based on their slope, landscape position, soil descriptions) (NRCS ,1982 and 1996a) were identified. These mapping units were quantified and compared to help refine the potential landslide hazard of each alternative.

Potential impacts from slumps and landslides would depend on their size and location. Potential impacts could include land or habitat disturbance as well as impacts to drainages that may impact water quality and aquatic resources from additional sedimentation. Slumps and landslides could be a potential safety and operational concern if one of these events caused a derailment or interrupted service. In areas where slumps and landslide are common and occur naturally (including areas of bank erosion with slumps or creeps toward the Cheyenne River), construction may require large disturbances to provide a stable surface for the railroad. Some activities that may be required to stabilize these areas could include excavating unstable material and reshaping slopes, providing positive drainage so that water drains away from the railroad bed and off of potential unstable slopes, and stabilization of river banks to reduce or eliminate under cutting.

Shrinking-swelling clays. There are several formations that would be crossed by the alternatives that have beds of bentonite, or rocks that have a bentonite

component. When wet, the bentonite clay structures expand, resulting in a loss of strength (Case, 1986b). If proper engineering designs are not implemented during construction, structural problems may occur to the railroad bed causing the tracks to sink, shift or otherwise be altered. If these problems are severe they can pose a safety and operational concern.

Paleontological Resources. There are world-famous paleontological deposits in the vicinity of the alternatives. Ancestors of the modern day rhinoceros, horse, pig, cat, early birds, reptiles and invertebrates may be found in various strata which would be crossed by the alternatives. There are known paleontological sites adjacent to the alternatives and the possibility is high that paleontological resources of scientific significance could be disturbed/uncovered by earth-moving activities during construction.

Subsurface paleontological resources could be revealed during construction and excavation for any of the alternatives and would offer a unique opportunity to discover new specimens. Given the Forest Service and BLM standards and guidelines, the possibility of irretrievably damaging a resource of scientific significance would be low on Federal lands. Because paleontological resources are not protected on private lands, scientifically significant specimens could be destroyed by any of the alternatives. The potential loss of significant paleontological resources on private lands is high.

The Forest Service requires Class III paleontological field surveys, conducted by a qualified paleontologist, where the alternatives cross formations that have a high Probable Fossil Yield Classification (PFYC). Accord to Beasley (1999), this would include all formations which have a PFYC of 3 or 5. These formations have a high probability of yielding paleontological resources that are of concern. This classification is based largely on how likely a geologic unit is to produce vertebrate fossils of terrestrial (non-marine) origin. Based on the results of these surveys, the Forest Service and BLM would determine the extent of monitoring that may be necessary during construction on NFS or public lands. Forest Service and BLM stipulations require that any paleontological resources discovered during construction must be immediately reported to the Federal agency having jurisdiction where the discovery is found. All operations in the immediate vicinity of the discovery would be halted until written authorization is issued by either the Forest Service or BLM. These agencies would conduct an evaluation of the discovery and determine appropriate actions to prevent the loss of significant scientific values.

To quantify potential impacts to paleontological resources, crossing lengths through each PFYC (i.e., 3 and 5) is compared by alternative. The PFYC for each formation which would be crossed by the alternatives is provided on Table 3-32. Geologic formations that would be crossed by each of the alternatives is based on the geologic mapping of Love and Christiansen (1985) and Darton (1951) and provided in Tables 3-27 through 3-31.

4.11.3 Alternative A (No Action). This alternative, if implemented, would not provide any positive impacts to the mineral industry in Wyoming because a new railroad would not be constructed to haul mineral commodities to their markets. In addition, because the project would not be built, it would not provide a new market for the local aggregate industry.

Implementation of the No Action Alternative would avoid the possibility of disturbing paleontological resources. However, this would eliminate the potential of discovering new scientifically-significant paleontological resources.

4.11.4 Alternative B (Proposed Action). This alternative would cross a total of 158 miles of the Pierre Shale and Fort Union formations which have a high susceptibility for slumps and landslides. The potential for slumps or landslides would be high where this alternative crosses steep slopes or where cutting or loading of slopes or anomalously high precipitation may cause landslides. In South Dakota, 48.2 miles of the Pierre Shale Formation would be crossed while in Wyoming 109.8 miles of the Pierre Shale and Fort Union formations would be crossed. In Wyoming, this alternative would not cross known landslides (Larsen *et al.,* 1991a and 1991b), therefore the landslide potential along this alternative would likely be confined to those areas in South Dakota where steep slopes adjacent to the Cheyenne River would be crossed.

Areas that are prone to slumping and landslides have been correlated to soils mapping units. Based on this analysis, Alternative B would traverse 36.4 miles of steeply sloping soils in the vicinity of the Cheyenne River, the most of any alternative. If construction triggered a landslide, the impact would be considered significant and long-term since these events can be difficult to stabilize and can cause other significant environmental impacts such as habitat degradation and severe water quality degradation.

Alternative B would cross a total of 41.7 miles of formations with a PFYC of 5 (8.9 miles in South Dakota and 32.8 in Wyoming). All of the formations in South Dakota that have a PFYC of 5 occur on private lands where there are no protective measures for paleontological resources. In Wyoming, 7.3 miles of these formations that have a PFYC of 5 occur on NFS lands (see Tables 3-29 and 3-34). The remaining 254.4

miles of this alternative would cross formations that have a PFYC of 3.

In Wyoming, this alternative would cross approximately 2 miles of the 5,140-acre Thunder Basin Paleontological Special Interest Area (SIA) on the TBNG (see Figure 3-23). This site is known to contain a high concentration of fossil remains from the late Cretaceous Period. This is the most productive fossil-bearing site on the TBNG. Standard stipulations and conditions of approval should prevent impacts from occurring to paleontological resources at this site and important discoveries could be made in the SIA during construction of this alternative.

4.11.5 Alternative C (Modified Proposed Action). This alternative would cross a total of 138.5 miles of the Pierre Shale and Fort Union formations. As with Alternative B, the potential for slumps or landslides would be high where this alternative crosses steep slopes or where cutting or loading of slopes or anomalously high precipitation may cause landsliding in these formations. In South Dakota, 52.8 miles of the Pierre Shale Formation would be crossed while in Wyoming 85.7 miles of the Fort Union and Pierre Shale formations would be crossed. In Wyoming, Alternative C would not cross known landslides (Larsen *et al.*, 1991a and 1991b) - the landslide potential along this alternative would likely be confined to those areas in South Dakota where steep slopes adjacent to the Cheyenne River would be crossed.

This alternative would traverse 21.1 miles of steeply sloping soils in the vicinity of the Cheyenne River that are prone to slumps and landslides. That distance is 15.3 miles less than Alternatives B. If construction of Alternative C triggered a landslide, the impacts would be considered significant and long-term impact because these events can cause habitat degradation and other environmental impacts.

Alternative C would cross a total of 56.2 miles of formations that have a PFYC of 5. Of that total, 19.9 miles of the route would affect those formations in South Dakota and 36.3 miles would affect formations in Wyoming. In South Dakota and Wyoming, 1.4 and 8.0 miles of these geologic units would be crossed on NFS lands, respectively (see Tables 3-30 and 3-34). Alternative C would cross 14.5 more miles of these highly fossiliferous units than Alternative B. This alternative would also cross 217.6 miles of formations that have a PFYC of 3, 36.8 miles less than Alternative B.

In Wyoming, this alternative would cross about 2.4 miles of the Thunder Basin Paleontological SIA, described above for Alternative B (see Figure 3-23). Standard stipulations and conditions of approval should prevent significant impacts from occurring to paleontological resources at this site or on other Federal lands which would be crossed by the alternatives. Construction of this alternative could result in important discoveries.

Phiney Flat Route Variation. This route variation would cross the same formations and have the same potential impacts in Wyoming as Alternative C. In South Dakota, approximately 7 miles more of the Pierre Shale Formation would be crossed by this variation. However, his difference is not considered noteworthy since the variation would primarily cross level terrain which should not be prone to slumping. In addition, this route variation would cross 0.8 miles less of soils that are prone to slumps and landslides than Alternative C.

This variation would also cross the same length of formations that have a PFYC of 5 as Alternative C (see Table 3-31). This route variation would have the same potential impacts to paleontological resources as Alternative C.

W G Flat Route Variation. This route variation would cross the same formations and have the same potential impacts in Wyoming as Alternative C. In South Dakota, this route variation would essentially cross the same lengths of the Pierre Shale and Fort Union formations as Alternative C. This route variation would cross about 1.3 fewer miles of soils that have a high potential for slumps and landslides. The W G Flat Route Variation would cross fewer miles of these soils because it would not parallel the Cheyenne River to the extent that Alternative C would. Therefore, this route variation may have slightly less of a potential for slumps and landslides.

Summarized in Table 3-32 are the formations crossed by this route variation. The route would cross the same amount of formations that have a PFYC of 5 as Alternative C. Therefore, potential impacts to paleontological resources would be the same for this route variation as Alternative C.

4.11.6 Alternative D (Existing Corridors Alternative). This alternative would cross a total of 164.2 miles of the Pierre Shale and Fort Union formations which have a high susceptibility for slumps and landslides. In South Dakota, 69.9 miles of the Pierre Shale Formation would be crossed and 94.3 miles of the Fort Union and Pierre Shale formations would be crossed in Wyoming. Also in Wyoming, Alternative D would cross two very small areas of known landslides (Larsen *et al*, 1991a and 1991b). One of these areas is located south of Newcastle in Sections 12 and 13, T. 4 S., R. 61 W.) in an area immediately east of the existing BNSF railroad. The other area is located west of Newcastle (Section 24, T. 2 S., R. 62 W.) and is also east of the existing BNSF railroad.

The Alternative D route would not parallel the Cheyenne River in South Dakota where steep slopes occur. Therefore, this alternative would cross the least amount of soils that have a high potential for slumps and landslides. Only 2.7 miles of those soil groups would be crossed. Compared to the other alternatives, Alternative D would have the least potential to trigger slumps or landslides.

This alternative would cross a total of 109.9 miles of highly fossiliferous formations that have a PFYC of 5, the most of any alternative. In South Dakota, 56.5 miles of these geologic units would be crossed and in Wyoming 53.4 miles would be crossed. Compared to Alternative C, this alternative would cross 53.7 more miles of these formations, with only 5.4 miles of these formation occurring on NFS lands (see Table 3-33). This alternative would not cross the Thunder Basin Paleontological SIA. However, because this alternative would cross the most formations with a PFYC value of 5 on private lands, it may have the greatest potential to significantly impact paleontological resources.

4.11.7 Proposed Mine Loop Options. The Black Thunder North Mine Loop would cross 3.6 miles of the Lebo Member of the Fort Union Formation and 0.90 miles of the main body of the Wasatch Formation. The Black Thunder South Mine Loop would cross 3.9 miles of the Lebo Member of the Fort Union Formation and 3.2 miles of the main body of the Wasatch Formation. The North Antelope East and West mine loops would cross 1.5 and 2.4 miles of the Fort Union Lebo Member, respectively.

The Black Thunder mine loops would have the potential to impact paleontological resources where they cross the Wasatch Formation. Both of the Black Thunder mine loops would cross soils that have a high potential for slumps or landslides. The North Antelope mine loops would not affect areas with a high potential for slumps or landslides. The Fort Union Formation has a PFYC of 3. However, because the North Antelope loops would be constructed entirely on non-Federal lands, protection of paleontological resources would not occur.

4.11.8 Proposed Yard Sites. All of the West Staging Yard would be constructed on the Lebo Member of the Fort Union Formation. The Wall Yard would be constructed on Skull Creek Shale and the White River Group and the Edgemont Yard would be constructed on alluvium and the Belle Fourche and Mowry Shale. The only yard that has the potential to impact paleontological resources is the Wall Yard where it would be constructed on the White River Group. The Western Yard is the only yard that would cross formations that have a high potential for landslides - however, the yard sites is relatively flat and landslides are not a concern.

4.12 Water Resources

DM&E is in the process of preparing permit applications for the COE and state 401 water quality agencies that address the impacts to all waters of the United States including perennial, ephemeral and intermittent streams. The information contained in those applications is not repeated here. Rather, this section provides a comparison of the number of streams that would be crossed by the alternatives. For additional information, including detailed plan and profile drawings of major water body crossings and hydrology studies, please refer to the applications.

4.12.1 Summary of Impacts Common to All Alternatives (Except the No Action Alternative)

Groundwater. Potential impacts to groundwater could occur if implementation of any of the alternatives destroys or impairs water supply wells that provide water for domestic, livestock or wildlife use. In addition, impacts could occur to groundwater if spills of fuel or other fluids contaminates groundwater. Potential impacts to water wells would be mitigated by DM&E replacing or repairing any well damaged during construction. A Spill Prevention Countermeasure and Control (SPCC) Plan would be developed by DM&E for both the construction and operation phases of the project to reduce the risk of surface water or groundwater being contaminated. During construction, any water necessary for construction purposes (i.e., compaction, dust abatement, etc.) would be acquired in compliance with appropriate regulations.

Surface Water. Disturbances within a stream corridor may trigger a variety of impacts that differ in frequency, duration, intensity and location. Physical disturbances within a stream corridor can cause impacts locally (i.e., stream reach) or at locations far removed from the site. Vegetation removal from streambanks, flood plains and uplands often impacts the hydrologic and geomorphic functions of stream corridors. Vegetation removal can result in increased erosion and sedimentation which degrades water quality. Increased erosion and sedimentation may be from disturbed upland areas, as well as from streambanks where vegetation has been removed which may contribute to unstable streambanks.

Stream channel modifications required to accommodate the railroad grade can directly affect stream hydraulics by potentially increasing stream velocities from straightened channels, reducing stream meanders and by creating a uniform crossing section. Some of the potential effects caused by these changes include:

increased erosion, levels of sediment and contaminants reaching streams, increased water temperature, turbidity and pH; incised channels; lower ground water elevations; stream bank failure and loss of habitat for aquatic and terrestrial species. Habitat diversity can also be lost from stream bank armoring.

Storm Water Requirements. One of the greatest areas of concern for impacts to surface water is sedimentation resulting from construction-related runoff. Sediment can flow directly to perennial streams or to intermittent drainages and then to perennial streams. The Clean Water Act establish a comprehensive framework for addressing storm water discharges under the NPDES program. In 1990, the EPA published regulations requiring all storm water discharges associated with industrial facilities, including construction projects which disturbs 5 acres or more, to obtain NPDES permits.

Under the permit, operators who are required to obtain an NPDES permit to discharge storm water must prepare a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP outlines the potential pollution sources and measures which will be used to prevent storm water contamination. Proper implementation and maintenance of these measures will be essential to minimize impacts to surface waters from construction of the railroad.

4.12.2 Alternative A (No Action). Implementation of this alternative would eliminate project-related impacts to surface waters or groundwater.

4.12.3 Alternative B (Proposed Action). This alternative would cross a total of 41 perennial streams in South Dakota and Wyoming. In South Dakota, 35 perennial streams would be crossed in 6 hydrologic units, with 25 of these stream crossings occurring within the Middle Cheyenne Spring hydrologic unit. In this hydrologic unit, 15 of the perennial stream crossings would occur on Spring Creek (see Table 3-35). To achieve the design grade of this alternative, numerous stream channel alterations of Spring Creek would be required. These stream alterations and impacts to adjacent riparian areas are expected to cause significant impacts to this stream. Three of the crossings of Spring Creek would occur on NFS lands and 12 would occur on private land. In Wyoming, this alternative would cross a total of 6 perennial streams in the Upper Belle Fourche hydrologic unit. This includes 3 crossings of the Belle Fourche River and 3 crossings of Caballo Creek (see Table 3-35). This alternative would also be constructed adjacent to 2 perennial streams in South Dakota (i.e., Battle Creek and Cheyenne River) where construction impacts to these streams could occur. These impacts could occur from stream channel alterations or bank stabilization/armoring work to accommodate construction of this alternative.

This alternative would cross a total of 671 intermittent streams in both South Dakota and Wyoming. Table 3-45 provides the number of intermittent stream crossings by hydrologic unit. This alternative would cross 34 and 70 more intermittent streams than Alternatives C and D, respectively. Most of these intermittent stream crossings would occur on private lands (i.e., 512 or 76 percent) with most of the remaining streams being crossed on NFS lands (139 or 21 percent).

This alternative would cross 3 stream segments that are on the 303(d) waterbody list in South Dakota which do not support their designated uses. Two of these stream segments are associated with the Cheyenne River and the other is associated with the crossing of Rapid Creek. This is the same number as Alternative C including the route variations and 8 fewer than Alternative D. Additional sediment loading of these streams from project activities would be considered a significant impact and may accelerate the need for TMDLs.

Most impacts to streams would be considered short-term as long as crossing structures do not impede either high or low flows and allow the passage of aquatic organisms. However, the potential impacts to Spring Creek from this alternative would be expected to be long-term. This is because of the number of stream crossings and channel alternations that are proposed for this stream. The addition of a railroad within the riparian areas of Spring Creek could significantly impact the functions of this system..

4.12.4 Alternative C (Modified Proposed Action). As with Alternative B, this alternative would also cross a total of 40 perennial streams in South Dakota and Wyoming. In South Dakota, 36 perennial streams would be crossed in 6 hydrologic units, with 27 of these stream crossings occurring within the Middle Cheyenne Spring hydrologic unit, which is more than Alternative B (see Table 3-36). This alternative would cross Spring Creek 21 times which is 6 more times than Alternative B. Like Alternative B, this alternative would require numerous stream channel alterations of Spring Creek which is expected to cause significant impacts to this stream and it's adjacent riparian and wetland areas.

All of the perennial stream crossings in South Dakota and Wyoming would occur on private lands. In Wyoming, this alternative would cross a total of 4 perennial streams in the Upper Belle Fourche hydrologic unit which is 2 less than Alternative B. This alternative would cross the Belle Fourche River once and Caballo Creek 3 times (see Table 3-35).

This alternative would also be constructed immediately adjacent to 7 perennial streams (2 areas along the Cheyenne River and 5 areas along Spring Creek) which would likely cause additional stream impacts (see Table 3-43). Close proximity of the alternative to these streams may require channel alteration or bank stabilization/armoring to accommodate construction of this alternative.

This alternative would cross 3 stream segments that are on the 303(d) waterbody list in South Dakota which do not support their designated uses. Two of these stream segments are associated with the Cheyenne River and 1 is associated with the crossing of Rapid Creek. As shown on Table 3-53, this alternative would cross 8 fewer streams that are on 303(d) list than Alternative D .

A total of 637 intermittent streams would be crossed by this alternative in South Dakota and Wyoming. Table 3-46 provides the number of intermittent stream crossings by hydrologic unit. Similar to all of the alternatives, most of the intermittent streams that would be crossed would occur on private lands (i.e., 490 or 76 percent) with most of the remaining intermittent streams crossings occurring on NFS lands (121 or 20 percent).

Phiney Flat Route Variation. This route variation would prevent significant impacts to Spring Creek by eliminating 20 crossings of this stream and numerous stream channel alterations. Avoiding these crossings would reduce the total number of perennial stream crossed in South Dakota to 16 (see Table 3-37) which is the least of all of the alternatives. This route variation would cross the same perennial streams in Wyoming, as Alternative C. This route variation would also have 36 fewer intermittent stream crossings than Alternative C, (601 vs. 637).

W G Flat Route Variation. As shown on Table 3-38, the W G Flat Route Variation would cross 33 perennial streams in South Dakota, which is 3 less than Alternative C. Although, this route variation would still result in significant impacts to Spring Creek, it would eliminate approximately 30 crossings and numerous alterations of the stream in Hay Canyon in Sections 12, 13, 24, 25 and 36 of T. 7 S., R. 8 E. and Section 1 of T. 8 S., R. 8 E. Based on stream designations on USGS 1:24,000 topographic maps, this stream is intermittent, however, field surveys suggest this stream may be perennial and supports abundant emergent riparian and wetland communities with high functions and values, particularly for wildlife. By avoiding Hay Canyon, this route variation would prevent significant and long-term impacts to this stream corridor. This route variation would cross the same perennial streams in Wyoming as Alternative C. This route variation would have 53 fewer intermittent stream crossings than Alternative C.

4.12.5 Alternative D (Existing Corridors Alternative). This alternative, if implemented, would cross a total of 57 perennial streams in South Dakota and Wyoming which is 16 and 14 more the Alternatives B and C, respectively. In South Dakota, 38 perennial streams would be crossed in 5 hydrologic units, with 16 of these stream crossings occurring within the Middle Cheyenne Spring hydrologic unit and 13 stream crossings occurring with in the Middle Cheyenne Elk hydrologic unit (see Table 3-39). Although this alternative would have 11 crossings of Boxelder Creek and 7 crossings of Beaver Creek, these stream crossings would occur in areas that have been previously crossed by the railroad. Consequently, impacts to these streams from multiple crossings is not expected to be significant. This alternative would avoid both Spring Creek and Hay Canyon in South Dakota. All of the perennial streams which would be crossed by this alternative in South Dakota would be on private lands.

In Wyoming, this alternative would cross 19 perennial streams which is 13 more than Alternative B and 15 more than Alternative C. These stream crossings would occur in 2 hydrologic units with 8 of these stream crossings occurring in the Beaver hydrologic unit and 11 crossings occurring in the Upper Belle Fourche hydrologic unit. All of the stream crossings in Wyoming would occur on private lands, except one of the crossing of Caballo Creek and one crossing of the Belle Fourche River which would occur on state lands (see Table 3-39).

This alternative would be constructed adjacent to 10 perennial streams in both South Dakota and Wyoming (see Table 3-44). Impacts to these streams would likely occur because of the proximity of the alternative. In these areas, streambanks may need to be stabilization or armored or the channel may need to be altered to allow construction of the alternative.

This alternative would cross 707 intermittent streams which is 70 more than Alternative C and 30 less than Alternative B. Like the other alternative, most of these intermittent stream crossings would occur on private lands (584 or 83 percent), with 88 (12 percent) occurring on NFS lands and 32 (5 percent) occurring on state lands.

Impacts to water resources from this alternative are expected to be less than Alternative B and C. This is because this alternative would be constructed within or adjacent to an existing transportation corridor for most of its length. Therefore, most of the streams that would be crossed by this alternative are already impacted by existing crossing structures.

4.12.6 Proposed Mine Loop Options. None of the proposed mine loop options would cross perennial streams. The Black Thunder North Mine Loop would cross 9 intermittent streams (1 on NFS lands, 3 on State of Wyoming lands and 5 on private lands). The Black Thunder South Mine Loop would cross 12 intermittent streams - 8 on NFS lands and 4 on private lands. The North Antelope West and North Antelope East mine loops would cross 4 and 2 intermittent streams, respectively, all on private lands.

4.12.7 Proposed Yard Sites. The proposed Wall Yard would not cross any perennial or intermittent streams. The Edgemont Yard would not cross any perennial streams and would only cross 1 intermittent stream. The West Staging Yard would not cross any perennial streams but would cross a total of 21 intermittent streams.

4.13 Soil Resources

4.13.1 Significance Criteria. Impacts to soils would be considered significant if:

- The loss of topsoil, soil productivity, or erosion prevents successful reclamation within 5 years of construction.
- Sedimentation decreases water quality below preconstruction conditions in the long-term.
- Occupied habitats (aquatic or terrestrial) for any Federally-listed or proposed threatened or endangered species are impaired from erosion or sedimentation.

4.13.2 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). To evaluate the potential impacts from the alternatives, soils which would be crossed have been categorized according to their limiting characteristics and combined into 7 soil groups (see Table 3-56). Characteristics of these soil groups are described in Section 3.13.2 and are discussed in terms of their potential impacts below. Table 3-57 provides comparisons of the distance that each alternative and route variation would cross within the different the soil groups.

Construction of the railroad could adversely affect soils in several ways. The most serious effects include increased soil erosion and loss of soil productivity, thereby impairing revegetation success. Revegetation is crucial for soil stabilization and restoration and preventing off-site impacts.

Disturbance to soils in Group 1 would be difficult to reclaim because of their chemical and physical properties. Soils in Group 1 are either saline or sodic and revegetating these soils will require plant species that are adapted to these conditions. Group 1 soils have a high salt content that interferes with the water and nutrient uptake of plants. These conditions are especially sensitive to new plant seedlings because their root systems are not developed and they are extracting water and nutrients from a smaller volume of soil compared to established and deeper-rooted plants. In addition, erosion from these soils could adversely affect water quality and aquatic habitats because sediments would have a high salt content.

Vegetation clearing and grading operations during construction would expose soils surfaces and increase the potential for erosion. A soil's susceptibility to erosion from wind and water varies according to characteristics such as soil texture, structure, topography or slope, surface roughness, amount of vegetation cover, and climate. Erosion from water occurs primarily on exposed soils on moderate to steep slopes, whereas wind-induced erosion often occurs on dry, sandy soils where vegetation cover is sparse. Soils in Groups 2 and 3 have a high water and wind erosion hazard potential.

Soil erosion could result in the loss of topsoil and a potential increase in siltation and salinization of surface waters. This, in turn, could adversely effect the water quality and aquatic habitat of surface waters. The magnitude, extent and duration of the construction-related impact would depend on several factors including the proximity of construction sites to water, the properties of the soils affected, and the method, duration and time of year of construction activities.

Potential erosion from mass movement (i.e., slumps or landslides) is not quantified in Soil Groups 2 or 3 although these processes can cause significant impacts. In South Dakota, slumps and landslides are prevalent on steeply sloping soils adjacent to stream flood plains, especially along the Cheyenne River. These slumping areas have been correlated to the following soil mapping units:

- Samsil clay, 15 to 40 percent slopes, mapping unit SaE, in Fall River County.
- Schamber-Eckley complex, 9 to 40 percent slopes, mapping unit SmE, in Fall River County; .
- Samsil Clay, 25 to 40 percent slopes, mapping unit SbF, in Pennington and Custer counties.
- Samsil Rock Outcrop Complex, 25 to 75 percent slopes, mapping unit SdF, in Pennington and Custer counties.
- Samsil-Pierre clays, 15 to 25 percent slopes, mapping unit ScE, in Pennington and Custer counties.

The distance that would be crossed in these soil mapping units by each alternative have been quantified to provide an indication of the potential amount of slumping/landslide hazard terrain that would be affected by each alternative.

Soil compaction can result from the repeated movement of heavy construction equipment and vehicles within construction sites and on access roads. The degree of compaction would depend on the soils texture, moisture content and the amount of traffic. Compaction damages soil structure and reduces pore space, which impedes the movement of water and air in the soil. Compaction lowers soil productivity and increase runoff rates which also increases erosion potential. Most soils along the alternatives routes would be susceptible to compaction.

Another common impact that could occur from construction of the alternatives is the loss of soil productivity. Contributing factors include erosion, compaction and the burial or mixing of topsoil with subsoil horizons during grading activities. The mixing of soil horizons would lower soil productivity and could decrease successful revegetation by diluting the superior physical and chemical properties of the topsoil with the less productive subsoil. Topsoil is typically higher in organic matter, fertility and biologic activity than subsoils and generally has not accumulated high concentrations of salts.

Soils in Group 4 have physical characteristics that limit their reclamation potential because their profiles have a limited water storage or capacity which causes them to be drier or more droughty than other soils. Soils in this group are shallow to bedrock; have a high content of coarse fragments; or have a low available water capacity. Most of the soils which would be crossed in this group have several of these limiting properties. Soils that have a low available water capacity are typically 1) coarse textured; 2) have a limited soil volume because of a restrictive layer in their profile, such as a cemented layer, hardpan or shallow bedrock or; 3) have a high volume of coarse fragments. The semi-arid climate of the project area also compounds the revegetation problems with these soils because of their droughty characteristics.

The distance that each alternative would affect soils that are shallow to bedrock was evaluated. In addition to their droughty character, construction cuts in these shallow soils may encounter bedrock that would likely remain exposed after reclamation. Rock exposures can cause indirect impacts to reclaimed areas because these areas are often steep impervious surfaces that can accelerate storm water runoff and increase runoff volumes. Runoff from these areas onto newly reclaimed areas that have not yet stabilized can cause erosion and sedimentation impacts. In addition, cut slopes in some soft shale materials, such as the Pierre Shale, are easily weathered and can be difficult to stabilize because they continually erode. This potential impact would be greatest where these cut slopes occur near streams where eroded materials can be transported to surface waters. According to available soil surveys (NRCS, 1982, 1986 and 1996), the bedrock that may be encountered during construction of the alternatives is considered "soft", typically ripable and does not require blasting or special equipment to excavate.

Soils in Group 5 are hydric soils that are saturated long enough to periodically produce anaerobic conditions, which influences plant growth. Soils in this group would be classified as jurisdictional wetlands if they were within a characteristic wetland hydrologic system and support hydrophytic plants in sufficient quantity. These soils are rare in semi-arid areas and they typically support plant communities that provide important biological habitats and add to the landscapes diversity. Almost all of the soils in this group that would be crossed by the alternatives occur in South Dakota. Because of their wetness, adaptive species would be required on these soils during reclamation to ensure successful revegetation of these soils.

Prime farmland soils (Group 6) occur along each alternative in South Dakota. In Wyoming, prime farmland soils would only be affected by Alternative D. All of the prime farmland soils crossed by the alternatives are considered prime if they are irrigated. Although the quantity of prime farmland soils that are actually irrigated has not been determined, constructing on these highly productive soils by any of the alternatives or route variations would preclude them from being cultivated in the long-term.

Construction activities could also lower soil productivity by disrupting or damaging existing irrigation systems, canals, laterals or ditches. These potential impacts have not been quantified, however, DM&E is currently negotiating agreements with affected landowners regarding the measures or compensation that would be necessary to mitigate these potential impacts.

Soils in Group 7 may have slopes of 15 percent or greater. Construction on these slopes is of concern because cut and fill slopes generally require larger disturbed areas. Erosion potentials are higher on these slopes and additional reclamation or erosion control procedures are usually necessary to ensure that impacts do not occur. Soils on steep slopes typically have higher runoff rates and receive less effective moisture than soils on level or less sloping areas and can be difficult to reclaim because of their droughty character. These dry conditions can be compounded if the slope aspect is to the south or west because these aspects receive more

solar radiation. In addition, depending on the steepness of slope, some forms of seeding may be restricted, such as drill seeding, because typical equipment can not safely work on these slopes. Therefore, other seeding methods which are more expensive (hydroseeding) or may be less effective (broadcast seeding) would be required.

Construction may also result in the establishment of noxious weeds in areas where none or relatively few existed prior to construction. The clearing of existing vegetation would expose soils and reduce plant competition providing the opportunity for weeds to become established. Once weeds are established they may spread onto adjacent areas if they are not controlled. Weed seeds can be carried into or spread through the project area by construction equipment and vehicles when they pass through infested areas or if the equipment is transported in from other areas that are infested with weeds. Weeds can also be spread during construction activities when materials are hauled from cuts to fills or into borrow or waste areas. The magnitude of this impact would depend on weed species, their prevalence in the area prior to construction and the weed's effect on adjacent land uses.

4.13.3 Alternative A (No Action). Implementation of Alternative A would not disturb any of the sensitive soil groups described or cause any of the potential impacts to soil resources that are discussed above.

4.13.4 Alternative B (Proposed Action). Table 3-58 provides the miles of each soil group which would be crossed by Alternative B. As with all of the alternatives, impacts from disturbance (i.e., miles crossed) to limiting soil groups (Groups 1 through 7) would be markedly higher on private lands than on state or Federal lands because the route would mostly affect private lands.

With adequate mitigation measures to control erosion, prevention of topsoil loss, and control measures to prevent invasions of noxious weeds, impacts to soils should be short-term for all soil groups, except for Group 6 - prime farmland soils. In addition, mitigation measures will need to address the procedures to be taken to ensure that compacted soils or soils that are difficult to reclaim (Groups 1, 3, 4 and 7) are stabilized and revegetated as quickly as possible.

Impacts to prime farmlands would be considered a long-term impact because construction of the alternative would remove these soils from crop production. This alternative would cross approximately 27.6 miles of prime farmland soils in South Dakota. No prime farmland soils would be crossed by this alternative in Wyoming. Alternative B would cross the least amount of prime farmland soils (see Table 3-57).

As discussed above, soil mapping units SaE, SmE, SbF, SdF and ScE in Fall River, Custer and Pennington counties are prone to slumping and landslides. If slumps or landslides were to occur on these soils, it would be considered a long-term impact because these slumps can be difficult to stabilize. This alternative would cross approximately 36.4 miles of soils in these mapping units. Compared to the other alternatives, Alternative B would cross the largest amount of soils in these mapping units because the alignment is adjacent to the Cheyenne River for a longer distance.

Exposing rock outcrops in cuts on shallow soils would be a long-term impact since these outcrops would likely remain exposed after construction. Rock exposures would most likely occur where the alternative would traverse steep slopes and where cuts would be required. This alternative would cross 129.2 miles of soils that are shallow to moderately deep with bedrock at depths of 40 inches or less. In addition, this alternative would cross 103.8 miles of soils that may have slopes greater than 15 percent. Compared to the other alternatives, Alternative B could expose more bedrock because it crosses the greatest amount of shallow soils and soils with steep slopes (see Table 3-57 for comparison of alternatives).

4.13.5 Alternative C (Modified Proposed Action). Table 3-59 summarizes distances that Alternative C would cross in each soil group. Generally, Alternative C would have the same types of impacts as Alternatives B and D, however, this alternative is 22.3 miles shorter than Alternative B and 86.2 miles shorter than Alternative D. Therefore, impacts to soils would be less under this alternative. Likewise, impacts to soils which have a high water erosion hazard (Group 2) would be less with this alternative. For example, Alternative C would impact 95.4 miles of soils that have a high water erosion hazard compared to 112 miles impacted by Alternative B and 100 miles impacted by Alternative D.

This alternative would also cross less soils that have steep slopes in Group 7 (91.1 miles) than Alternative B (103.8 miles). However, Alternative D would cross the least amount of any alternative through soils in Group 7, affecting only 78 miles (see Table 3-57).

As indicated for Alternative B, impacts to soils from implementing this alternative would be short-term if adequate mitigation measures are implemented to control erosion, prevent the loss of topsoil and prevent invasion or spread of noxious weeds. In addition, mitigation measures will need to address the procedures that will be taken to ensure that soils that are compacted or difficult to reclaim (soils in Groups 1, 3, 4 and 7) are stabilized and revegetated as quickly as possible.

As with Alternative B, impacts to prime farmlands from implementing this alternative would be considered a long-term impact because construction would remove these soils from production. This alternative would cross approximately 30 miles of prime farmland soils in South Dakota. No prime farmlands would be crossed by this alternative in Wyoming. Compared to the other alternatives, this alternative would cross 1.3 miles more of prime farmland soils than Alternative B and 8.6 miles less than Alternative D (see Table 3-57).

Alternative C would cross approximately 21.1 miles of soils that are prone to slumping and landslides. If these events were triggered by construction of this alternative, it would be considered a long-term impact. This alternative would cross approximately 15.3 fewer miles of these soils than Alternative B. However, Alternative C would cross 2.7 more miles of these soils than Alternative D.

This alternative would have less of a potential to expose shallow bedrock during construction than Alternative B, and about the same potential as Alternative D. Compared to Alternative B, this alternative would cross about 11.4 fewer miles of soils that are shallow to bedrock (Soil Group 4) and about 12.7 fewer miles of soils that have steep slopes (Soil Group 7) where rock could be exposed during cut and fill operations (see Table 3-57).

Phiney Flat Route Variation. This route variation would have the same potential impacts as Alternative C in Wyoming and in Fall River County. Compared to Alternative C, the principle differences that this route variation would have would mainly occur on private lands in Custer County (see Table 3-60). In comparison to Alternative C, this route variation would have the following differences (see Table 3-57):

- It would impact about 1.2 miles less of soils in Group 2 that have a high water erosion hazard.
- It would impact 1.1 miles less of soils that are shallow to bedrock and 1.3 miles less of soil that have a low water holding capacity which are soils in Group 4.
- It would impact about 1.2 miles less of soils that may have steep slopes.
- It would cross approximately 1.3 miles more of prime farmland soils. These soils are only considered prime farmlands if they are irrigated.
- It would cross 20.3 miles of soils in mapping units SaE, SmE, SbF, SdF and ScE which are prone to slumping. This variation would cross 0.8 fewer miles of these soils than Alternative C.

W G Flat Route Variation. This route variation would have the same potential impacts as Alternative C in Wyoming and Pennington County. Compared to Alternative C, the primary difference that this route variation would have in the types of soils that would be crossed would occur on private lands in Fall River County (see Table 3-61). In comparison to Alternative C, this route variation would have the following differences (see Table 3-57):

- It would impact about 1.5 miles less of soils that have a high water erosion hazard, however, this variation would impact approximately 2.8 miles more of soils that have a high wind erosion hazard.
- It would impact about 1.6 miles less of soils that are shallow to bedrock.
- It would impact approximately 2.8 miles less of prime farmland soils.
- It would cross 21.2 miles of soils in mapping units SaE, SmE, SbF, SdF and ScE which is about the same as Alternative C.

4.13.6 Alternative D (Existing Corridors Alternative). Table 3-62 provides the distances which would be crossed by Alternative D in each soil group. Even though Alternative D is significantly longer than Alternatives B and C, it would be constructed within or adjacent to existing transportation corridors. That is expected to significantly reduce impact to soils. In addition, even though Alternative D is the longest alternative it does not have the greatest crossing lengths through all of the limiting soil groups (see Table 3-57).

This alternative would cross about 32.8 miles of saline soils in Group 1 which is 6.6 miles more than Alternative B and 11 miles more than Alternative C (see Table 3-57). Because these soils can be difficult to revegetate, the reclamation plan for this alternative would need to specify salt-tolerant seed mixtures on these soil types. Mulching or other moisture conserving reclamation techniques may be required to ensure that these soils are stabilized and revegetated adequately.

This alternative would affect the least amount (2.7 miles) of soils in South Dakota that are prone to slumping and landslides (soils in mapping units SaE, SmE, SbF, SdF and ScE). Therefore, this alternative should have the least potential to cause slumps over the long-term.

This alternative would cross more prime farmland soils (38.6 miles) than the other alternatives (see Table 3-57). However, some of these prime farmland soils have been previously impacted by the existing trans-portation corridor. In addition, this alternative would probably be the least disruptive to existing agricultural operations because the alignment would generally pass on the edges of cultivated fields adjacent to existing railroad rights-of-way. Because Alternatives B and C are cross-country alignments that would be constructed outside of existing

transportation corridors, they would tend to bisect cultivated fields.

4.13.7 Proposed Mine Loop Options. The primary difference in impacts to soils between the Black Thunder North and South mine loops is in their total overall length. The Black Thunder South Mine Loop is 2.6 miles longer than the Black Thunder North Mine Loop (7.1 miles compared to 4.5 miles). This additional length would cause more total soil disturbance and could cause more potential erosion. However, the Black Thunder North Mine Loop would cross about 1.9 miles more of steep soils in Group 7 than the Black Thunder South Mine Loop. Construction on steep soils typically requires larger disturbed areas and longer cut and fill slopes to achieve design grades. Therefore, disturbance to soils in Group 7 could increase the potential for erosion. The difference between the mine loop options for other limiting soil groups is generally not considerable.

The largest difference in impacts to soils with limiting characteristics between the North Antelope East and North Antelope West mine loops would occur to soils in Group 4 which have a low AWC. The North Antelope West Mine Loop would cross twice the amount of soils in this group as the North Antelope East Mine Loop (1.8 miles compared to 0.9 miles). Furthermore, the North Antelope West Mine Loop is 0.9 miles longer than the North Antelope East Mine Loop (2.4 miles compared to 1.5 miles) which would cause greater soil disturbance.

4.13.8 Proposed Yard Sites. The Wall Yard would cross soils in Group 1 that are saline, soils that are shallow to bedrock and have a low available water capacity in Group 4 and soils that are hydric in Group 5. The majority of the soils that would be affected by the Edgemont Interchange Yard are designated as prime farmland soils in Group 6. Other soil groups that would be crossed by this yard include soils that are saline and sodic in Group 1, soils that have a high wind erosion hazard in Group 3 as well as soils that are shallow and have a low available water capacity in Group 4. The Western Yard would cross soils that are saline and sodic in Group 1, soils that are shallow to bedrock and have a low available water capacity in Group 4, as well as soils that may have slopes greater than 15 percent in Group 7 and that have a high erosion hazard in Group 2.

The primary impacts to soils from these yards is that they would be taken out of production and converted to a long-term industrial use. These soils would not be available to produce crops or forage for livestock or wildlife. In addition, because the yards will encompass large areas and be constructed mostly with impervious surfaces, they could contribute large volumes of runoff to adjacent areas. This runoff could cause erosion to these adjacent areas unless proper drainage is provided. Construction of the yards would be considered a long-term impact to soils and an irreversible and irretrievable commitment of resources, particularly where prime farmlands are taken out of production.

4.14 Vegetation Resources

Issues related to potential impacts to vegetation resources were raised by USFWS, SDGFP, and WGFD as they were addressing wildlife and fisheries habitat issues and are summarized, below:

- Construction and disturbance impacts could reduce forage possibly leading to increased forage competition between big game and livestock.
- Loss of habitats and desirable vegetation could potentially reduce the biological diversity of the area.
- Potential loss of native vegetation communities and soil disturbance will lead to increased encroachment or invasion of noxious weeds and undesirable plant species.
- Impacts to riparian forest and woody draw habitats, including direct removal and fragmentation of these habitats, must be addressed as well as impacts to riparian oxbow wetlands along the Cheyenne River in South Dakota.
- Disturbance to existing vegetation cover may lead to increased soil erosion and stream sedimentation.
- Require revegetating disturbed sites with desirable native species and avoid planting species such as sweet clover or alfalfa that would attract grazing wildlife.

4.14.1 Significance Criteria. Impacts produced by alternatives would be considered significant if the following occurred:

- Within 5 years reclaimed areas do not attain adequate vegetation cover and species composition to stabilize revegetated sites and to support pre-existing land uses including livestock forage and wildlife habitat. This criteria is most important for areas disturbed outside the railroad right-of-way (i.e., waste and borrow areas).
- There is invasion and establishment of noxious or nonnative weeds.

Significant impacts could occur from any of the alternatives if adequate revegetation measures are not implemented and monitored to insure successful revegetation. In addition, SDGFP has a policy of no net loss of Resource Category 1 wildlife habitats that include woody draws, native grasslands, sagebrush-grasslands, riparian woodlands, and wetlands. Impacts to vegetation and associated wildlife species would be considered

significant if there was a net loss of any Resource Category 1 Habitat.

4.14.2 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). Potential impacts to vegetation from the alternatives include crushing and/or mowing herbaceous species and shrubs, tree removal and removal of vegetation during construction. Although disturbed areas that are not required for operations of the railroad would be revegetated, the time required to return these areas to their preconstruction condition would vary depending on several factors. Vegetation recovery would also be dependent on treatment of topsoils which is a valuable seed sources for native plant species. Therefore, impacts to vegetation could be considered temporary, long-term or permanent. Temporary impacts would occur on construction sites that are successfully revegetated within 5 years of seeding. Long-term impacts to vegetation would occur where revegetation requires more than 5 years to become reestablished. Permanent impacts to vegetation would occur on areas that are converted into industrial use, such as the railroad bed, sidings and yards.

Long-term impacts to vegetation may occur on areas where edaphic conditions or weed invasions limits revegetation success or when the vegetation type disturbed requires more the 5 years to reestablish. Problem areas that may be difficult to revegetate include soils with limiting chemical or physical characteristics that restrict plant establishment because of nutrient imbalances or limits the soils moisture storage capacity. These soils would include shallow, saline or sodic soils. Where these soil types occur on south or west facing aspects their limiting characteristics would be compounded because these slopes receive more solar radiation which increases evaporations rates and decreases the moisture available to plants.

Impacts to vegetation communities dominated by shrub and tree species are more long-term since reestablishment of these species takes many more years compared to herbaceous or grassland type communities. For example, big sagebrush shrublands may take 10 to 20 years to become established to their preconstruction condition while the woodlands would take 25 to 75 years and the riparian and woody draws 10 to 60 years. Impacts to these vegetation types may adversely affect wildlife species that are, in some way, dependant for life history functions.

Disturbed areas that become heavily infested with weeds such as cheatgrass could also hinder successful revegetation causing long-term impacts. Cheatgrass is a winter annual that begins growth in the fall or early spring which gives it a competitive edge over many native species and once it is established it is a strong competitor with native species. In addition, the establishment of cheatgrass increases the fire hazard because it is a highly flammable fuel that can rapidly accumulate (Knight, 1994).

Most noxious weeds are opportunistic, introduced species which become particular problems when the native communities are disturbed. Perennial pepperweed, Russian knapweed, skeletonleaf bursage, yellow toadflax an dalmatian toadflax can form dense stands that are difficult to eliminate because of their deep and extensive root systems; Dyer's woad first invades disturbed soil then spreads to rangelands and regenerates from roots if mowed; hoary cress becomes established on disturbed alkaline soils and out-competes other species (Whitson *et al.,* 1996). There are some noxious weeds, including horsenettle and houndstongue, that contain toxic compounds and others like yellow starthistle and leafy spurge that cause physical irritation of herbivores' digestive tracts. Characteristics and measures that can be used to control other noxious weeds are provided in Table 4-4.

Some weeds can be effectively controlled through mechanical means (mowing, plowing) but others can only be eradicated by application of herbicides, including 2,4-D, Tordon, Banvel, or some combination of mechanical, chemical, and application of biological agents such as species-specific insect parasites (see Table 4-4). Herbicide application, however, has the potential to affect non-target species including Federally-listed threatened species (Ute ladies'-tresses), rare, and sensitive species (see Table 3-86).

Another impact common to all alternatives is the potential conversion of native vegetation to introduced species within construction sites where agencies do not stipulate or have the authority to stipulate (i.e., private lands) the use of native species in revegetation seed mixes. In these areas introduced grasses and forbs may dominate the species in seed mixes to ensure rapid establishment of vegetation cover for erosion control and to reduce weed competition. Although these areas would be revegetated with species that have similar structure, stature and functions they would not be native to the area. On NFS lands, all revegetation seed mixes would be approved by the Forest Service and would not contain non-native species. In addition, where mulching is done on NFS lands, weed-free hay would be required.

4.14.3 Alternative A (No Action). Implementation of the No Action Alternative would eliminate project-related impacts to vegetation.

4.14.4 Alternative B (Proposed Action). In South Dakota, Alternative B would pass through 114 miles of grasslands, 7 miles of riparian deciduous vegetation and

Table 4-4 Characteristics of Selected Noxious Weeds Known to Occur in the Vicinity of the Alternatives and Potential Control Measures		
Common Name	**Weed Characteristics (1)**	**Potential Control Measures (2)**
Canada thistle	Aggressive weed that is difficult to control; plowing roots increases propagation	Biological, chemical
Common burdock	Grows on roadsides, ditch banks, in pastures and waste areas; seeds distribute when burs become entangled in animal hair	Mechanical, chemical
Diffuse knapweed	Infests dry rangelands, roadsides, pastureland; may out compete and exclude desirable plants	Biological, chemical
Field bindweed	Adapts to different environmental conditions including cultivated fields; deep taproot generates many lateral roots; seeds viable to 50 years	Mechanical, biological, chemical
Horsenettle	In the Nightshade family; a persistent weed; poisonous to livestock	Mechanical, chemical
Leafy spurge	Irritates mouth and digestive tracts of cattle; has an extensive root system with nutrient reserves that make it difficult to control	Mechanical, biological, chemical
Musk thistle	Forms dense stands, crowding out desirable plants on range, pastures, roadsides, ditch banks, streambanks, waste areas, croplands	Mechanical, biological, chemical
Perennial sowthistle	Common were adequate water is present: ditch banks, cultivated cropland, fertile waste areas	Mechanical, chemical
Plumeless thistle	Locally abundant in pastures, stream banks, fields and roadsides	Mechanical, biological, chemical
Russian knapweed	Form colonies in cropland, pastures and roadsides; spreads by deep growing roots	Mechanical, biological, chemical
Scotch thistle	Aggressive plant forms dense stands that may be impenetrable to livestock; in waste areas and roadsides	Mechanical, chemical
Spotted knapweed	On disturbed soils, out compete desirable plants; allelopathic chemicals may inhibit growth of other plants	Biological, chemical

Notes:
1 = Source: Whitson, *et al.*, 1996.
2 = Source: Forest Service, 1996b.
Mechanical control includes mowing top growth, pulling or grubbing plant out of the ground, tillage and severing roots below ground.
Biological control includes use of species-specific invertebrate herbivores and plant allelopathic compounds.
Chemical control includes application of herbicides.

woody draws, over 2 miles of coniferous (ponderosa pine, juniper) woodlands, and approximately 2 miles of wetlands[4] (see Tables 3-63 and 3-74). Short-term impacts would therefore occur within 3 of SDGFP's Resource Category 1 habitats although the actual amount of short- and long-term disturbance to native grasslands is unknown: grasslands crossed by Alternative B - 92 miles of which are on private lands but only 2.5 miles of grasslands would be affected on state lands - have not been examined for plant species composition or evaluated as native grasslands. And, no wetlands, riparian or woody draws would be affected on state lands (see Tables 3-63 and 3-74). Nevertheless, there would be short- and long-term losses of Resource Category 1 habitats on and off state lands.

The alternative would cross 1.7 miles of wetlands in South Dakota, most of which are on private lands but 0.23 mile of riverine wetlands would be affected on BGNG (see Table 3-74). Also affected would be nearly 21 miles of cropland and pasture.

[4] Wetland estimates in this section are based on land use and land cover and are considered inaccurate. More accurate estimates are provided in Section 4.16.

Most of the vegetation affected by Alternative B in Wyoming is on private land (70 percent). The route would pass through 128 miles of grasslands and 15 miles of sagebrush steppe that includes mixed rangelands and shrub-dominated rangelands. Less than one mile of the route would pass through wetlands in Wyoming (see Tables 3-63 and 3-74). The route would affect 0.5 mile of deciduous woodlands and about 8 miles of croplands and/or pastures (see Table 3-63).

Once completed, vegetation would not be allowed to grow on the rail bed ballast and rails and probably be maintained to low-growing herbaceous forms within the rail bed grade and associated ditches. Those areas would be lost to reestablishment of native vegetation over the long-term. From the outer margins of the rail bed ditch to DM&E's right-of-way edge opportunities may exist for revegetating disturbed areas for native plant species as long as growth forms meet safety requirements for the operating railroad (adequate sight distances, access for track maintenance). If native plant species can become established within the railroad right-of-way, fencing the outer boundary to exclude livestock

from the tracks should enhance revegetation by native species.

But, from DM&E's right-of-way to the outer edge of disturbed construction zones, disturbed vegetation would be reclaimed to land owner specifications. Consequently, native species would be expected to become reestablished on only a fraction of the area disturbed since private lands account for 84 percent of Alternative B in South Dakota and 70 percent of the route in Wyoming. Existing land-use practices on those private lands are expected to continue, whether devoted to livestock grazing, crop production, other agricultural uses or industrial uses (including mining and quarrying). Where those situations exist there would be a long-term loss of the current vegetation cover type.

4.14.5 Alternative C (Modified Proposed Action). In South Dakota, Alternative C would pass through 110 miles of grasslands, nearly 6 miles of deciduous riparian vegetation, less than 1 mile of upland deciduous woodlands (including woody draws), 3 miles of coniferous woodlands (ponderosa pine, juniper), and approximately 1.3 miles of wetlands (see Tables 3-64 and 3-75). Short-term impacts would therefore occur within 4 of SDGFP's Resource Category 1 habitats although the actual amount of short- and long-term disturbance to native grasslands is unknown: grasslands crossed by Alternative C (101 miles of grasslands are on private lands but only 1.5 miles of grasslands would be affected on state lands) have not been examined for plant species composition or evaluated as native grasslands.

No wetlands or deciduous riparian vegetation would be affected on state lands (see Tables 3-64 and 3-75). Nevertheless, there would be short- and long-term losses of Resource Category 1 habitats on and off state lands. The route would cross 1.3 miles of wetlands in South Dakota, none of which are on BGNG (see Table 3-75). Also affected would be nearly 21 miles of cropland and pasture. Alternative C would affect nearly the same amounts of each kind of vegetation as Alternative B, except levels of affect would differ for different land owners.

Most of the vegetation affected by Alternative C in Wyoming would be on private land (67 percent). The route would pass through 110 miles of grasslands and 11 miles of sagebrush steppe that includes mixed rangelands and shrub-dominated rangelands. Only 0.3 mile of the route would pass through wetlands in Wyoming (see Tables 3-64 and 3-75). The route would also affect 0.3 mile of coniferous woodlands and about 9 miles of croplands and/or pastures (see Table 3-64). Since the length of Alternative C through Wyoming is less than the length of Alternative B, less vegetation in each category is affected, generally, by Alternative C.

Native species would be expected to become reestablished on only a fraction of the area disturbed since private lands account for 92 percent of Alternative C in South Dakota and 67 percent of the route in Wyoming. Existing land-use practices on those private lands are expected to continue, whether devoted to livestock grazing, crop production, other agricultural uses or industrial uses (including mining and quarrying). Where those situations exist there would be a long-term loss of the current vegetation cover type.

Phiney Flat Route Variation. Short-term effects described for Alternative C in Wyoming would be identical to those for the Phiney Flat Route Variation. In South Dakota, the Phiney Flat Route Variation would pass through 106 miles of grasslands, about 4 miles less than Alternative C. Approximately 6.1 miles would pass through deciduous riparian vegetation, less than 1 mile would pass through upland deciduous woodlands (including woody draws), 3 miles would affect coniferous woodlands (ponderosa pine, juniper), and 1.3 miles would pass through wetlands (see Tables 3-65 and 3-76). Similar to Alternative B and Alternative C, short-term impacts are likely within 4 of SDGFP's Resource Category 1 habitats. No wetlands or deciduous riparian vegetation would be affected on state lands (see Tables 3-61 and 3-76).

The route would not cross any wetlands on BGNG (see Table 3-76). Nearly 26 miles of cropland and pasture would be crossed - more than Alternative C. But the route would affect slightly less wetlands and less grasslands than Alternative C through South Dakota.

Long-term impacts along the Phiney Flat Route Variation are expected to be identical to those described for Alternative C, above, especially since the same relative amount of private lands (92 percent) in South Dakota would be disturbed by both alternatives. Existing land-use practices on those private lands are expected to continue.

W G Flat Route Variation. Since the W G Flat Route Variation in Wyoming would not change from Alternative C, short-term effects described for Alternative C in Wyoming would be identical to those for the W G Flat Route Variation. In South Dakota, the W G Flat Route Variation would pass through 107 miles of grasslands, about 3 miles less than Alternative C. Approximately 3.3 miles would pass through deciduous riparian vegetation, less than 1 mile would pass through upland deciduous woodlands (including woody draws), 3 miles would affect coniferous woodlands (ponderosa pine, juniper), and 1 mile would pass through wetlands (see Tables 3-66 and 3-77). Similarly to Alternative B and Alternative C, short-term impacts are likely within 4 of SDGFP's Resource Category 1 habitats. No wetlands

or deciduous riparian vegetation would be affected on state lands (see Tables 3-66 and 3-77).

The route would not cross any wetlands on BGNG (see Table 3-77). Nearly 25 miles of cropland and pasture would be crossed, more than Alternative C. But the W G Flat Route Variation would affect less wetlands and less grasslands than Alternative C through South Dakota.

Long-term impacts along the W G Flat Route Variation are expected to be identical to those described for Alternative C, above, especially since the same relative amount of private lands (92 percent) in South Dakota would be disturbed by both alternatives. Existing land-use practices on those private lands are expected to continue.

4.14.6 Alternative D (Existing Corridors Alternative). In South Dakota, Alternative D would be located almost entirely on private lands (98 percent), most of which is within DM&E's existing right-of-way. That route passes through 119 miles of grasslands, slightly less than 5 miles of deciduous riparian vegetation, less than 1 mile of upland deciduous woodlands (including woody draws), over 2 miles of coniferous woodlands (ponderosa pine, juniper), and approximately 0.5 mile of wetlands (see Tables 3-67 and 3-78). Short-term impacts might occur within 4 of SDGFP's Resource Category 1 habitats if those have regenerated within the existing railroad right-of-way. Otherwise, impacts would be restricted to those habitats between Smithwick and South Dakota-Wyoming state line.

No wetlands, deciduous riparian vegetation or woody draws would be affected on state lands (see Tables 3-67 and 3-78). Nevertheless, there might be short- and long-term losses of Resource Category 1 habitats off state lands. The route would not cross BGNG. But, Alternative D would possibly affect nearly 43 miles of cropland and pasture if those land uses overlap construction zones.

As in South Dakota, most of the vegetation which would be affected by Alternative D in Wyoming is on private land (79 percent), more than any other alternative. The route would pass through 69 miles of grasslands and 81 miles of sagebrush steppe that includes mixed rangelands and shrub-dominated rangelands. The route would pass through 1.3 miles of wetlands in Wyoming (see Tables 3-67 and 3-78). The route would potentially affect 7.0 miles of coniferous woodlands and about 8.5 miles of croplands and/or pastures if those were within potential construction zones (see Table 3-67).

4.14.7 Proposed Mine Loop Options. The Black Thunder mine loops would be within grasslands, developed land and strip mines. The Black Thunder South Mine Loop would also cross 0.3 miles of wet meadow wetland type. The Black Thunder North and South mine loops would cross 9 and 12 intermittent streams, respectively. The North Antelope mine loops would cross croplands and grassland. In addition, the North Antelope East Mine Loop would cross 0.06 miles of wet meadow. The North Antelope West and East mine loops would cross 4 and 2 intermittent streams, respectively.

4.14.8 Proposed Yard Sites. The proposed yard at Wall would be within croplands and intersect the I-90 corridor. The site contains 3 wetlands. Construction and operation of the Wall Yard would eliminate these vegetation types for the life of the project. The proposed Edgemont Interchange Yard would be within grassland vegetation, on soils designated as prime farmlands. That yard would cross 1 intermittent stream, a tributary to the Cheyenne River, and be within 0.5 mile of the river. The Western Yard would cross mostly grasslands. No wetlands would be affected.

4.15 Grazing Resources

The following issues relevant to grazing resources have been raised:

- Fragmentation of grazing allotments.
- Isolation of water sources.
- Reduced pasture/allotment sizes.
- Increased fence densities.
- Disruption of grazing operations/logistics/access.
- Livestock losses.
- Loss of AUMs.
- Increase in permit administration.
- Impacts to historic trailing of livestock.
- Impacts from construction.

4.15.1 Significance Criteria. Impacts produced by the alternatives would be considered significant if the following occurred:

- Loss of more than 10 percent of AUMs within any individual allotment.
- Separating livestock from water source either temporarily or permanently.
- Permanent obstruction of historic livestock trails.
- Loss of access to part of the allotment..

4.15.2 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). Impacts to grazing resources are only described for Forest Service and BLM administered grazing allotments that would be directly affected by the alternatives. Although impacts to privately owned grazing lands crossed by the alternatives would be generally the same as those described for

Federal allotments, they are not quantified here. Impacts specific to privately-owned grazing lands would be mitigated according to agreements negotiated by DM&E and individual landowners. At this time, those agreements are confidential.

Table 4-5 provides a comparison of the number of Forest Service and BLM allotments which would be crossed by the alternatives. The table also provides the total acres of disturbance and AUMs that would be lost in the affected allotments. So that effects of alternatives could be compared, a 200-foot wide corridor centered on the railroad centerline was established in a GIS so acreage affected and AUMs potentially lost could be calculated within each allotment.

The impacts to grazing resources include: fragmentation of allotments caused by the railroad bisecting allotments or allotment pastures, isolation of water sources and supplies, loss of forage during construction, disruption of operations and blocking access to the allotments. These impacts are discussed in more detail below. Other potential direct and indirect impacts include: displacement of livestock from preferred grazing areas and stock watering facilities or ponds, damage to range improvements, disruption of livestock movements or trailing operations, spread of noxious weeds, and increased loss of livestock from vehicle-livestock collisions during the construction phase and collisions with trains during the operational phase.

Forage Loss. Construction and operation of the railroad would remove forage available for livestock use. The impact from this forage loss would depend on the amount actually lost in each allotment or pasture since allotments are managed according to their stocking rate. The loss in forage would be considered a long-term impact even though disturbed areas not needed for operation of the railroad would be revegetated after construction. Reclaimed areas would be within the railroad's fenced right-of-way and unavailable for livestock grazing. If the loss in AUMs is very large or significant, adjustments to allotment management plans may be necessary to prevent overgrazing. Management adjustments that may be necessary if AUM losses are significant include reducing the number of livestock grazed or reducing the length of the grazing period. In addition, forage could be lost indirectly if noxious weeds become established on disturbed areas and invade adjacent rangelands. Noxious weeds can lower stocking rates of rangelands if uncontrolled; weeds generally outcompete and replace desirable forage species.

Indirect short-term loss of forage could also result from fugitive dust generated by construction traffic settling on forage species. Heavy accumulations of dust on plants would likely reduce the palatability of forage species and would force livestock to use other areas in the allotment, away from construction sites. This impact should be temporary since precipitation would wash the dust off of the plants and new plant growth would not be affected after construction.

Fragmentation of Allotments. Construction of the railroad through an allotment could bisect it so that portions are unconnected and fragmented into small unmanageable parcels. Livestock and machinery crossings will reduce fragmentation to some degree. The significance of this impact would depend on the alignment of the railroad in each allotment, presence of range improvements or facilities (corrals, water sources, etc.) and size of the bisected allotment parcels. In some cases, fragmentation may only be a minor impact. But if numerous small and unmanageable parcels are created, management and physical changes within and adjacent to the allotment may be required. Such changes could include moving or modifying allotment fences to eliminate small unmanageable parcels and reallocating fragmented parcels to other pastures or allotments. Construction of additional fences within allotments to mitigate fragmentation impacts would increase fence densities in the area and could adversely affect big game movements.

Isolation of Water Sources. The semi-arid climate of the project area requires adequately distributed water sources so that livestock efficiently utilize range forage resources. Water sources in the project area include developed wells and springs which can supply a perennial water source or temporary sources such as ponds or impoundments that only hold water seasonally. Construction of the railroad could directly impact these water sources or could isolate a water source from livestock use since the railroad would be an impassible barrier. Impacts to water sources would depend on their proximity to the railroad, the type of water source (perennial or seasonal), and whether other water sources are in the area. Isolation of water sources could cause livestock distribution problems which could contribute to overgrazing in some areas of the allotment while other areas would remain under-utilized. Livestock and wildlife might also avoid water sources during operation if they are very near the railroad. However, it is unclear how severe this indirect impact would be or if effects would be greater during construction or during operation. Livestock and some wildlife may habituate to consistent train traffic.

Disruption of Operations or Access. Construction of the railroad through grazing allotments would create an impassible barrier that could disrupt operations or management. Access through or to allotments could be limited or restricted if roads or trails are cut off and alternative access across or under the railroad is not provided. Severity of this impact would depend on the alignment of the railroad through the allotments, the types

Table 4-5 Summary of Grazing Impacts to Federally Administered Allotments									
	Alternative B			Alternative C			Alternative D		
	South Dakota	Wyoming	Total	South Dakota	Wyoming	Total	South Dakota	Wyoming	Total
Forest Service Allotments Affected	25	57	82	13	43	56	0	38	38
BLM Allotments Affected	7	4	11	6	4	10	3	6	9
Total	32	65	97	19	49	68	3	44	47
Total Acres of Allotment Disturbance (1)	619.1	2,146.7	2,765.8	373.3	1,690.0	2,063.3	32.4	1,287.6	1,320.0
Total AUMs Lost in All Allotments	168.9	411.6	580.5	79.6	354.2	433.8	6.2	231.9	238.1
1 = For purposes of alternative comparison, an estimated 200-foot wide corridor centered on the alternative centerline was established to estimate acres affected by disturbance and to determine AUMs that could potentially be lost with in each allotment.									

of allotment improvements that are isolated by the railroad, roads or trails crossed by the railroad and whether those would remain open after construction, or if there is sufficient access from other existing roads. If these impacts are not adequately mitigated by providing appropriate crossing locations or alternate road access, fragmented allotment parcels could become inaccessible to livestock and permittees. If these impacts occur and allotment management adjustments are not made, overgrazing and deterioration in range condition may occur on some areas of the allotment.

4.15.3 Alternative A (No Action). Implementation of the No Action Alternative would eliminate potential project-related impacts to Forest Service and BLM administered grazing allotments.

4.15.4 Alternative B (Proposed Action). Alternative B would affect a total of 93 Forest Service and BLM administered allotments in South Dakota and Wyoming. In South Dakota, this alternative would impact 32 allotments (25 Forest Service and 7 BLM allotments). In Wyoming, 61 allotments would be affected by Alternative B (57 Forest Service and 4 BLM allotments - see Table 4-5). Fragmentation and the disruption of operations or access to these allotments and the impacts to water sources (destruction or isolation) by construction of this alternative would be considered a short-term impact as long as these impacts are adequately mitigated.

Each allotment listed in Table 4-6 would be crossed by Alternative B in Wyoming and South Dakota. Short-term impacts are indicated on the table. Mitigation measures that would be required to insure that potential allotment impacts are temporary or short-term are included in the table. Suggested mitigation measures should be verified in the field to determine if they are adequate or if other measures would be necessary and appropriate to minimize impacts.

Alternative B would disturb an estimated 2,766 acres within the 93 allotments. In South Dakota, 619 acres of disturbance would occur in 32 allotments while 2,147 acres of the total disturbance would occur in 61 allotments in Wyoming. This disturbance would result in the total loss of about 581 AUMs in these 93 allotments. Total forage loss from the South Dakota allotments would be approximately 169 AUMs; 412 AUMs would be lost in the Wyoming allotments (see Table 4-5). The loss in forage would be considered a long-term impact even though disturbed areas would be revegetated because reclaimed areas would mostly be within the railroad's fenced right-of-way and unavailable for livestock use. This alternative would cause more disturbance to Federally-administered grazing allotments than the other alternatives.

Estimates of total AUMs lost and percent of each allotment's total forage that loss represents are provided in Table 4-6. Assuming that the railroads fenced right-of-way would be 100 feet on either side of the railroad (a 200-foot wide corridor), computed forage lost indicates that only 4 of the 93 allotments crossed would have a 10 percent or greater loss in forage, considered to be a significant impact.

The 3 allotments in South Dakota that would be impacted to that level of forage loss are BLM allotments. It should be noted that the forage loss calculation on the BLM allotments is only based on the BLM lands within these allotments. Private lands within these allotments are not considered, and therefore the estimated impact on entire allotments would probably be less than the 10 percent forage loss threshold.

Table 4-6
Impacts to Federal Grazing Allotments From Alternative B

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
South Dakota									
Creston	FRRD 41	private	5.3	private	private	private	private	private	Private
Gilmore	FRRD 63	652.1	76.9	20.0	3.1	yes	no	significant	Cattle crossing
Reed	FRRD 98	406.2	16.5	5.6	1.4	no	possible	significant	Field verify water source - provide access across track
Circle C	FRRD 38	186.2	11.5	2.6	1.4	no	no	no	None
Reed	FRRD 97	188.6	23.7	8.0	4.2	yes	yes	significant	Cattle crossings, water source, adjust pasture fence boundary and reallocate bisected pasture to another allotment
Hardpan	FRRD 396	private	18.3	private	private	private	private	private	Private
Kaiser	FRRD 79	1,257.3	49.7	21.1	1.7	yes	yes	yes	Cattle crossing and access to water on Cheyenne River south of railroad
Hardpan	FRRD 397	638.4	60.4	15.3	2.4	yes	no	significant	Will have loss of pasture east of the railroad
Red Shirt	FRRD 100	331.6	29.9	6.7	2.0	significant	yes	significant	Loss of water along the Cheyenne River and disruption of future pipeline
Hardpan	FRRD 426	no grazing	25.6	no grazing	no grazing	no	no	no	Adjust pasture fence and reallocate bisected pasture area to FRRD 397
Red Shirt	FRRD 99	238.6	19.8	4.4	1.8	no	yes	yes	Extend existing pipeline to west of railroad
Chalk Hills	FRRD 8	832.0	1.1	0.2	0.02	no	no	yes	Need access and cattle underpass
Chalk Hills	FRRD 13	239.4	0.02	n/a	n/a	no	no	no	None. The right-of-way may clip a corner of the allotment
Likewise	FRRD 81	92.1	12.1	7.1	7.7	yes	yes	yes	Need water west of railroad from Cheyenne River
Chalk Hills	FRRD 14	37.3	1.8	0.4	1.1	not determined	not determined	not determined	Crosses mostly private and a private pipeline
Chalk Hills	FRRD 17	143.7	25.2	6.3	4.4	yes	yes	yes	Access to Cheyenne River and water
Likewise	FRRD 80	149.2	33.1	10.0	6.7	yes	yes	yes	Underpass
Chalk Hills	FRRD 11	48.9	8.7	1.9	3.9	yes	no	yes	None
Chalk Hills	FRRD 10	158.0	18.7	8.5	5.4	significant	significant	significant	Access to water on the Cheyenne River
Bondurant	FRRD 33	544.7	16.5	7.5	1.4	no	no	no	None

Table 4-6
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
ND Misc	FRRD 451	no authorized use	10.1	not determined	not determined	yes	no	yes	Not determined since no authorized use
Chalk Hills	FRRD 12	167.3	35.2	7.0	4.2	yes	yes	yes	Field verify water
Chalk Hills	FRRD 2	217.2	2.8	0.7	0.3	no	no	no	None
Chalk Hills	FRRD 1	387.9	29.2	17.2	4.4	yes	no	yes	Underpass and access
Stumer	FRRD 116	230.8	13.4	3.4	1.5	no	yes	yes	Main water access will need to be developed or water piped to the west side of the railroad.
DDD/Soderquist 8292 (3)		57.0 (2)	12.3	3.7	6.5	yes	yes	unknown	Cattle crossing to access water on the Cheyenne River
Maude, Walter 07266 (3)		20.0 (2)	13.3	2.1	10.5 (1)	yes	unknown	unknown	Not determined (4)
Mosier/Tepaske John/ 8428 (3)		32.0 (2)	8.7	1.0	3.1	yes	unknown	unknown	Not determined (4)
River Allotment/ Hinesley Ted 8133 (3)		98.0 (2)	26.1	5.3	5.4	yes	unknown	unknown	Not determined (4)
Wasta/Schell 8413 (3)		18.0 (2)	8.4	1.9	10.6 (2)	yes	unknown	unknown	Cattle crossing (4)
Breakneck Hill/ B&H Ranches (3)		8.0 (2)	4.8	1.0	12.5 (3)	yes	unknown	unknown	Cattle crossing (4)
Beaver Creek/ Andersen Edwin 8032 (3)		22.0 (2)	0.2	0.04	0.2	no	no	no	None
Wyoming									
Ostlund/270	Cottonwood	612.8	65.7	13.4	2.2	yes	yes	yes	Cattle crossing and water source
Keeline/271	Black Thunder	4,145.6	237.0	38.2	0.9	yes	yes	yes	Cattle crossing and water source north side of tracks
Ostlund/270	Castle Rock	140.1	29.2	5.8	4.1	yes	yes	yes	Cattle crossing and water source

Table 4-6
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
Ostlund/270	East	351.0	29.2	6.0	1.7	yes	yes	yes	Cattle crossing and water source
Ostlund/270	Diamond L	private	40.6	private	private	yes	yes	yes	Cattle crossing and water source
Keeline/271	East Black Thunder	1,419.1	64.6	9.9	0.7	yes	yes	yes	Cattle crossing and water source north of tracks
Kerr-McGee/214	Kerr-McGee Mine	0.0	69.4	mining permits					Not determined
West Cellars/10	South	551.3	32.3	6.5	1.2	yes	yes	yes	Cattle crossing
Kerr-McGee/214	6	113.0	4.9	1.2	1.1	no	no	yes	Cattle crossing and adjust pasture fence
Kerr-McGee/214	3, 4 and 5	458.9	49.4	9.9	2.2	yes	no	yes	Modify pasture fence and allocate small bisected pasture area to another pasture
Kerr-McGee/214	Kerr-McGee Mine	0.0	1.2	mining permits					Not determined
Gordon/262	Summer	960.6	84.3	15.1	1.6	yes	yes	yes	Cattle crossing and water source
Stringer/273	North Highway	36.0	13.5	2.0	5.6	yes	yes	yes	Cattle crossing and modify allotment/pasture fence boundary. Allocate small bisected pasture area to Kerr McGee allotment pasture #3.
Gordon/262	Private	private	7.8	private	private	no	no	no	Modify pasture fence and allocate small bisected pasture area to another pasture
Stringer/273	Stringer	184.4	21.2	4.7	2.5	yes	yes	no	Cattle/road crossing
School Creek/240	Little Thunder	1,276.4	27.1	7.7	0.6	yes	yes	yes	Cattle/road crossings. Alternative water sources (spring development) may be needed south of railroad.
School Creek/240	Lovin	553.1	63.3	14.7	2.7	yes	no	yes	Two cattle crossings.
School Creek/240	Mine	mining permits	10.5	mining permits					Active mining
School Creek/240	South Basin	440.0	126.6	22.0	5.0	no	no	no	Not determined
School Creek/240	South Pasture	mining permits	25.7	mining permits					Active mining
Gordon/262	Spring	408.2	33.0	10.6	2.6	yes	yes	yes	Cattle crossing and water source

Table 4-6
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
Gordon/262	South Winter	651.7	34.9	15.2	2.3	yes	yes	yes	Cattle crossing and water source
Gordon/262	North Winter	102.1	8.6	1.9	1.9	yes	yes	no	Modify pasture fence and allocate small bisected pasture area to another pasture
Sewell/394	Calving	773.4	49.9	13.5	1.7	yes	yes	yes	Cattle crossing and water source
Bruce/313	Calf	438.1	24.6	5.7	1.3	yes	yes	yes	Cattle crossing
Wildcat Creek/398	Shook	478.8	27.3	7.0	1.5	yes	yes	yes	Cattle crossing, fencing and water source
Lynch/222	Winter	327.2	34.7	7.7	2.3	yes	yes	yes	Cattle crossing and water source
Lynch/222	Yearling	private	25.3	private	private	yes	yes	not determined	Not determined
Lynch/222	Calf	private	24.0	private	private	yes	yes	not determined	Not determined
Wildcat Creek/398	Fisher	524.1	31.0	7.9	1.5	yes	yes	yes	Cattle crossing and water source.
Lynch/222	Heifer	115.7	15.2	2.1	1.8	yes	yes	yes	Cattle crossing
Lynch/222	Calving	404.8	24.9	7.3	1.8	yes	yes	yes	Cattle crossing
Lynch/222	Private	private	1.3	private	private	no	not determined	not determined	Not determined
Lynch/222	Private	private	3.4	private	private	yes	not determined	not determined	Not determined
Lynch/222	Field	private	2.6	private	private	no	not determined	not determined	Not determined
Lynch/222	Little Frog Creek	599.0	44.2	10.3	1.7	yes	yes	yes	Cattle crossing. Well TB44/(W14) less than 200 feet from railroad.
Lynch/222	Bull	77.9	7.4	1.8	2.3	no	no	no	Move fence
Grieves/352	Wildcat	673.5	70.1	17.5	2.6	yes	yes	yes	Cattle crossings, fence and water source.
Lynch/222	Big Frog Creek	411.7	32.4	7.7	1.9	yes	yes	yes	Cattle crossing
AU7/365	Lodgepole	1,453.6	83.1	19.8	1.4	yes	yes	yes	Cattle crossing
South Rochelle Hills/272	Dry Lake	195.6	34.4	3.4	1.7	yes	yes	yes	Cattle crossing

Table 4-6
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
Irwin/212	East	1,530.7	83.8	17.1	1.1	yes	yes	yes	Cattle crossing, restore water sources. One impoundment impacted and one well (TB65-W09) less than 50 feet from centerline.
Shaw/395	Summer	1,027.8	48.4	11.5	1.1	yes	yes	yes	Cattle crossing and water source
Rosecrans/299	Rochelle Hills	425.0	53.8	8.5	2.0	yes	no	yes	Cattle crossing
Rosecrans/299	Rough Draw Exclosure	0.0	0.1	n/a	n/a	n/a	n/a	n/a	Railroad would be immediately adjacent to this enclosure
Irwin/212	Winter	913.9	43.1	8.8	1.0	yes	yes	yes	Cattle crossing and water source
Shaw/395	North	385.8	24.5	5.8	1.5	yes	yes	yes	Cattle crossing and water source
AU7/365	Spring Creek	942.6	6.5	1.5	0.2	yes	yes	no	Adjust pasture fence. One impoundment would be directly impacted by alignment.
AU7/365	Stud	151.2	18.8	4.5	3.0	yes	yes	yes	Cattle crossing and adjust pasture fence
Irwin/ 212	Middle Beckwith	131.3	14.6	4.6	3.5	yes	yes	yes	Cattle crossing and water source
North Antelope/205	North Horse	69.4	18.2	7.6	11.0	yes	yes	yes	Cattle crossing, modify pasture fence and water source
North Antelope/205	South Horse	56.4	5.6	2.3	4.0	yes	yes	yes	Modify pasture fencing and allocate small bisected pasture area to another pasture
North Antelope/205	Meadow	113.2	20.0	8.3	7.3	yes	yes	yes	Move pasture fencing and allocate small bisected pasture area to another pasture
Irwin/212	House	146.8	45.3	9.6	6.5	yes	yes	yes	Cattle crossing, move pasture fencing and allocate small bisected pasture area to another pasture. Well TB66/(W17) less than 100 feet from railroad
North Antelope/205	Red Hills	762.0	50.5	13.3	1.7	yes	yes	yes	Cattle crossing and modify pasture fence
Jacob's/213	Railroad	mining permits	3.2	mining permits					None
Jacob's/213	Railroad	mining permits	37.1	mining permits					Cattle crossings and water source
Smith Claude (3)		18.0	0.02	n/a	n/a	no	no	no	None

Table 4-6
Concluded

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
Christensen Chris (3)		83.5	19.6	3.0	3.6	yes	unknown	unknown	Cattle crossing (4)
Michale Harris (3)		66.1	5.6	0.8	1.2	yes	unknown	unknown	Cattle crossing (4)
Dry Creek Ranch/7143 (3)		168.0	32.2	7.9	4.7	yes	unknown	unknown	Cattle crossing (4)

1 = For purposes of alternative comparison, an estimated 200-foot wide corridor centered on the alternative centerline was established to estimate acres affected by disturbance and to determine AUMs that could potentially be lost within each allotment.
2 = Based on acres per AUM provided in tables in Section 3.16.
3 = Information based on only the BLM parcels that are impacted by the alternative; private lands within the allotment are not included in the calculations.
4 = Because these small BLM parcels are surrounded by private lands, management is generally controlled by the allotment permittee.

Table 4-7
Impacts to Federal Grazing Allotments from Alternative C

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
South Dakota									
Gilmore	FRRD 63	651.9	65.2	16.9	2.6	yes	yes	significant	Cattle crossing and water source on west side of railroad
ND Misc	FRRD 420	65.7	13.4	5.0	7.6	no	no	no	None
Reed	FRRD 98	406.1	0.2	0.1	0.02	no	possible	significant	Field verify water source - provide access
Circle C	FRRD 38	186.2	2.8	0.6	0.3	no	no	no	None
Reed	FRRD 97	188.6	43.3	14.2	7.5	yes	yes	significant	Cattle crossings, water source, adjust pasture fence boundary and reallocate bisected pasture to another allotment
Red Shirt	FRRD 106	431.4	39.9	8.0	1.9	yes	yes	significant	Cattle crossing or land exchange
Red Shirt	UNKNOWN	8.0	5.8	1.2	15.0	yes	no	no	None
Triple Seven	FRRD 25	528.5	9.1	3.4	0.6	no	no	no	Allotment boundary adjustment and land exchange
South Fork	FRRD 115	private	27.7	private	private	no	no	no	None
Chalk Hills	FRRD 5	197.9	18.7	3.7	1.9	yes	yes	yes	Cattle crossing, crosses pipeline, move private fence and land exchange
Chalk Hills	FRRD 2	217.3	18.1	4.5	2.1	yes	yes	yes	Cattle crossing and crosses pipeline
Stumer	FRRD 116	230.8	24.2	6.1	2.6	yes	yes	yes	Need another water source west side of railroad
Sand Creek	FRRD 181	0.0	29.0	not grazed	not grazed	no	no	no	None
Wasta/Schell 8413 (3)		18.0	8.4	1.9	10.6	yes	unknown	unknown	Not determined (4)
DDD/Soderquist 8292 (3)		57.0	12.3	3.7	6.5	yes	yes	unknown	Cattle crossing to access water on the Cheyenne River
Maude, Walter/07266 (3)		20.0	9.1	1.4	7.0	yes	unknown	unknown	Not determined (4)
River Allotment/Hinesley Ted 8133 (3)		98.0	24.6	5.0	5.1	yes	unknown	unknown	Not determined (4)
Breakneck Hill/B&H Ranches (3)		8.0	4.1	0.8	10.3	yes	unknown	unknown	Cattle crossing (4)

Table 4-7
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
Beaver Creek/ Andersen Edwin 8032 (3)		18.0	17.4	3.1	17.2	no	no	no	none
Wyoming									
Ostlund/270	Thomas (NW)	280.4	35.9	6.6	2.4	yes	yes	yes	Two cattle/road crossings
Ostlund/270	Cottonwood	612.8	17.1	3.5	0.6	yes	yes	yes	Cattle crossing or modify pasture fence and allocate bisected pasture area to Thomas pasture.
Ostlund/270	Bull	265.5	24.8	4.1	1.5	yes	no	no	Modify pasture fence boundary to east side of railroad. Permittee owns land on the west side of the pasture.
Kerr-McGee/214	Kerr-McGee Mine	mining permits	64.2	mining permits					Cattle crossing and modify pasture fence on south end of allotment. Allocate bisected area to the Stringer allotment North Highway pasture.
Kerr-McGee/214	6	113.0	13.7	3.3	2.9	yes	yes	yes	Cattle crossing to access water source (pasture will be modified after reclamation according to mine plan). Allotment management is trying to maintain all Federal land in one pasture.
Kerr-McGee/214	3, 4 and 5	458.9	68.8	13.8	3.0	yes	yes	yes	Cattle crossing. Eliminate small pasture fragment by immediately paralleling Highway 450 with railroad alignment, if possible.
Stringer/273	North Highway	36.0	13.1	1.9	5.3	yes	yes	yes	Cattle crossing and modify allotment/pasture fence boundary. Allocate small bisected pasture area to Kerr-McGee allotment pasture #3.
Stringer/273	Stringer	184.4	21.5	4.8	2.6	yes	yes	no	Cattle/road crossing
School Creek/240	Little Thunder	1,276.4	104.5	29.8	2.3	yes	yes	yes	Cattle/road crossings. Alternative water sources (spring development) may be needed south of railroad.
School Creek/240	Lovin	553.1	73.5	17.1	3.1	yes	no	yes	Two cattle crossings
School Creek/240	Mine	mining permits	10.5	mining permits					Active mining

Table 4-7
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
School Creek/240	South Basin	440.0	126.6	22.0	5.0	no	no	no	Not determined
School Creek/240	South Pasture	mining permits	25.7	mining permits					Active mining
Keeline/271	South Burdwick	242.8	57.2	4.9	2.0	yes	yes	yes	Cattle crossing. Railroad approximately 100 feet from well TB71 (W17) - the yard (north alternative) would impact this well. Modify east side of pasture fence to encompass all of the proposed yard in this pasture.
Small/220	Little Thunder	171.1	24.7	6.7	3.9	yes	yes	yes	Cattle crossing and modify pasture fences. Allocate north part of the allotment to the north pasture and the south part to the Hanson Draw pasture.
Keeline/271	Bull	377.3	47.3	13.1	3.5	yes	yes	no	Cattle crossing and water source on south side of railroad. Modify west side of pasture fence to encompass main body of yard in the South Burdwick pasture.
Keeline/271	Piney Creek	1,595.0	72.9	33.1	2.1	yes	yes	no	Three cattle crossings
School Creek/240	Buck	58.5	12.5	1.2	2.0	no	no	no	Modify pasture fence to eliminate pasture fragment, have railroad be west boundary of pasture.
School Creek/240	Meadow	40.8	14.6	3.2	7.8	yes	no	no	Modify pasture boundaries and eliminate pasture. Allocate east side of pasture to the Buck pasture and the west side to Rock pasture. Coordinate with landowner for crossings.
School Creek/240	Rock	133.6	4.2	0.9	0.7	no	no	no	Modify pasture fence and have railroad be boundary between Buck and Rock pastures.
School Creek/240	Thornburg I	886.6	24.0	4.9	0.6	yes	yes	yes	Cattle/road crossings and modify pasture fence. Allocate bisected pasture areas to Thornberg II pasture.
School Creek/240	Thornburg II	131.9	4.0	0.5	0.4	yes	no	no	Modify allotment boundary fence to eliminate small fragment in southeast pasture corner.

Table 4-7
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
School Creek/240	Calf	219.6	25.5	5.1	2.3	yes	yes	no	Modify pasture fence and replace pond 240-6 (W06). Allocate bisected pasture area to Thornberg I pasture.
Sewell/394	Calving (winter)	773.4	49.4	13.4	1.7	yes	yes	yes	Three cattle/road crossings and water source on south side of railroad on Federal land. Provide wind break (structure on north side of railroad).
Bruce/313	Calf	438.1	24.3	5.7	1.3	yes	yes	yes	Two cattle/road crossings. Coordinate with landowner.
Wildcat Creek/398	Shook	478.8	29.7	7.6	1.6	yes	yes	yes	Two cattle crossings and water source. Replace impoundment directly impacted by railroad. Potential pipeline may be required from the windmill located on the south side of the railroad to the north side of the tracks. If windmill is impacted, replace/repair.
Wildcat Creek/398	Fisher	524.0	31.1	8.0	1.5	yes	yes	yes	Cattle/road crossing - based on landowner coordination.
Teckla/298	North	155.9	30.6	2.6	1.7	yes	yes	no	Cattle crossing and replace well TB 112 (W17) if impacted
Teckla/298	South	159.6	48.5	4.1	2.6	yes	yes	yes	Three cattle crossings. Railroad approximately 100 feet from well TB-73 (W15)
Grieves/352	Wildcat	673.5	69.3	17.3	2.6	yes	yes	yes	Cattle/road crossings. Modify allotment boundary and allocate Federal land in NE Section 27 to Wildcat allotments Shook pasture. Insure that impoundments 352-2 and the other unknown structure function as water sources. Need wind protection (structure) on north side of tracks.
AU7/365	Lodgepole	1,453.6	86.8	20.7	1.4	yes	yes	yes	Four cattle crossings. Coordinate crossing needs with landowner.
Teckla/298	West Beckwith Exclosure	n/a	0.1	n/a	n/a	no	no	no	Not determined

Table 4-7
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
North Antelope/205	Reno	435.6	48.4	10.5	2.4	yes	yes	yes	Cattle crossings. Move railroad alignment to fence boundary on the south end of the allotment to eliminate pasture fragment, if possible. Cannot relocate small pasture fragment to the adjacent Red Springs/School allotment/pasture because it is private land and the landowner is not a Forest Service permittee.
Shaw/395	Summer	1,027.8	48.9	11.6	1.1	yes	yes	yes	Cattle crossings approximately every 0.5 miles. Repair impoundment 395-1. Provide access to windmill on south side of railroad. Provide water source in Sections 8 and 9 because new well drilled in Section 17 on the south side of railroad would be isolated.
Irwin/212	Winter	913.9	78.1	15.9	1.7	yes	yes	yes	Cattle crossings. Modify pasture boundary between Irwin Winter and Irwin House pastures. May require potential pipeline to provide water into North Antelope, North Horse pasture from well in Irwin Winter pasture. Forest Service would like to contain all Federal lands together, therefore, they do no want to allocate Federal lands into the Irwin Upper Beckwith pasture which is all private.
Shaw/395	North	385.8	24.6	5.9	1.5	yes	yes	yes	Two cattle crossings.
AU7/365	Stud	151.2	26.1	6.2	4.1	yes	yes	yes	Cattle crossings on Federal land. Eliminate pasture and reallocate bisected pasture areas to other pastures (i.e. AU7 Spring Creek and AU7 Lodgepole pastures).
North Antelope/205	North Horse	69.4	12.8	5.3	7.6	yes	yes	yes	Modify pasture fence and provide water source. Allocate small pasture area south of tracks to Buck and South Horse pasture. Provide water by pipeline (0.5 miles) from well in Irwin Winter pasture.
North Antelope/205	South Horse	56.4	10.6	4.4	7.8	yes	yes	yes	Move fence to eliminate pasture fragment and allocate small bisected pasture area to another pasture (i.e., North Antelope North Horse pasture).

Table 4-7
Concluded

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
North Antelope/205	Meadow	113.2	21.4	8.9	7.8	yes	yes	yes	Cattle crossing. Modify pasture fence and allocate small bisected pasture area to North Antelope private pasture.
Irwin/212	House	146.8	26.9	5.7	3.9	yes	no	yes	Modify pasture fence to eliminate pasture fragment. Allocate small pasture area to Irwin Winter pasture area.
North Antelope/205	Red Hills	762.0	54.4	14.3	1.9	yes	yes	yes	Cattle crossing and modify pasture fence.
Jacob's/213	Railroad	mining permits	44.8	mining permits					Cattle crossing and water source
Smith Claude (3)		18.0 (2)	6.6	1.1	6.1	yes	unknown	unknown	Not determined (4)
Christensen Chris/4051 (3)		83.5 (2)	19.1	2.9	3.5	yes	unknown	unknown	Cattle crossing (4)
Michael Harris/4333 (3)		66.1 (2)	7.9	1.2	1.8	yes	unknown	unknown	Cattle crossing (4)
Dale Osborn/7410 (3)		6.0 (2)	2.8	0.4	6.7	yes	unknown	unknown	Not determined (4)

1 = For purposes of alternative comparison, an estimated 200-foot wide corridor centered on the alternative centerline was established to estimate acres affected by disturbance and to determine AUMs that could potentially be lost within each allotment.
2 = Based on acres per AUM provided in tables in Section 3.16.
3 = Information based on only the BLM parcels that are impacted by the alternative; private lands within the allotment are not included in the calculations.
4 = Because these small BLM parcels are surrounded by private lands, management is generally controlled by the allotment permittee.

Table 4-8
Impacts to Federal Grazing Allotments from Alternative D

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
South Dakota									
8377- 7274		16 (2)	3.7	0.7	4.4	no	no	no	Not determined (4)
River Allotment/ Hinesley Ted 8133		98.0 (2)	24.6	4.7	4.8	yes	unknown	unknown	Not determined (4)
Breakneck Hill/ B&H Ranchester		8.0 (2)	4.1	0.8	10.3	yes	unknown	unknown	Cattle crossing (4)
Wyoming									
East Upton-Osage Community - 4	South	532.3	4.8	0.8	0.2	no	no	no	Move fence
Middle Upton-Osage Community - 5	#3	604.3	71.0	10.3	1.7	no	dam 498-28 disrupted	no	Move fence, replace dam
Middle Upton-Osage Community - 5	#2	479.2	35.7	5.2	1.1	no	no	no	Move fence
West Upton-Osage #6	South	531.3	54.0	12.9	2.4	no	no	no	Move fence
Oliver - 380	North	108.1	14.0	3.3	3.1	no	no	no	Move Fence, field verify private well on centerline
Huckins - 397	1	15.8	18.5	3.0	19.0	no	no	no	Move fence
Mirich - 372	Railroad	17.4	45.7	10.2	58.6	possible pasture elimination	no	no	Move fence
Mirich - 372	Bush	32.1	25.0	5.5	17.1	no	no	no	Move fence
North Antelope/205	Meadow	113.2	21.4	8.9	7.9	yes	yes	yes	Cattle crossing. Modify pasture fence and allocate small bisected pasture area to North Antelope private pasture.

Table 4-8
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
North Antelope/205	North Horse	69.4	12.8	5.3	7.6	yes	yes	yes	Modify pasture fence and provide water source. Allocate small pasture area south of tracks to Buck and South Horse pasture. Provide water by pipeline (0.5 miles) from well in Irwin Winter pasture.
North Antelope/205	Red Hills	762.0	54.4	14.3	1.9	yes	yes	yes	Cattle crossing and modify pasture fence.
North Antelope/205	Reno	435.6	48.4	10.5	2.4	yes	yes	yes	Cattle crossings. Move railroad alignment to fence boundary on the south end of the allotment to eliminate pasture fragment, if possible. Cannot relocate small pasture fragment to the adjacent Red Springs/School allotment/pasture because it is private land and the landowner is not a Forest Service permittee.
North Antelope/205	South Horse	56.4	10.6	4.4	7.8	yes	yes	yes	Move fence to eliminate pasture fragment and allocate small bisected pasture area to another pasture (i.e., North Antelope North Horse pasture).
Irwin/212	House	146.8	26.9	5.7	3.9	yes	no	yes	Modify pasture fence to eliminate pasture fragment. Allocate small pasture area to Irwin Winter pasture area.
Irwin/212	Winter	913.9	78.2	16.0	1.8	yes	yes	yes	Cattle crossings. Modify pasture boundary between Irwin Winter and Irwin House pastures. May require potential pipeline to provide water into North Antelope, North Horse pasture from well in Irwin Winter pasture. Forest Service would like to contain all Federal lands together, therefore, they do no want to allocate Federal lands into the Irwin Upper Beckwith pasture which is all private.
Jacob's/213	Railroad	mining permits	44.8	mining permits					Cattle crossing and water source
Kerr-McGee/214	Kerr-McGee Mine	mining permits	64.2	mining permits					Cattle crossing and modify pasture fence on south end of allotment. Allocate bisected area to the Stringer allotment North Highway pasture.

Table 4-8
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
Kerr-McGee/214	6	113.0	13.7	3.3	2.9	yes	yes	yes	Cattle crossing to access water source (pasture will be modified after reclamation according to mine plan). Allotment management is trying to maintain all Federal land in one pasture.
Kerr-McGee/214	3, 4 and 5	458.9	68.8	13.8	3.0	yes	yes	yes	Cattle crossing. Eliminate small pasture fragment by immediately paralleling Highway 450 with railroad alignment, if possible.
School Creek/240	Buck	58.5	12.5	1.2	2.0	no	no	no	Modify pasture fence to eliminate pasture fragment. Have railroad be west boundary of pasture.
School Creek/240	Meadow	40.8	14.6	3.2	7.8	yes	no	no	Modify pasture boundaries and eliminate pasture. Allocate east side of pasture to the Buck pasture and the west side to Rock pasture. Coordinate with landowner for crossings.
School Creek/240	Rock	133.6	4.2	0.9	0.7	no	no	no	Modify pasture fence and have railroad be boundary between Buck and Rock pastures.
School Creek/240	Thornburg I	886.6	24.0	4.9	0.6	yes	yes	yes	Cattle/road crossings and modify pasture fence. Allocate bisected pasture areas to Thornberg II pasture.
School Creek/240	Thornburg II	131.9	4.0	0.5	0.4	yes	no	no	Modify allotment boundary fence to eliminate small fragment in southeast pasture corner.
School Creek/240	Calf	219.6	25.5	5.1	2.3	yes	yes	no	Modify pasture fence and replace pond 240-6 (W06). Allocate bisected pasture area to Thornberg I pasture.
School Creek/240	Lovin	553.1	73.5	17.1	3.1	yes	no	yes	Two cattle crossings.

Table 4-8
Continued

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
School Creek/240	Little Thunder	1,276.4	27.1	7.7	0.6	yes	yes	yes	Cattle/road crossings. Alternative water sources (spring development may be needed south of railroad).
School Creek/240	Mine	mining permits	10.5	mining permits					Active mining
School Creek/240	South Basin	440.0	126.6	22.0	5.0	no	no	no	Not determined
School Creek/240	South Pasture	mining permits	25.7	mining permits					Active mining
Ostlund/270	Thomas (NW)	280.4	35.9	6.6	2.4	yes	yes	yes	Two cattle/road crossings
Ostlund/270	Cottonwood	612.8	17.1	3.5	0.6	yes	yes	yes	Cattle crossing or modify pasture fence and allocate bisected pasture area to Thomas pasture.
Ostlund/270	Bull	265.5	24.8	4.1	1.5	yes	no	no	Modify pasture fence boundary to east side of railroad. Permittee owns land on the west side of the pasture.
Stringer/273	North Highway	36.0	13.1	1.9	5.3	yes	yes	yes	Cattle crossing and modify allotment/pasture fence boundary. Allocate small bisected pasture area to Kerr-McGee allotment pasture #3.
Stringer/273	Stringer	184.4	21.2	4.7	2.6	yes	yes	no	Cattle/road crossing
Teckla/298	West Beckwith Exclosure	n/a	0.1	n/a	n/a	no	no	no	Not determined
Teckla/298	North	155.9	30.6	2.6	1.7	yes	yes	no	Cattle crossing and replace well TB 112 (W17) if impacted.
Teckla/298	South	159.6	48.5	4.1	2.6	yes	yes	yes	Three cattle crossings. Railroad approximately 100 feet from well TB-73 (W15)
Fern Porter - 04281		12 (2)	1.1	0.2	1.7	no	unknown	unknown	Not determined(4)
True Ranches - 04337		25 (2)	7.4	2.3	9.2	yes	unknown	unknown	Not determined(4)
Barton Land & Livestock Co - 14016		40 (2)	14.4	3.6	9	yes	unknown	unknown	Not determined (4)

Table 4-8
Concluded

Allotment	Pasture	Total AUMs	Acres of Disturbance (1)	AUMs Lost (2)	Percentage AUMs Lost	Pasture Fragmentation	Isolation of Water	Disruption of Operation or Access	Potential Mitigation Measures
Steven Mirich - 04205		80 (2)	5.9	1.5	1.9	yes	unknown	unknown	Not determined (4)
West Timber Creek 12091		14 (2)	3.5	0.4	2.9	no	no	no	Move fence
Dale Osborn/7410 (3)		6.0 (2)	2.8	0.4	6.7	yes	unknown	unknown	Not determined (4)

1 = For purposes of alternative comparison, an estimated 200-foot wide corridor centered on the alternative centerline was established to estimate acres affected by disturbance and to determine AUMs that could potentially be lost within each allotment.
2 = Based on acres per AUM provided in tables in Section 3.16.
3 = Information based on only the BLM parcels that are impacted by the alternative; private lands within the allotment are not included in the calculations.
4 = Because these small BLM parcels are surrounded by private lands, management is generally controlled by the allotment permittee.

4.15.5 Alternative C (Modified Proposed Action). Alternative C, would affect 66 allotments in South Dakota and Wyoming, which is 27 fewer than Alternative B. In South Dakota, this alternative would impact 19 allotments (13 Forest Service and 6 BLM allotments). In Wyoming, 47 allotments would be affected (43 Forest Service and 4 BLM allotments - see Table 4-5). As with Alternative B, fragmentation and the disruption of operations or allotment access are possible effects from this alternative and would be considered short-term impacts as long as appropriate mitigation is applied. Impacts to water sources (destruction or isolation) would also be considered a short-term impact if mitigated.

Table 4-7 lists all allotments that would be crossed by this alternative in each state and indicates if short-term impacts would be expected. Mitigation measures that would be required to insure potential allotment impacts are either temporary or short-term are also specified in the table. If this alternative or the route variations are implemented, any recommended mitigation measure should be verified on-site to determine adequacy or if other measure would be more appropriate to minimize and/or insure impacts are short-term.

This alternative would disturb an estimated 2,063 acres within the 66 allotments crossed in South Dakota and Wyoming. In South Dakota, 373 acres of disturbance would occur in 19 allotments and the remaining disturbance of 1,690 acres would occur in 47 allotments in Wyoming. Surface disturbance would result in the loss of approximately 434 AUMs in the 66 allotments for the long-term, approximately 80 AUMs lost in South Dakota allotments and 354 AUMs lost in Wyoming allotments. Alternative C would disturb approximately 25 percent fewer acres in Forest Service and BLM allotments than Alternative B. In addition, Alternative C would reduce AUM loss in Forest Service and BLM allotments by about 25 percent, compared to Alternative B (see Table 4-5).

Estimates of total AUMs lost and percent of each allotment's total forage that loss represents are provided in Table 4-7. Computed forage lost indicates that only 4 of the 66 allotments crossed by this Alternative C would have a 10 percent or greater loss in forage which would be considered a significant impact.

Three of the allotments in South Dakota that would subject to this amount of forage loss are BLM allotments. It should be noted that the forage-loss calculation on the BLM allotments is only based on the BLM lands within these allotments. Private lands within these allotments are not considered so the impact on a whole allotment basis would probably be less than the 10 percent forage loss threshold.

Phiney Flat Route Variation. Compared to Alternative C, implementation of this route variation would prevent the impacts to 3 pastures in 2 allotments on the BGNG. The pastures that would not be impacted by this route variation include FRRD 97 and FRRD 98 in the Reed Allotment along with the FRRD 38 pasture in the Circle C Allotment. In addition, this route variation would have 10.8 fewer acres of impact to pasture FRRD 63 in the Gilmore Allotment compared to Alternative C. This would reduce the loss of AUMs in pasture FRRD 63 by approximately 2.8 AUMs.

W G Flat Route Variation. This route variation would affect all of the same allotments as Alternative C except it would not cross the Sand Creek Allotment (FRRD 181) on the BGNG. In addition, this variation would cross along the edge of BLM allotment 7329 (record number 8428) and would disturb approximately 1.3 acres of the Federal parcel within this allotment. This Federal parcel has 18 AUMs and is grazed from November through April by cattle.

4.15.6 Alternative D (Existing Corridors Alternative). Alternative D would affect 47 Forest Service and BLM allotments in South Dakota and Wyoming, 19 fewer than Alternative C and 46 fewer than Alternative B. In South Dakota, Alternative D would impact only 3 BLM allotments. In Wyoming, 44 allotments would be affected (38 Forest Service and 6 BLM allotments - see Table 4-5). As discussed for other alternatives, fragmentation, the disruption of operations or access to allotments caused by this alternative would be considered short-term impacts as long as there is adequate mitigation. Impacts to water sources would also be considered short-term impacts if mitigated. Table 4-8 lists the allotments that would be crossed. Mitigation measures that would be required for impacts to only be short-term are provided in the table for each allotment. If this alternative is implemented, these mitigation measures should be field verified to determine if they are adequate or if other measures would be needed minimize impacts or shorten duration.

This alternative would follow existing railroads for a large portion of its length in South Dakota and Wyoming. Therefore, potential fragmentation of pastures should not be as extensive as might be expected by other alternatives.

This alternative would disturb a total of 1,320 acres in the 47 allotments in South Dakota and Wyoming. In South Dakota, 32 acres of disturbance would occur in the 3 BLM allotments crossed while the remaining 1,288 acres disturbed would be in the 44 allotments crossed in Wyoming. Surface disturbances would produce estimated loss of approximately 238 AUMs in these 47 allot-

ments over the long-term with 6 AUMs lost in BLM allotments in South Dakota and 232 AUMs lost in Wyoming allotments. Alternative D would disturb approximately 342 fewer AUMs than Alternative B and about 196 fewer AUMs would be lost than Alternative C (see Table 4-5). However, this forage loss analysis only considers impacts to Forest Service and BLM administered grazing allotments and does not include impacts to private grazing lands. When considering private lands, this alternative may actually have greater impacts because this alternative is longer than either Alternative B or Alternative C.

Estimates of total AUMs lost and percent of each allotment's total forage that loss represents are provided in Table 4-8. Computed forage lost indicates that only 4 of the 47 allotments crossed by this alternative would have a 10 percent or greater loss in forage. One small Forest Service allotment pasture in Wyoming, the Mirich-Railroad Allotment, would have approximately 60 percent of the total allotment forage lost due to implementation of this alternative. This impact would most likely cause this pasture to be eliminated.

4.15.7 Proposed Mine Loop Options. The Black Thunder North Mine Loop would cross 5 pastures in 3 allotments. These include: the Stringer Allotment's North Highway pasture, the Little Thunder Allotment's Mine pasture as well as the two Kerr-McGee Mine pastures and the #4 pasture in the Kerr-McGee Allotment. This option would reduce the total AUMs in these pastures by approximately 2 AUMs. Reductions in AUMs for the 2 Kerr McGee allotment pastures were not calculated because these pastures are in a mine permit area and are currently not being used.

The Black Thunder South Mine Loop would cross 3 pastures in two allotments. These include: the Stringer Allotment's North Highway pasture and the Little Thunder Allotment's Mine and West Peck pastures. This option would impact a total of approximately 45.1 AUMs in these allotments with the Little Thunder Allotment's Mine pasture having the largest AUM loss with about 37.6.

The North Antelope West Mine Loop would only affect the North Antelope Allotment's Red Hills pasture. Approximately 7.8 AUMs would be lost from this pasture if this option is implemented. The North Antelope East Mine Loop would affect 4 pastures in the North Antelope Allotment. These pastures include: Buck Draw, meadow, South Horse and Private. Implementation of this option would reduce total AUMs in these pastures by approximately 6.7.

4.15.8 Proposed Yard Sites. Only the Western Yard would impact Federal grazing allotments. The Western Yard would be constructed within the following allotments and pastures: School Creek Allotment - Little Thunder pasture; Small allotment - Little Thunder pasture; and Keeline Allotment South Burdwick and Bull pastures.

4.16 Wetland and Riparian Resources

DM&E is currently preparing an application for the COE and state 401 water quality certification agencies which requests approval to dredge and fill waters of the United States including wetlands. Information contained in that application is not repeated here. Rather, this section focuses on a comparison of potential impacts to wetlands and riparian resources between the alternatives. It will be left to the COE and others with proper regulatory authority to determine whether alternative impacts are significant.

4.16.1 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). Resource recovery time is considered an important factor in determining and evaluating impacts to wetlands and riparian areas. Impact is considered to be either temporary, long-term, or permanent depending on the amount of time it would take for the reestablishment of a wetland or riparian area's functions. Recovery within a period of 3 years after construction is considered temporary while a recovery period of greater than 3 years is considered long-term. The non-recoverable loss of a particular wetland or riparian areas functions is considered permanent. Because the railroad would be a permanent aboveground facility impacts to wetlands are considered long-term.

Construction of the alternatives would have the following impacts on wetland and riparian resources:

- Wetland and riparian areas would be permanently filled or altered, resulting in a permanent or temporary change of hydrology, soils or the composition of vegetation.
- Permanent or temporary degradation in the functions of wetlands or riparian resources would occur.

Potential impacts to wetlands from discharges of fill materials are described in 40 CFR Part 230.41. The possible impacts to wetland functions from the discharge of fill material in wetlands may include: damage or destruction of habitat which adversely affects the biological productivity of wetland ecosystems by smothering, or altering the hydrology by dewatering, by permanently flooding, or by altering substrate elevation which effects water flow. The addition of fill material may destroy wetland vegetation or result in advancement of

succession to dry land species. It may reduce or eliminate nutrient exchange by a reduction of the system's productivity, or by altering current patterns and velocities.

Disruption or elimination of wetland systems can degrade water quality by obstructing circulation patterns that flush wetland systems, by interfering with the filtration function of wetlands, or by changing the aquifer recharge capability of a wetland. Filling activities can also change the wetland habitat value for fish and wildlife. Discharging fill material in wetlands may modify the capacity of wetlands to retain and store floodwaters and to serve as a buffer zone shielding upland areas from erosion. Secondary impacts may result when disruption of flow or circulation patterns occur even if there is an apparently minor loss of wetland acreage. Similar to wetlands, the alteration of riparian ecosystems may prevent them from maintaining water quality, flood water storage and providing important fish and wildlife habitat.

To quantify potential impacts to wetlands by each of the alternatives and route variations the wetland crossing length in miles was determined based on USFWS NWI mapping (see Section 3-17). Tables 3-69 through 3-73 provide the potential crossing length by wetland type by landowner and state for each of the alternatives.

Impacts to wetlands and riparian areas from implementation of the alternatives would be considered an irreversible and irretrievable commitment of the resource since construction of the railroad would require filling and excavating wetlands to achieve the design grade and since the railroad would be a permanent aboveground structure. Although, permitting requirements would require mitigation to compensate for wetlands lost from project construction activities, such compensation often is some distance away from the impacted wetlands. Therefore, wetlands or riparian areas that would be lost or altered and the functions that they provide would be lost locally.

4.16.2 Alternative A (No Action). Implementation of Alternative A would not disturb any wetlands or riparian areas or cause any of the potential impacts to these resources that are discussed above.

4.16.3 Alternative B (Proposed Action). Impacts to wetlands from this alternative would be permanent or long-term since construction activities would require the filling or excavation of wetlands to achieve the railroad design grade. The length of each wetland type which would be crossed by Alternative B is provided in Table 3-74. Approximately 2.32 miles of this alternative would cross wetlands (i.e., 1.68 miles in South Dakota and 0.64 miles in Wyoming). In South Dakota, about 86 percent of the wetland impact would occur on private lands with the remaining impact on NFS lands. In Wyoming, about 92 percent of the wetlands that would be crossed occur on private lands with the remaining wetlands being crossed on NFS lands. In South Dakota, 0.78 mile of the wet meadow type would be affected, the most of any wetland type. Effect to other wetlands are summarized in Table 3-74. Alternative B would cross more wetlands than any other alternative.

Alternative B would cross 41 perennial streams (35 in South Dakota and 6 in Wyoming) and 671 intermittent streams. Fifteen of the perennial stream crossings in South Dakota would occur on Spring Creek. All of the perennial streams have riparian characteristics and would support most of the riparian functions. Impacts to riparian areas on Spring Creek would be significant because of the number of stream crossing and channel alterations proposed for Alternative B. Indirect impacts may include increased flows and sedimentation which could also affect aquatic habitats. Although, the intermittent streams that would be crossed by this alternative have not been evaluated for their riparian characteristics, some of these streams would exhibit riparian characteristics and would provide some of their functions.

4.16.4 Alternative C (Modified Proposed Action). Effects of Alternative C to wetlands are summarized in Table 3-75. This alternative would cross approximately 1.58 miles of wetlands in South Dakota and Wyoming. All of the wetlands that would be crossed by this alternative in South Dakota are on private lands. In Wyoming, approximately 57 percent of the wetlands crossed by this alternative would occur on private lands with the remainder on NFS and state lands. Alternative C would mostly affect wet meadows in South Dakota but also the aquatic bed type, associated with impoundments. In Wyoming, this alternative would cross only 2 wetland types: wet meadows (0.16 miles) and aquatic beds (0.12 miles).

Alternative C would cross 40 perennial streams (36 in South Dakota and 4 in Wyoming) and 637 intermittent streams. Twenty-one perennial stream crossings in South Dakota would occur on Spring Creek, 6 more than Alternative B. Impacts to riparian areas on Spring Creek would be significant because of the number of stream crossings and channel alterations proposed. Altered riparian and wetland ecosystems along this stream would degrade or impair functions of these and may contribute to indirect down-stream impacts.

Although all of the intermittent streams that would be crossed by this alternative have not been evaluated for their riparian characteristics, some of these streams do exhibit riparian characteristics and would provide important riparian functions. Alternative C would make a number of crossing of intermittent streams in South

Dakota within Hay Canyon. Although this stream is designated as an intermittent stream, it has perennial characteristics and supports riparian and wetland communities with high functions and values. Construction of this alternative would require significant stream channel alterations which would cause significant impacts to wetland and riparian resources within Hay Canyon. Impacts associated with implementing this alternative would be long-term and would be an irreversible and irretrievable commitment of resource.

Phiney Flat Route Variation. This route variation would eliminate 20 crossings of Spring Creek. This stream supports woody riparian areas and numerous wetlands. Wetland types mapped along Spring Creek are either riverine or riparian forest and have high functional values. Other wetland types cross by this route variation are summarized in Table 3-76.

W G Flat Route Variation. This route variation avoids Hay Canyon and eliminates the 30 crossing of the streams in this canyon that would be affected by Alternative C. This route variation would prevent significant impacts to riparian and wetland resources within Hay Canyon as well as eliminating any indirect impacts downstream due to stream channel alterations. Wetland types associated with Hay Canyon are either riverine or palustrine emergent and have relatively high functional values, especially for wildlife. Other wetland types crossed by this route variation are summarized in Table 3-77.

4.16.5 Alternative D (Existing Corridors Alternative). A total of 1.81 miles of wetlands would be crossed by Alternative D (0.50 miles in South Dakota and 1.31 miles in Wyoming), 0.51 mile less than would be affected by Alternative B but 0.23 mile more than Alternative C (see Tables 3-74, 3-75 and 3-78). Unlike Alternatives B and C, most of the wetlands affected by this alternative would be in Wyoming. All wetlands crossed in South Dakota are on private lands. The predominate wetland type affected in both states are wet meadows. Affected aquatic bed wetland types are associated with impoundments on intermittent drainages. Alternative D would not cross any forested wetlands and would only cross 0.03 miles of scrub shrub wetlands in South Dakota.

A total of 57 perennial streams (38 in South Dakota and 19 in Wyoming) and 707 intermittent streams may be crossed by this alternative. In South Dakota there would be numerous crossing of Boxelder and Beaver Creek but these stream crossings are at existing railroad crossing locations. Impacts to riparian areas or wetlands crossed by this alternative have been previously impacted by past railroad construction and maintenance activities. Functions and values of these wetlands or riparian systems would likely be less affected than at sites with no previous impact. Most of the intermittent streams which would be crossed by Alternative D have been previously disturbed by existing railroad crossings.

4.16.6 Proposed Mine Loop Options. The Black Thunder South Mine Loop would cross 0.30 miles of privately-owned wet meadow. The North Antelope East Mine Loop would cross 0.06 miles of aquatic bed wetland types. The Black Thunder North and North Antelope West mine loops would not cross wetlands.

4.16.7 Proposed Yard Sites. The Edgemont Yard would not intersect any wetlands. The West Staging Yard would intersect one aquatic bed wetland on NFS land which is associated with a water well and is considered nonjurisdictional. The Wall Yard would intersect 3 separate wet meadow wetlands on private land.

4.17 Threatened, Endangered and Special Status Species

Public and agency scoping responses requested full analyses of project impacts to threatened, endangered and sensitive species. However, concern was raised that there is insufficient data to conduct impact analyses on these species. These issues are addressed in the following sections. General habitat issues and species-specific issues raised by USFWS, SDGFP, WGFD and private organizations from their written and oral comments are summarized, below:

- Increased train traffic and new tracks paralleling or crossing major rivers in Wyoming and South Dakota will increase the potential for derailments with spills and discharge of diesel fuel into surface waters. Such spills could adversely affect water quality and fish and wildlife resources locally and downstream. A spill contingency plan, along with disclosure of chemicals likely to be present was requested.
- Chemical treatment of railroad ties may be a contamination hazard.
- Construction crossing numerous wetlands, riparian areas and streams can impact those habitats. Specific mitigation was recommended to avoid taking any Federal trust wildlife resources or contamination of water sources.

The following are species-specific issues raised by Federal and state agencies:

- Consider all prairie dog colonies as potential habitat for the black-footed ferret. Surveys for ferrets, following established guidelines, should be

conducted in prairie dog colonies prior to construction.

- Construction on portions of the TBNG in Wyoming could impact an area proposed for reintroduction of black-footed ferrets. Ferrets already reintroduced into the Conata Basin/Badlands site could be affected if prairie dog colonies are located in the project area; the potential for colonization by black-footed ferrets of colonies affected by the project must be evaluated.
- Consider any habitat in South Dakota with significant humus and/or topsoil (mixed agricultural lands - mowed fields, pastures - grasslands, and second growth timber) as suitable for the American burying beetle.
- Ute ladies'-tresses potentially occurs in moist soils near wetland meadows, springs, lakes and perennial streams in alluvial substrates. Prior to construction, surveys by a qualified botanist should be conducted when it is flowering, between mid-July and mid-September.
- Interior least terns are fairly common, nesting on sand and gravel bars of the Cheyenne River. Spills on the floodplain or in the river may lead to direct mortality or cause abandonment of nesting areas downstream.
- Bald eagles concentrate in winter along the Cheyenne River below Angostura Reservoir and nesting along river corridors in South Dakota is expected in the future. Disturbance from trains along the Cheyenne River corridor will probably eliminate the area as potential nesting habitat. Pollution could have an impact on bald eagle food sources and might accumulate in the food chain. And, there is potential for bald eagles to be killed by trains while feeding on carrion along the tracks.
- There is a historic record of Topeka shiners from the Cheyenne River and other tributaries to the Missouri River. Habitat destruction, degradation, modification, and fragmentation from siltation, reduced water quality, tributary impoundment, stream channelization, stream dewatering and piscivorus fish introductions are primary threats to the species.
- Sturgeon chubs (candidate species) and plains topminnow (formerly a South Dakota State-threatened species) are known to occur in the Cheyenne River in South Dakota. The USFWS determined that listing sturgeon chub is warranted but precluded by higher priority species. Spills and pollution from trains and maintenance work (including creosote treatment of ties, oil and fuel leaks from trains, use of herbicides, and other potential sources) may have cumulative effects on these and other fishes of the Cheyenne River.
- Spiny soft-shell turtles are rare in South Dakota but, partially because of its abundance along the Cheyenne River, it was removed from the South Dakota State threatened and endangered species list. Effects of pollution and contaminants, as above, are a concern for this species.
- Analysis of potential impacts of the project to swift fox was recommended. Although a candidate species, the USFWS determined that listing is warranted but precluded at this time and the agency remains concerned about the status of the species. Swift fox are found throughout the project area and are vulnerable to vehicular traffic, including train traffic.
- The USFWS recommends surveys for mountain plovers to minimize impacts to nesting birds. Mountain plover populations are declining throughout their range and available data suggests that listing as threatened or endangered is warranted.
- Many species of birds, including raptors and eagles, are protected under the Migratory Bird Treaty Act and Bald Eagle and Golden Eagle Protection Act. Activities that may adversely affect a migratory bird or eagle, their young, eggs or nests should be coordinated with the USFWS before any actions are taken. Removal or destruction of nests, or causing abandonment of a nest could constitute violation of these statutes. The USFWS recommended surveys for raptor nests and roost sites in the project area.
- Several non-game species of special concern in Wyoming (burrowing owls, mountain plovers, prairie falcons, golden eagles, bald eagles) have been documented in the project area and could be negatively impacted by direct and indirect loss of habitats used for different life history functions, direct mortality, and illegal harvest.
- The USFWS encouraged consideration of sensitive and at-risk plant species to prevent their inclusion on the endangered species list.

4.17.1 Significance Criteria. Impacts to Federally-listed threatened and endangered species, species proposed for listing, candidate species, and species with special status recognized by the USFWS, Forest Service, BLM, WGFD and SDGFP would be considered significant if any of the following occurred:

- The death of any individual due to project-related activities.
- Reduced recruitment and/or survival of individuals that would impede species' recovery or maintenance of current populations.
- Loss of Federally-designated critical habitats.
- Contributing causes to warrant an unlisted species to be proposed for listing as threatened or endangered under the Endangered Species Act.

Section 7(a) of the Endangered Species Act (ESA) requires Federal agencies to insure that actions which they authorize or permit are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat for such species. CEQ regulations for implementing NEPA (40 CFR Parts 1500-1508) suggest that impacts of such intensity that "*adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the (ESA) of 1973*" would be considered significant.

In their Mitigation Policy, the Wyoming Game and Fish Commission (1998) identified all Federally-listed species and their delineated critical habitats as "*irreplaceable*": any impact would be excluded to avoid any loss of habitat (see Table 4-9). No critical habitat for any Federally-listed species would be affected by any of the proposed alternatives.

Candidate species do not receive protection under ESA unless they are the subject of a published proposed rule determining endangered or threatened status. However, the USFWS monitors the status of all candidates, especially those for which available information indicates an imminent threat and the USFWS encourages consideration of these during long-range environmental planning. Forest Service and BLM policy does not allow actions that would change the status of candidate species under the ESA. In addition, the Wyoming Game and Fish Commission (1998) Mitigation Policy recommends no loss of habitat function for any Federal candidate species (see Table 4-9).

4.17.2 Summary of Impacts Common to All Alternatives (Except the No Action Alternative). Impacts on Federally-listed endangered or threatened species were considered and evaluated if a species potentially occurs in the vicinity of the proposed alternatives or if any of the criteria listed below are met:

- Potential for direct mortality of individuals (fish, wildlife, or plants).
- Potential for long-term or permanent loss or alteration of existing or potential fish or wildlife habitat supporting significant life history functions (e.g., breeding, wintering or migration).
- Potential for temporary alteration or disturbance of habitat that may result in avoidance by listed fish or wildlife species and increased mortality or lowered reproductive success.

Impacts common to all alternatives, discussed in Section 4.18 for Wildlife and Aquatic Resources, also apply to listed endangered and threatened fish and wildlife and other sensitive species (see Table 4-10). Since the distribution and abundance of threatened and endangered species are limited or in decline, any impact could have a greater effect on the size or viability of these populations than on populations of non-endangered or non-threatened species. In addition, habitat availability is often a limiting factor for endangered and threatened species and the short- or long-term loss of suitable habitat can contribute to the decline of populations. Direct short-term impacts such as mortality and displacement can be much more devastating than with other, more common species since displacement from suitable to less-suitable habitats in surrounding areas may decrease reproductive success and individual survival. Mortality of a single individual could be a highly significant loss to the species and most certainly to the local population.

Black-footed Ferret. Black-footed ferrets inhabited the project area and vicinity historically. They have been reintroduced to the Conata Basin/Badlands in South Dakota as a nonessential experimental population. Similarly, black-footed ferrets are being considered for reintroduction to TBNG in Wyoming. There are approximately 15,000 acres of prairie dog colonies within the TBNG reintroduction area, known as the Rosecrans Area (Byer and Luce, no date), but only 5,502 acres of that complex on TBNG have been managed to exclude poisoning with rodenticides and recreational shooting (Byer and Luce, no date). Elsewhere on TBNG, prairie dogs continue to be subject to recreational shooting although control through poisoning has been temporarily halted on NFS lands.

Recreational shooting can reduce local prairie dog populations by 35 to 69 percent (Knowles, 1988; Vosburgh and Irby, 1998). County weed and pest control agents provided locations of scattered prairie dog colonies along the alternatives in Wyoming and South Dakota and indicated many have been treated by them or by landowners with poisoned grain during the past decade. Typically, prairie dog populations can recover from shooting in one year (B. Perry, Forest Service, Wall Ranger District, personal communication with PIC Technologies, Inc.) while recovery following cessation of poisoning can take one to two years (Knowles, 1986; Cincotta *et al.*, 1987; Apa *et al., 1990).* Recovery of populations following plague, however, occurs much slower and some populations may never recover to pre-epizootic levels (Mulhern and Knowles, 1997). And, sylvatic plague is fatal to black-footed ferrets (Williams *et al.*, 1994).

Except for a 1983 record judged as confirmed (Jobman and Anderson, 1991) found in the vicinity of Edgemont, a ferret skull found in Converse County, Wyoming in 1979, 2 records judged as confirmed (1974

Table 4-9 Summary of Wyoming Game and Fish Commission Mitigation Policy as it Applies to Wildlife Species and Wildlife Habitats		
Mitigation Category	**Recommended Mitigation Objective**	**Applicable Species and/or Habitats**
Irreplaceable Species/Habitats	No loss of habitat or habitat function: the impact is excluded	•Federally Listed Threatened and Endangered Species •Federally Delineated Critical Habitat
Vital Species/Habitats	No loss of habitat function (arrangement and capability of habitat components to sustain species, populations, and wildlife diversity over time); species supported by the habitat are unchanged.	•Federal Candidate Species •Wyoming Native Species of Special Concern Status 1 & 2 •Wyoming Crucial Habitats •Wetlands •Stream Class 1 (premium trout waters, fishery of national importance)
High Species/Habitats	No net loss of habitat function for biological community encompassing project area. The area will support species' populations by maintaining habitat function	•Wyoming Native Species of Special Concern Status 3 •Trophy Game Animal •Big Game, Trophy Game Winter-Yearlong Range •Parturition Areas •Riparian Habitats •Other Important or Limited Habitat (aspen, old growth, snags, cliffs, caves) •Stream Class 2 (very good trout waters, fishery of statewide importance) •Trophy Fisheries (managed for angling larger than average fish) •Special Fisheries (managed for angling unique fish species)
Moderate Species/Habitats	No net loss of habitat value (relative importance of habitat type and conditions to sustain socially or ecologically significant wildlife populations)	•Game Fish •Furbearing Animal •Wyoming Native Species Status 4 •Big Game Animal •Game Birds •Other Big Game and Trophy Game Seasonal Ranges •Stream Class 3 (important trout waters, fishery of regional importance) •Wild Fisheries (managed for angling non-stocked, natural reproducing fishery) •Basic Yield Fisheries (managed for angling opportunities, stocked or not)
Low Species/Habitats	Minimize reduction of habitat value (habitat is abundant or not essential to sustain community, population, or sub-population).	•Native Species Status 5-7 •Small Game •Stream Class 4 (low production trout waters, no sustained fishing pressure) •Stream Class 5 (very low production waters, often without trout fishery) •Put-and-Take Fisheries (angling for hatchery-raised fish)

and 1981) in Campbell County and 1 confirmed historical report from Niobrara County (all within 16 miles of the alternatives), there is no recent documented evidence that ferrets presently occur within the project area or would be adversely affected by any of the alternatives.

Of primary concern for this species is the potential impacts Alternative B could have on the Rosecrans Area's suitability as a black-footed ferret recovery site. Currently, the Black-footed Ferret Recovery Implementation Team considers the Rosecrans Area as one of the top ten ferret recovery sites in North America and is developing a rule that would allow ferret reintroduction. Alternative B could adversely affect the suitability of portions of the Rosecrans Area by introducing noise, vibration, night lighting and other obstacles to ferret movement and dispersal. If Alternative B is selected additional planning would be required to minimize impacts to the ferret reintroduction site.

Whooping Crane. No impacts to whooping cranes are anticipated because their occurrence within the project area is highly sporadic. In the past, very few reports of whooping cranes document their limited presence in the project area and vicinity in South Dakota during migrations. Because their occurrence within the project area is unlikely in the foreseeable future, impacts due to any of the alternatives are unlikely.

Interior Least Tern. The decline of interior least terns throughout their breeding range in the Mississippi and Missouri river basins has been related to construction of dams and reservoirs that alter water flows making nesting habitat unavailable; river channelization that alters river hydraulics that likewise adversely affect nesting sites on nonvegetated islands and sandbars; and human recreational use of those sites during the breeding period [5] (Erwin, 1983).

Interior least terns are known to nest along the Cheyenne River, upstream from its embayment at Oahe Reservoir to the middle reaches in Pennington County. Their occurrence farther upstream where the alternatives are routed parallel to the river has been observed. Mud, sand and gravel bars in the Cheyenne River have been

[5] Federal Register, May 28, 1985, 50(102):21874-21792.

Table 4-10
Summary of Primary and Secondary Impacts to Wildlife

Impact Type	Species-Group-Habitat	Documented or Inferred Effects	Circumstances - Location	Sources
Primary Impacts				
wildlife-train and wildlife-vehicle collisions	mule deer	mortality increases in confined areas with limited escape from trains; mortality on highways increases with traffic volume and winter severity; construction of new highways through deer travel lanes leads to substantial mortality	deer migration to and from winter range in SW Wyoming; NE Utah	Reeve, 1990; Romin & Bissonette, 1996
		summary of deer mortality on highways; collisions increase with traffic and vehicle speed	highways nation-wide; western US	Arnold, 1978; Reed, 1981; Reeve, 1986
	wildlife in habitats adjacent to roads	mortality of nocturnal, slow moving mammals, birds found in right-of-way vegetation, reptiles and amphibians in habitats adjacent to highways	highways nation-wide; Texas	Leedy, 1978; Case, 1978; Wilkins & Schmidly, 1980; Adams & Geis, 1984
wildlife mortality during construction	burrowing animals and wildlife using burrows	inferred from studies showing numerous vertebrate species use burrows made by burrowing mammals	prairie dog colonies, western US	Chase *et al*, 1982; Clark *et al*, 1982
	ground nesting birds, sage/sharp-tailed grouse, mountain plover	inferred from vulnerability to trampling of birds nesting on beaches and crushed nests from ORV use in deserts	beaches on New Jersey coast; deserts in California	Burger, 1995; Luckenbach, 1978
mortality from toxic compounds	waterfowl, muskrats	inferred from increased metabolic rates due to increased thermal conductivity of oiled fur or feathers	laboratory studies	McEwan & Koelink, 1973; McEwan *et al.*, 1974
	waterfowl eggs, adult waterfowl, domestic livestock	petroleum intoxication is fatal to waterfowl, cattle and presumably wild ruminants; petroleum coating waterfowl eggs is toxic to embryos	field and laboratory studies	Hartung & Hunt, 1966; Leepen, 1976; Edwards *et al.*, 1979; Peterle, 1991
	aquatic insects, fish	diesel fuels and lube oils are much more toxic to aquatic organisms than more volatile gasoline and jet fuel or heavier crude oil	nationwide and laboratory studies	Markarian *et al*, 1994
bioaccumulation of toxic metals in rock/soils	least terns, piping plovers	selenium concentrations in least tern and piping plover eggs was above background levels at nest sites and potentially accumulated from selenium in shales along Missouri River; embryo toxicity inferred from other species	Missouri River, South Dakota	Ohlendorf *et al.*, 1986; Ruelle, 1993
degradation of aquatic habitats	aquatic insects, fish, amphibians	inferred from studies showing accumulation of organic materials in water leads to decay, oxygen depletion; erosion increases sediments that reduce light penetration and photosynthesis by aquatic plants; sediments fill substrate interstices, detrimental to macroinvertebrates, spawning habitat and egg survival	aquatic habitats in western US	Burns, 1972; Megahan & Kidd, 1972; Ringler & Hall, 1975; Patton, 1973; Reid & Dunne, 1984; Bilby *et al.*, 1989; Eaglin & Hubert, 1993; Reid, 1993; Brown, 1994
fragmentation of habitats	breeding passerine birds	habitat occupancy by obligate shrub-steppe bird species declines with reduced shrub (sagebrush) cover and reduced shrub patch size	sagebrush steppe in western US, southern Idaho	Braun *et al*, 1976; Knick & Rotenberry, 1995
fragmentation of habitats	small mammals	roads act as filters or barriers to animal movements by dividing habitats, especially wide roads with high speeds, high traffic volume	highways worldwide	Bennett, 1991; Forman & Alexander, 1998

Table 4-10
Continued

Impact Type	Species-Group-Habitat	Documented or Inferred Effects	Circumstances - Location	Sources
impedance of migration	elk, deer, moose	berms and large diameter pipelines on ground or set on blocks are visual and physical barrier to movements	oil and gas developments in Alberta	Morgantini, 1985
	pronghorn	4-strand and net-wire fencing associated with railroad or highway rights-of-way can prohibit pronghorns from reaching winter range and lead to significant winter mortality	Interstate 80, southcentral Wyoming	Buechner, 1947; Sundstrom & Hepworth, 1967; ZoBell, 1968; Riddle & Oakley, 1973; Bruns, 1977; Yoakum, 1978
	small mammals, reptiles, amphibians	railroads and highways can be barriers to crossing by small terrestrial vertebrates; animals will utilize culverts to cross railroads and highways	Europe	Yanes *et al.*, 1995
increased nest predation with carrion and garbage concent-rated along tracks as travel corridors	ground nesting birds, sage/sharp-tailed grouse, piping/mountain plover, interior least tern	inferred from potential for wildlife-train collisions, attraction to carrion by predators (coyotes), and relatively high risk of nest predation to ground nesting birds. Predators attracted to garbage are likely to predate nesting birds, and predators use roads, probably railroads to travel	western Wyoming, Colorado, Massachusetts, Washington	Reeve, 1990; Hein & Andelt, 1996; Yahner & Mahan, 1997; Danielson *et al.* , 1997; Baker *et al.*, 1999
loss of forage	herbivores	once removed, shrub-dominated vegetation may take decades to revegetate; shrub species do no readily regenerate from seed in topsoil	sagebrush steppe in intermountain west	Beauchamp *et al.*, 1975; West, 1988
diminished use of habitats - interruption of life history functions	mule deer	areas within 0.125 mile of roads tend to be avoided; mule deer density was less (not significantly) within 0.6-mile radius of oil and gas well drilling; mule deer mostly vacated a 0.5-mile area around well recompletion activities during winter; migratory mule deer avoid human disturbances more than resident deer	front range of Colorado; oil fields in central and western Wyoming; southern California	Rost & Baily, 1979; Easterly *et al*, 1991; Reeve, 1996; Nicholson *et al*, 1997
	pronghorn	effects of roads inferred from study showing pronghorn does with fawns escape from vehicles more than other groups; pronghorn density was lower within 0.6 mile of well drilling than beyond that distance	construction in southcentral Wyoming; oil field in central Wyoming	Reeve, 1984; Easterly *et al.*, 1991
	elk	hunted elk avoid roads; unhunted elk are more sensitive to people on foot than vehicles; elk tend to avoid forest roads and highways from 0.12 to 0.25 miles, elk cows are especially sensitive during calving; in sagebrush elk escape from humans 0.6 mile away; elk escape up to 2 miles from visible seismic operations in sagebrush and more than 1 mile from pedestrians	forests in Montana, Wyoming, Washington; sagebrush-steppe in Wyoming	Markum, 1976; Ward, 1976; Schultz & Bailey, 1978; Ward & Cupal, 1979; Witmer & deCalesta, 1985; Ryder & Petch, 1988
	sage grouse, sharp-tailed grouse	inferred from observations and studies emphasizing importance of sound and auditory stimuli produced by males to attract females: noise pollution could diminish lek attendance and reproduction	coal mines in Montana, behavioral studies in intermountain west	Eng *et al.*, 1979; Vehrencamp & Bradbury, 1989; Gibson & Bradbury, 1985; Gibson, 1989, 1992, 1996; Gratson, 1993

Table 4-10
Concluded

Impact Type	Species-Group-Habitat	Documented or Inferred Effects	Circumstances - Location	Sources
diminished use of habitats - interruption of life history functions	nesting and wintering raptors	disturbance during nesting may cause nest abandonment, egg and/or chick mortality. Some species (red-tailed hawk, golden eagles, prairie falcons) are more tolerant than others (ferruginous hawks, bald eagles). Wintering rough-legged are more sensitive to vehicles within 550 feet of perch than wintering golden eagles	studies of effects of various impact sources throughout western US	Fyfe & Olendorff, 1976; GYE Bald Eagle Working Team, 1983; White & Thurow, 1985; Grier & Fyfe, 1987; Andersen *et al.*, 1990; Holthuijzen *et al.*, 1990; Holmes *et al.*, 1993
	breeding passerines	documented in studies showing effects of well-traveled highways on diminished breeding bird density; inferred from dust-shadow associated with dirt roads reduced densities of ground nesting birds	highways in the Netherlands; oil pipeline studies in Alaska	Hanley *et al.*, 1980; van der Zande *et al.*, 1980; Forman and Alexander, 1998
	amphibians	traffic intensity on roads influence local frog density and traffic-related mortality	roads near Ottawa, Canada; Europe	Fahrig *et al.*, 1995; Forman & Alexander, 1998
Secondary Impacts				
increased recreational use	various wildlife species	extensive reviews indicate a wide variety of human recreational activities impact wildlife causing death, displacement, habitat modification, and pollution	summaries of studies done nationwide	Knight & Gutzwiller, 1995
	piping plover, least tern	recreational use (camping, picnicking, swimming, sunbathing, fishing) at least tern and piping plover nesting areas adversely affected productivity	Missouri River, South Dakota and North Dakota	Carreker, 1985; Kruse *et al.*, 1993; Mayer, 1993
recreational ORV use	various wildlife species	off-road vehicles in desert ecosystems reduce numbers of breeding birds, small mammals and reptiles	deserts in southwest US	Carter, 1974; Luckenbach, 1978; Bury, 1980
encroachment in winter range by subdivisions	big game	development of residential areas, resorts, campgrounds, summer and winter homes degrade lower elevation big game winter ranges	big game winter ranges in intermountain west	Mower & Smith, 1989; Henderson & O'Herren, 1992
domestic dogs and cats	various wildlife species	domestic dogs and cats directly kill wildlife ranging from rodents to big game; wildlife alarm responses to dogs may be greater than native predators	nationwide	Hamerstrom *et al.*, 1965; George, 1974; Lowry & McArthur, 1978; Bangs *et al.*, 1982
poaching	big game, furbearers	poaching big game and furbearers appears to increase concurrent with industrialization, influx of people	oil pipeline in Alaska; phosphate mines in SE Idaho	Klein, 1979; Kuck, 1986

mapped from 1:2,400 scale aerial photographs in the area where the river is adjacent to Alternatives B and C. The suitability of those sites for nesting by interior least terns is possible, but only during years of low water flows during late May, June and July that limit inundation of nesting islands and river bars prior to and during the nesting period.

Other factors determining potential site suitability include the amount of vegetation cover established on bars and islands, local abundance of food fish (fish less than 4 inches long) and concentration of predators (Carreker, 1985). Minimum habitat areas required for nesting sites are unknown but small colonies of interior least terns have nested on a 0.22-acre island and 0.45-acre sandbar (Carreker, 1985) - larger than most but not all sites in the project area.

Nesting least terns appear tolerant of vehicular traffic, whether on highways or trains, but abandon nests and colonies if directly disturbed by pedestrians, off-road vehicles, pets and livestock (Carreker, 1985), and recreational use such as camping, picnicking, swimming, sunbathing, and fishing (Kruse *et al.*, 1993; Mayer, 1993). Mammalian and avian predators, including coyotes, skunks, foxes, raptors, crows and gulls, prey on eggs and chicks (Carreker, 1985; Kruse *et al.*, 1993). Carrion is expected along the operational railroad and, if allowed to persist, could attract predators (Hein and Andelt, 1996). Local concentrations of predators are likely to impact ground nesting birds (Baker *et al.*, 1999), including interior least terns.

Bioaccumulation of contaminants, particularly of selenium derived from seleniferous soils and shales along the Missouri River, may be sufficient to cause embryo death or deformities of least terns (Ruelle, 1993). Selenium concentrations in subbituminous coal from the Powder River Basin (0.73 ppm in coal) are far below concentrations found in bituminous coals of the midwest and Appalachian basins (range of 2.5 to 5.7 ppm; Ensminger, 1977). Thus, elevated selenium levels due to coal dust contamination of water or soils is unlikely. However, if present in similar concentrations to those found in marine shales along the Missouri River (4.79-13.60 mg/kg dry weight; Ruelle, 1993), increased selenium loads in the Cheyenne River could occur following erosion and runoff from construction sites.

Other environmentally hazardous trace elements found in coals from the Powder River Basin include antimony (0.67 ppm in coal), arsenic (3 ppm), beryllium (0.7 ppm), cadmium (2.1 ppm), mercury (0.1 ppm), lead (7.2 ppm), and zinc (33 ppm), all in concentrations lower than coals of the midwest and Appalachian basins (Ensminger, 1977). Arsenic may become biologically concentrated in aquatic food chains. Cadmium, mercury, and zinc can be adsorbed through the digestive and respiratory tracts of invertebrates and vertebrates. Exposure to cadmium may lead to direct toxicity or may bioaccumulate in such organisms as aquatic molluscs while mercury, depending on its form in chemical compounds, can accumulate in aquatic invertebrates and fish. Zinc can accumulate in aquatic organisms and produce chronic and acute toxicity. Bioaccumulation of lead can progress from herbivores to carnivores as well as adsorption through body surfaces of fish and aquatic invertebrates (Wilkes, 1977). Whether any of these hazardous trace elements would bioaccumulate to toxic levels from fugitive coal dust is unknown but, given the low concentrations in Powder River Basin coal, such effects appear highly unlikely.

Construction adjacent to the Cheyenne River may require bank armoring (such as riprap or more substantial structures) to stabilize the riverbank. If that was necessary, changes in river flow dynamics would be expected thus altering existing deposition and erosion regimes that created local mud, sand, or gravel bars (Reid, 1993) that might serve as suitable nesting habitats.

Traditionally, wood treated with creosote used to inhibit wood-destroying fungi, has been the principal material for rail ties and bridge construction where small drainages were crossed. Coal tar creosote is heavier than water and practically insoluble (Budavari *et al.*, 1989). However, phenols, which may be components of creosote, are highly toxic by ingestion, inhalation or skin adsorption (Talmage, 1977) as are cresols and creosote components (Fraser *et al.*, 1991) and which are soluble in water (Budavari *et al.*, 1989).

Pallid Sturgeon. Construction of dams on the Missouri River with elimination of riverine habitats, alteration of water flows and blockage of spawning migration is believed to be the chief cause of decline of the pallid sturgeon (Dryer and Sandvol, 1993). Spawning habitats are unknown, but may be similar to those used by other sturgeons (Kallemeyn, 1983): spawning occurs in unchannelized main channels with relatively swift flow over substrates of rock, rubble or gravel. Hydroelectric dams have caused reduced flows during April to July which coincides with pallid sturgeon spawning. Higher flows appear to be necessary to stimulate sturgeon spawning migrations (Dryer and Sandvol, 1993).

The alternatives will not likely contribute to further degradation of riverine habitats inhabited by pallid sturgeons. Sturgeons are adapted to turbid waters, possibly depending on turbidity as cover from predators and feeding on fish species likewise adapted to turbid water. Consequently, sedimentation in the Cheyenne River due to construction and operation of the railroad is not likely to pose a hazard to pallid sturgeon in Lake Oahe or at the Cheyenne River confluence. Contamination of eggs by selenium, mercury, and cadmium could

occur if soils disturbed during construction contained high amounts of these trace elements.

Pallid sturgeons downstream from the project area could be adversely affected if petroleum products were accidently discharged into aquatic environments. Such materia ls are toxic to algae, invertebrates, and fish. Of the products likely to be present during railroad construction and operation, data compiled from a wide range of sources indicate that diesel fuels and lube oils are considerably more toxic to aquatic organisms than other, more volatile products (gasoline) or heavier crude oil (Markarian *et al.*, 1994). However, crude oils and heavier asphalt residues will persist in aquatic environments longer than lube oils, fuel oil and gasoline but their bioavailability diminishes over time, mostly due to physical aggregation, precipitation, or emulsification (Markarian *et al.*, 1994). Impacts of such residuals to aquatic habitats that primarily affect aquatic substrates (hence, sturgeon food sources), can remain for much longer periods (Markarian *et al.*, 1994).

Topeka Shiner. Although Topeka shiners were collected in the Cheyenne River embayment in the 1960's, none have been reported in collections made since then and their occurrence in the project area is unlikely. If they did occur, increased sedimentation during construction could adversely affect water and substrate quality: Topeka shiners inhabit cool, low order prairie streams with good water quality and mostly with silt-free substrates of gravel, cobble, and sand[6]. Sedimentation of inhabited streams would adversely affect Topeka shiners. Accidental release of petroleum products, discussed above, would also adversely affect Topeka shiners but, until they are documented inhabiting aquatic habitats that would be potentially affected by the new railroad, there is no reason to anticipate that the species would be impacted by these or other sources.

American Burying Beetle. Reasons for decline of American burying beetles are not clear. Loss of climax forests with deep litter, humus and soils has been postulated (Anderson, 1982) but the species has been found in areas never covered with forests such as the Nebraska Sandhills (Ratcliffe and Jameson, 1992) and grasslands in southern South Dakota (Backlund and Marrone, 1997). Other hypotheses include wide-spread use of ultra-violet light attractants with electronic bug-zappers, introduction of exotic species-specific disease and use of DDT for mosquito control[7].

There is no indication that the species presently or has historically occurred along the proposed new railroad alternatives and the extent of potential habitats that would be affected are unknown: while they may depend on suitable soils and/or litter for burying vertebrate carcasses, the presence of carcasses of up to 7 ounces (mouse-size mammals and sparrow-size birds) appear to be at least as critical to their presence in an area (Holloway and Schnell, 1997). Mammalian and avian species within similar size categories are likely to occur along all the alternatives. While wildlife mortality is expected due to collision with trains, deaths of mice and passerine birds is not expected to be substantial and are not likely to be attractants to American burying beetles once the railroad is operational. More likely are impacts due to construction, but only if beetles are present at construction sites. Maintenance of vegetation by mowing or herbicide application and the possibility of localized brush or grass fires from trains once the railroad becomes operational could impact burying beetles if they actually occur.

Impact projections are impossible because of inadequate information about the beetles' distribution in the project area and vicinity of each alternative. However, estimates of potential habitats affected can be made, based on general soils types where suitable soils are assumed to include sandy soils (those with high wind erosion potential) and prime farmland soils (those with relatively well developed top soils). These soils would be crossed by all of the alternatives in South Dakota. Potential for alternatives to impact American burying beetles was considered if proposed routes would pass through these two soil types where they coincide with riparian, grasslands, and/or deciduous woodlands. Recent collections of the species in South Dakota were made in these habitats (Backlund and Marrone, 1997).

Piping Plover. As discussed for interior least terns, decline of piping plovers in the Missouri River basin has been related to construction of dams and reservoirs that alter water flows making nesting habitat unavailable, river channelization that alters river hydraulics that likewise adversely affect nesting sites on nonvegetated islands and sandbars, and human recreational use of those sites during the breeding period[8] (Dinsmore, 1983a; Kruse, *et al.,* 1993.). Similar problems exist on the Cheyenne River where water releases from Angostura Reservoir can often flood potential nesting habitats downstream. Bioaccumulation of selenium in piping plover eggs from the Missouri River in South Dakota is higher (range 4.9-13.0 mg/kg dry weight) than in least tern eggs (range 2.9 to 11.1 mg/kg dry weight; Ruelle, 1993). Piping plover nests are similarly vulnerable to predation by crows, fox, opossum, Norway rat and gulls (Dinsmore, 1983a).

The state of knowledge about the local occurrence of piping plovers and risks they may face during project construction and operation is the same as that discussed for interior least terns, above. They may not, though, be

[6] Federal Register, December 15, 1988, 63(240):69008-69021.

[7] Federal Register, July 13, 1989, 54(133):29652-29655.

[8] Federal Register, December 11, 1985, 50(238):50726-50734

as tolerant of vehicular traffic as terns (Dinsmore, 1983a) but most reports of plovers vacating nests have focused on humans approaching nests on foot rather than noise levels and vehicular frequencies associated railroads or highways. Only one observation of a piping plover within the vicinity of the alternatives has been recorded and they appear less likely to be present along the middle and upper reaches of the Cheyenne River than interior least terns. Further, available data suggests water flows in the Cheyenne River during May and June of most years are likely to inundate and/or scour islands and river bars, thus making them unsuitable as nest sites.

Bald Eagle. Bald eagles have been documented wintering within the project area and 4 unsuccessful nesting attempts have been observed in Wyoming on TBNG. Sources of direct mortality of bald eagles include intentional or accidental shooting (USFWS, 1986) and collisions of eagles with vehicles. Since wintering bald eagles in some areas feed on big game carrion, they sometimes suffer direct mortalities when struck by vehicles while feeding at roadsides. It is unlikely that slow moving construction vehicles would inadvertently kill eagles feeding on carcasses but personnel vehicles driven to and from construction sites could kill eagles feeding on road killed carrion. Trains, too, kill bald eagles that have gorged themselves feeding on deer carcasses. Such mortalities have been recorded elsewhere in Wyoming where bald eagles feed on big game carcasses along highways and railroads (B. Rudd, 1999. WGFD, personal communication with PIC Technologies, Inc.; A. Reeve, PIC Technologies, Inc., unpublished data). In the project area, such bald eagle mortalities would be most likely where the alternatives pass through big game winter ranges, areas were elk, white-tailed deer, mule deer and/or pronghorn are expected to congregate.

Studies on the effects of human activities on bald eagles have focused on toxicity of environmental contaminants, habitat losses and alterations, and behavioral responses by eagles to disturbances. Since bald eagles tend to avoid human activities during all times of year, construction activities can temporarily displace eagles during their migration, wintering, and nesting periods. However, disturbances to eagles when they are migrating will probably not displace them from habitats that are key to their survival since other equally suitable habitats are available.

During winter, bald eagles perch near food sources (Stalmaster and Newman, 1979; DellaSala *et al.*, 1989) and displacement from perches may cause them to occupy less optimal foraging habitats and increase their energy expenditures due to flight (Stalmaster and Gessaman, 1984). The USFWS (1986) has recommended that key bald eagle habitats be protected from disturbances from November 15 to March 15 with a 0.25-mile buffer zones around nests, nocturnal roosts, and shorelines of feeding waters. Buffer zones of 0.50-mile (2,640 feet) at nest and roost sites were recommended to regulate activities if eagles at those sites had line-of-sight views of the activities (USFWS, 1986). Currently, the Forest Service requires spatial buffers of 1 mile around winter roosts from November 1 through April 1.

Bald eagle nesting territories in the Greater Yellowstone Ecosystem (GYE) and elsewhere have been abandoned as a result of human activities (GYE Bald Eagle Working Team, 1983). One study indicated that nesting bald eagles flushed from nests when approaching humans were an average of 1,500 feet (range of 187 feet to 3,250 feet) from the nest (Fraser *et al.*, 1979 cited in GYE Bald Eagle Working Team, 1983). On NFS lands, zones excluding surface disturbances or occupancy within 0.5-mile of bald eagle nests and exclusion of any construction activities within 1 mile of nests during the nesting period, February 1 through July 31, will probably provide sufficient protection for nesting eagles. Annual monitoring of potential nesting habitats for establishment of nest site(s) will be necessary before such measures can be implemented.

Ute Ladies'-tresses. This plant species has been subject to habitat losses and alterations[9] through stream and wetland modifications, land-use changes to agriculture and domestic livestock grazing, urbanization, water project diversions to agriculture and urban use, human recreational use leading to trampling and introduction of exotic weeds that compete for resources (USFWS, 1995). There are known populations of Ute Ladies'-tresses south of the project area, one straddles Niobrara County, Wyoming and Sioux County, Nebraska and the other is in extreme southeastern Goshen County, Wyoming. Both populations occur on private land in wetlands that are subject to moderate-heavy livestock grazing and/or mowed as native hay meadows (Hazlett, 1996; Fertig, 1998).

Limited examination of 21 potential sites within the project area indicated there are at least 4 locations where the species could occur along the proposed alternatives in Wyoming and South Dakota (Kass, 1998). Direct impacts to this species, as well as other plant species of concern (see Table 3-86), would be most likely during construction if machinery and surface disturbances obliterated local populations. Too, impacts to this species could occur if the railroad track bed altered local conditions that contribute to wetland hydrology.

Canada Lynx. No impacts to lynx are anticipated due to any of the new railroad alternatives since their occurrence within the project area is highly unpredictable and unlikely.

[9] Federal Register, January 17, 1992, 57(12):2048-2053.

Proposed, Candidate and Petitioned Wildlife Species

Mountain Plover. Mountain plovers occur along the proposed alternative routes in Wyoming. Conversion of rangeland and prairies to agriculture, mortality incurred during agricultural practices and operations in cultivated fields, and practices designed to emphasize grazing by domestic livestock over maintaining presence of other organisms (introduction of exotic plant species, eradication of burrowing mammals) on which mountain plovers are somewhat dependent during the nesting period have been cited as factors contributing to their decline[10].

Since mountain plovers nest on the ground, adult birds, young and eggs are susceptible to mortality by vehicles and construction equipment, especially along 2-track roads and undeveloped areas within the project area. They are also vulnerable to predation by a variety of mammals, raptors and loggerhead shrikes (Dinsmore, 1983b). Presence of carrion along the railroad, once it is operational, is likely to attract predators to the vicinity. For the same reasons discussed under interior least terns, concentrations of predators could devastate local productivity of ground nesting birds, including mountain plovers.

Sturgeon Chub. Sturgeon chubs inhabit the Cheyenne River in South Dakota. In the Missouri River, creation of reservoirs and stream channelization altered water temperature, flow regimes and reduced turbidity (USFWS, 1993b) to which sturgeon chubs are adapted[11] (Hesse, 1994). Even though turbidity is a habitat component, these chubs appear to prefer gravel bottoms and consequently are found where high velocity flows keep fine sediments from accumulating (Hesse, 1994). Thus, they may be susceptible to increased sedimentation of the Cheyenne River if that occurred during and following construction of the proposed project. Further, changes in stream flow due to bank stabilization structures could impact downstream habitats as could accidental release of petroleum products (see discussion under pallid sturgeon, above).

Water depletions from the Cheyenne River could impact the species during construction. Sturgeon chubs probably spawn in late spring to midsummer (Lee *et al.,* 1980) and may depend on swift currents to allow eggs and larva to be carried downstream (USFWS, 1993b). Since flows in the Cheyenne River are highly variable, dependent in part on water released from Angostura Reservoir, water withdrawals for project construction could locally exacerbate existing limiting flow regimes.

Sicklefin Chub. Declines of this species appears to be related to diminished turbidity and flows in large rivers, principally the Missouri River, where series of dams have substantially altered the species' habitat (Hesse, 1994). Although sicklefin chubs were collected in the Missouri River in the 1950's downstream from the new railroad alternatives, they are believed extirpated there now (USFWS, 1999c). Because their occurrence within the project area is doubtful in the foreseeable future, impacts due to any of the alternatives are unlikely.

Swift Fox. Swift fox are probably found using all upland habitats in the vicinity of the proposed project in Wyoming and South Dakota. Removal of vegetation from the project area may reduce prey species and potential swift fox habitat. This species is occasionally killed by vehicular traffic which has been estimated as contributing 5 percent of annual swift fox mortality in one study, but most swift fox mortality is from coyotes (Rongstad *et al.*, 1989). Like other fox species, swift foxes will consume carrion (Samuel and Nelson, 1994; Uresk and Sharps, 1986; Scott-Brown *et al.*, 1987) and so are vulnerable to being struck by trains if they feed on carcasses along the railroad. But, they will not approach carrion that are being utilized by coyotes (Rongstad *et al.*, 1989).

Black-tailed Prairie Dog. The distribution of these colonial rodents has diminished as land has been converted to agriculture and by urbanization (Knowles, 1995; Wuerthner, 1997). Indiscriminate shooting (Vosburgh and Irby, 1998) and intentional poisoning (Roemer and Forrest, 1996) have impacted colonies on a local scale. Exotic disease epizootic episodes have eliminated black-tailed prairie dogs from larger areas (Mulhern and Knowles, 1995). Though not specifically documented, they are killed on highways by vehicles and may be killed by trains since black-tailed prairie dogs use roads for dispersal (Knowles, 1985; Reading and Matchett, 1997). However, the principal impact by the alternatives is expected to occur during ground clearing and construction of the rail bed. Whether the presence of an operating railroad would inhibit their movements from one side to another is unknown.

Since the USFWS received a petition to list the black-tailed prairie dog under the ESA, the Acting Deputy Chief, National Forest System instructed (May 27, 1999) the Regional Forester of Region 2 to cease poisoning prairie dogs on NFS lands while the USFWS conducts a status review. Two situations warranted exceptions: where poisoning is the only alternative to reduce risks of plague to humans and where plague-infested colonies are proximate to plague-free black-footed ferret reintroduction sites. Plague has been a major factor in the decline of prairie dogs and the only plague-free state remaining in the species' historic range is South Dakota.

[10] Federal Register, February 16, 1999, 64(30):7587-7601.

[11] Federal Register, January 18, 1995, 60(11):3613-3615.

Other Species with Special Status. Species with some form of special status other than those Federally listed threatened, endangered, proposed and candidate species and which could occur in the vicinity of the project alternatives are listed in Table 3-86, in the preceding chapter. Some are aquatic species (fish, amphibians), many are wetland-dependent but others could be or have been found in the various upland habitats present on the project area. Impacts anticipated for other wildlife and aquatic resources and summarized in Table 4-10 could apply to species with special status. For species most likely to occur on the project area, specific impact descriptions follow:

Burrowing owls have been documented nesting in the project area vicinity where they are probably found in low vegetation (low density sagebrush and desert shrub). Since they nest in burrows dug by mammals (prairie dogs and badgers), burrowing owls are susceptible to mortality by vehicles and excavation machinery. They appear to tolerate many types of human activities including vehicular traffic and construction noise (Marks and Ball, 1983) but it is assumed that disturbances near nest sites during the nesting period will influence nesting success. Burrowing owls have suffered from indiscriminate shooting where prairie dogs and ground squirrels are used for target practice (Marks and Ball, 1983).

Long-billed curlews and loggerhead shrikes could be impacted if nests, eggs, or birds are destroyed by vehicles or foot traffic. Construction activities in dense sagebrush, conifer-sagebrush and greasewood vegetation could adversely impact nests and nesting activities of loggerhead shrikes while activities in low vegetation (dry playas, low density sagebrush, saltbush) could impact nests of long-billed curlews.

Along with surface disturbances associated with all the alternatives, increased use of existing roads by project-related vehicles and ORV use by the public could eventually lead to secondary impacts (mortality and habitat loss) to black-tailed prairie dogs, eastern spotted skunks, river otters and eastern short-horned lizards. Changes in water flows on the Cheyenne River and/or reduced water quality could have adverse effects on resident spiny softshell turtles.

American bitterns, great blue heron, black terns, and many other bird species of concern so classified by the USFWS, Forest Service, WGFD and SDGFP would be expected to occur in wetlands, waterbodies and riparian cottonwood habitats in the project area. Compliance with Federal regulations (i.e., Section 404 of the Clean Water) would insure that any loss of these habitats would be replaced and thus minimize impacts to these species. However, many other sensitive bird species such as Baird's sparrow, Brewer's sparrow, loggerhead shrike, lark bunting, and chestnut-collared longspur inhabit upland shrublands and grasslands which have no specific protection. These species are susceptible to removal of nesting habitats, habitat degradation due to train traffic and noise during operations, and potential increased nest predation if predators are attracted to carrion along the tracks.

Plants. Except for Ute ladies'-tresses discussed above, there are no other Federally-listed threatened or endangered plant species that would be affected by any alternatives in Wyoming and western South Dakota. Nineteen plant species of concern (so classified by the Forest Service and/or BLM) potentially occur within the project area (see Table 3-86). Coordination with the Forest Service, BLM and botanical experts will be necessary to determine whether surveys for these species are warranted prior to implementation of the alternatives. Without the benefit of such surveys it is impossible to accurately estimate potential impacts to these species.

4.17.3 Alternative A (No Action). Implementation of the No Action Alternative would eliminate potential project-related impacts to threatened, endangered, proposed, and candidate wildlife and plant species and species with special status that have been described, above.

4.17.4 Alternative B (Proposed Action). Short-term impacts due to construction of Alternative B to Federally-listed threatened or endangered species, species proposed for listing, candidate species, species petitioned for listing, and species with special status include direct mortality by field vehicles and construction machinery, avoidance of habitats that are utilized near construction sites and/or temporary habitat loss, and potential short-term degradation of habitats, especially aquatic habitats at sites where sediment discharge and accidental release of toxic substances occurs as well as habitats downstream. With a few exceptions, specific locations of habitats that are occupied by these species are not defined.

Active prairie dog colonies may be suitable habitat or provide important habitat components for listed, proposed and candidate species including black-footed ferrets, bald eagles, mountain plovers and swift fox. Alternative B would cross 4.9 miles of the proposed black-footed ferret reintroduction site - the Rosecrans Area - on TBNG. Construction and long-term operational impacts to this area would likely make the area unsuitable for reintroduction of the species.

Other species with special status that are known to occur in the project area and which are included in Table 3-86 also are associated with black-tailed prairie dog colonies during some time within the annual cycle. Included are the following mammals: shrews, various

vespertilionid bat species, and eastern spotted skunk (Clark *et al.*, 1982; Sharps and Uresk, 1990). Numerous bird species are also associated with prairie dog colonies and include ferruginous hawk, upland sandpiper, long-billed curlew, burrowing owl, Brewer's sparrow, lark bunting, grasshopper sparrow, chestnut-collared longspur and bobolink (Clark *et al.*, 1982; Agnew *et al.*, 1986; Sharps and Uresk, 1990). Some amphibians and reptiles included in Table 3-86 also occur on prairie dog colonies (tiger salamander, eastern short-horned lizard).

Several sources have contributed locations of black-tailed prairie dog colonies in the project area and vicinity of Alternative B. Mapped prairie dog colonies intersected by Alternative B are not as complete as for Alternative C since, except for those sections that coincide with or closely parallel Alternative C, no recent low-level aerial photo-graphy exists along Alternative B. Therefore, most of the colonies included in Table 3-85 were obtained from TBNG, BGNG, and WGFD data sets. Table 3-85 provides estimates of short-term and long-term disturbances within prairie dog colonies due to Alternative B: at least 11.6 miles of Alternative B would pass through prairie dog colonies in South Dakota and Wyoming compared to at least 17.5 miles of Alternative C (including the Phiney Flat and W G Flat Route Variations) and 6.2 miles of Alternative D. Beyond these comparisons, levels of short-term impacts to any of the terrestrial vertebrate species likely to occur in black-tailed prairie dog colonies can not be estimated.

Construction of Alternative B during winter within TBNG and along the Cheyenne River in South Dakota and its major tributaries in Wyoming (Black Thunder Creek, Little Thunder Creek and Antelope Creek) is likely to displace wintering bald eagles from perches and feeding areas or make those sites temporarily unsuitable within at least a 0.5-mile zone and perhaps up to 1 mile surrounding construction activities. Estimates of potential bald eagle wintering habitats within 0.5- and 1-mile zones of the Cheyenne River and major tributaries that could be affected by Alternative B are provided in Table 4-11.

Alternative B passes within 0.5-mile of potential bald eagle wintering habitat for approximately 85 miles in the affected counties (see Table 4-11). Nearly 129 miles of Alternative B is within 1 mile of potential wintering habitat. Most of the same areas where there are trees in riparian cottonwood zones are also potential bald eagle nesting habitats. Disturbances to wintering bald eagles could thus occur along 85 to 129 miles of Alternative B during the short-term (construction) as well as the long-term (operation). The Forest Service and BLM both have policies to protect bald eagle winter roosts from November 1 to April 1 and bald eagle nests from February 1 to July 31 by imposing a 1-mile buffer around nests and roosts, within which no surface disturbance would be allowed in those periods.

Construction of Alternative B during spring and early summer along the Cheyenne River corridor, primarily in Pennington County, could displace interior least terns if they select sand bars or islands within the river to nest. The actual amount of nesting habitat available will change from year to year since water flows in the Cheyenne River some years would inundate or scour sand bars and islands, making them unsuitable for nesting. If that was the case during construction, there would be no short-term impacts to interior least terns In years with low water flows, construction activities prior to nesting may cause terns to avoid the area, if they are present. But, since least terns appear to tolerate distant noise associated with highways and railroads, they may nest anyway.

Though not documented in the vicinity of Alternative B in South Dakota, American burying beetles could occur in suitable soils that include those with high sand content (soils with high wind erosion potential) and those with relatively well developed topsoil (soils with the best combination of physical characteristics for producing a sustained high yield of crops with adequate moisture). Soils in both groups would be crossed by Alternative B. Given the recent collections of American burying beetles in southern South Dakota in riparian areas, grasslands, and grasslands with interspersed stands of cottonwoods (Backlund and Marrone, 1997), Alternative B could affect similar potentially suitable habitats along the route in South Dakota. Over 3 miles of forested (cottonwood riparian) wetlands and 113 miles of herbaceous rangeland (grasslands) would be affected. Also, the route would pass through 20.5 miles of cropland and pasture that could also serve as suitable habitats.

The amount of disturbances by Alternative B in these suitable soil types where they occur in grasslands and other potential habitat for the species, are provided in Table 4-12. Surface disturbances to these soils during construction would probably contribute short- and long-term impacts to burying beetles if they actually occur. There are approximately 32 miles in South Dakota where Alternative B would pass through soils and habitats that might be used by American burying beetles for burying carrion and reproduction. The majority of those soils, 25 miles, are potentially prime farmland soils but it is unknown whether all or some are irrigated and/or cultivated. It is assumed that either farming treatment would make a site unsuitable for American burying beetles. If those prime farmland soils are taken out of production by Alternative B, they would probably be more suitable for use by the beetles, if they occur and if appropriate sized carrion is available. But without verification that the species actually occurs, short-term

Table 4-11 Miles of Alternative B Within 0.5 and 1 Mile of the Cheyenne River, Black Thunder Creek, Little Thunder Creek and Antelope Creek That Are Potential Bald Eagle Wintering Habitats		
County, State (ordered west to east)	**Miles Within 0.5 Mile of Potential Habitat**	**Miles Within 1 Mile of Potential Habitat**
Campbell, WY	8.7	13.2
Converse, WY	6.5	8.1
Weston, WY	14.2	24.8
Niobrara, WY	4.3	7.1
Fall River, SD	17.3	28.3
Custer, SD	21.6	24.3
Pennington, SD	12.4	23.0
Alternative B Total	85.0	128.8

Table 4-12 Number of Miles Where Alternative B Intersects Suitable Soils and Habitats Potentially Inhabited by American Burying Beetles in South Dakota						
South Dakota County (ordered west to east)	**Suitable Soil Type**	**Distance (miles) Crossed in Potential Habitats per Suitable Soil Type**				
		Cropland, Pasture	**Herbaceous Rangeland**	**Forested Wetland**	**Deciduous Forest**	**County Total**
Fall River	Sandy, Erosive	0.5	5.0	0.3	0	5.8
	Prime Farmland	7.8	10.5	0.5	0	18.8
Custer	Sandy, Erosive	0	1.1	0.5	0	1.6
	Prime Farmland	1.0	2.5	0.7	0	4.2
Pennington	Sandy, Erosive	0	0.1	0	0	0.1
	Prime Farmland	0.8	1.1	0	0	1.9
Alternative B Total		10.1	20.3	2.0	0	32.4

and long-term impacts to American burying beetles are not anticipated.

Short-term impacts to candidate (sturgeon chub) and sensitive (plains topminnow, flathead chub, finescale dace, longnose sucker) fish species could occur during construction from increased sedimentation due to runoff from construction sites near waterways. During construction and operation, short- or long- term impacts could occur to pallid sturgeon and other candidate and sensitive fish species as well as spiny softshell turtles if there were derailments and accidental release of diesel fuels or other petroleum products into the Cheyenne River or its tributaries. Both types of impacts would be most likely if potential discharge sites are within 500 feet of surface waters where there may be insufficient riparian vegetation to prevent spills from entering drainages. In addition, bald eagles and least terns could be impacted by widespread fish-kills that would adversely affect food sources and piping plovers nesting downstream could be affected if aquatic and burrowing invertebrate were killed.

Table 4-13 indicates the number of sites and/or distances at which the Alternative B route would be within 500 feet of the Cheyenne River or tributary streams with perennial flow. There are 177 total sites where Alternative B is within 500 feet of the Cheyenne River and perennial tributary streams. Alternative B would pass within 500 feet of these drainages for a total of 21.9 miles. These sites are believed to be those most likely where sediments and/or accidentally released toxic compounds could be discharged into the Cheyenne River system, both in the short-term and long-term.

In addition, water withdrawals from the Cheyenne River during construction could reduce water flows downstream, at least temporarily. Reduced flows during key periods including spawning and migration could produce localized short-term impact to candidate and sensitive fish species.

As a result of past surveys, 2 sites along Alternative B that have been evaluated as potential habitat for Ute ladies'-tresses, 1 site in Wyoming (Lodgepole Creek) and 1 site in South Dakota (Dry Creek). One other site in South Dakota (Plum Creek) and 3 in Wyoming (East Fork Coal Creek, Dry Creek, and Caballo Creek) could not be evaluated because access was denied.

Table 4-13 Number of Sites and Total Distance (Miles) Where Alternative B Is Within 500 Feet of the Cheyenne River or Tributary Streams				
County, State	Cheyenne River		Perennial Tributary Streams	
	Number of Sites	Total Distance	Number of Sites	Total Distance
Campbell, WY	0	0	11	1.4
Converse, WY	0	0	0	0
Niobrara, WY	0	0	0	0
Weston, WY	0	0	0	0
Custer, SD	42	4.3	79	7.7
Fall River, SD	5	1.0	27	5.4
Pennington, SD	2	0.1	11	2.0
Alternative B Total	49	5.4	128	16.5

In Wyoming, Alternative B would cross a total of 0.14 mile of wet meadows, palustrine emergent wetland temporarily and seasonally flooded, that could be potential habitat for the orchid (see Table 3-74). The route in South Dakota would cross 0.78 mile of the same wetland type. In both states, all wet meadow wetlands impacted by the alternative are on private lands. Occurrence along Alternative B of other sensitive plant species that are included in Table 3-86 is unknown. Individuals of any sensitive plant species inhabiting construction sites would be eliminated, at least for the short-term.

Long-term impacts due to the presence, operation and maintenance of Alternative B to Federally-listed threatened or endangered species, species proposed for listing, candidate species, species petitioned for listing, and species with special status are expected to be similar to short-term impacts, described above. They include direct mortality by trains and maintenance vehicles, avoidance of habitats that are near the tracks, and potential long-term deterioration of habitats, especially aquatic habitats at sites subject to sediment discharge and accidental release of toxic substances and aquatic habitats downstream.

For the life of the project, there is the potential for direct mortalities to terrestrial vertebrates by trains. Those threatened, endangered, proposed, candidate, petitioned and species with special status most likely to be impacted directly by train traffic include bald eagles, swift fox, black bear, mountain lion, golden eagles, ferruginous hawks, northern harriers, peregrine falcons, merlins, and short-eared owls. These species are those most likely to feed on carrion of other animals, such as big game species, that are killed by trains. These could be drawn to close proximity of the tracks, thereby increasing their risk of being killed.

Locations and numbers of mortalities are impossible to estimate except where tracks would intersect suitable habitats that are known to be used or may potentially be used. Thus, swift fox, ferruginous hawks and other raptors are most at risk where tracks intersect prairie dog colonies; bald eagles, merlins, northern harriers are most at risk where tracks would cross or closely parallel wooded riparian zones and/or ponderosa pine woodlands that coincide with areas of concentrated carrion. Those sites are predicted to include big game wintering ranges or other ranges where big game animals congregate and cross tracks. Potential indirect long-term impacts to ground nesting birds (interior least terns, piping plovers, mountain plovers) and nests of spiny softshell turtles could also occur if predators are drawn to a nesting area because of carrion concentrations along tracks.

Long-term impacts to habitats used by terrestrial and aquatic species due to surface disturbances are expected to be similar to those described under short-term impacts, above. However, once construction activities are complete and revegetation is successful, the total amount of some habitats affected by surface disturbance is expected to be less over the long-term. For example, where prairie dog colonies are crossed, black-tailed prairie dogs are likely to invade newly reclaimed ground up to some unknown distance from the tracks. While prairie dogs may repopulate disturbed areas within their colonies, the likelihood for their mortal-ity and mortality of scavengers would be expected to increase the closer burrows are to train traffic.

Noise due to train traffic is expected to be a long-term impact to some species. Background noise on the project area in both states is similar to EPA's "farm in valley" noise category which is about 39 dBA in daytime and 32 dBA at night. Estimates of distances at which noise attenuation from train whistles and locomotives diminishes to background daytime noise levels ranges from 39,000 feet - 7.4 miles (whistles) to 23,000 feet - 4.4 miles (locomotives). Attenuation distances are much greater for noise to diminish to nighttime background levels: 49,000 feet - 9.3 miles for whistles and 32,000 feet - 6.1 miles for locomotives. Noise levels of 60 dBA are comparable to EPA's "noisy urban residential"

category and noise from locomotives would reach that level at 5,700 feet - 1.1 mile from the tracks while whistle sound would attenuate to 60 dBA 3 miles away (16,000 feet).

The degree to which these noise levels would displace species is unknown and undoubtedly varies by species and local conditions. Abandonment of occupied habitats within some distance of the railroad is likely, particularly by nesting birds. For example, densities of nesting birds inhabiting woodlands begins to decline when noise levels form highways reaches 42 dBA and densities of grassland species declines when noise levels reach 48 dBA (Forman and Alexander, 1998). For noise of locomotives pulling cars, attenuation to 48 dBA may not occur for over 2.5 miles while attenuation to 42 dBA may be over 4 miles (see data in Table 2-6). Sound attenuation though, is likely to be greater in woods than grasslands and the distance of noise effects on breeding birds will probably be greater in grasslands than in woodlands. However, these noise effects on bird densities have been documented for vehicle traffic on highways with substantially higher traffic volume which is also a factor depressing densities of birds (Forman and Alexander, 1998). Whether the relatively low train traffic volume but with much greater noise per train would produce similar effects as highways in lowering bird densities in the project vicinity can not be predicted.

If they inhabit nest sites near Alternative B, bald eagles, interior least terns, piping plovers and mountain plovers could avoid those sites or other, potential nest sites during the long-term. Likewise, wintering bald eagles may avoid suitable feeding and perch sites if long-term noise levels are too high. It is possible that between 85 miles and 129 miles of potential bald eagle winter habitats could be affected by Alternative B (see Table 4-11). Though no bald eagles are currently nesting in the project area, they may in the future as nesting populations expand their range. However, the degree to which Alternative B limits future nesting by this species can not be determined.

Long-term runoff of sediments and toxic compounds could impact aquatic organisms downstream in much the same way as described under short-term impacts. Those same sites that were evaluated in Table 4-13 are likely to be those where chronic discharges occur with risk to listed and sensitive fish species, spiny softshell turtles, and other aquatic vertebrates and organisms that are components of aquatic food chains downstream.

Wildlife management indicator species (MIS) identified on BGNG include pronghorn antelope, mule deer, sharp-tailed grouse, black-footed ferret, and wild turkey. The Nebraska Forest Plan recognizes the black-footed ferret as the only Federally-listed endangered species that may inhabit the BGNG yearlong but that peregrine falcon, bald eagle, and whooping cranes are Federally-listed species that could occur as seasonal migrants and swift fox (South Dakota State-threatened species), and spiny soft-shelled turtles (formerly listed by South Dakota as State-threatened species) also occur.

Nebraska Forest Plan management area prescriptions that would be affected by Alternative B are provided in Table 1-2 and discussed in detail in Table 1 through Table 5 in Appendix A. Estimates of where and how much of Alternative B would impact known or potential habitats utilized by MIS species are provided in Table 4-14. Effects of Alternative B on the remaining MIS are discussed in Section 4.18.

Wildlife MIS identified on TBNG include featured species (pronghorn antelope, mule deer, and elk), recovery species (bald eagle, black-footed ferret, and peregrine falcon), and ecological indicator species (prairie vole, black-tailed prairie dog, yellow-breasted chat, sage grouse, golden eagle, Brewer's sparrow, willow flycatcher, mountain plover, upland sandpiper, ferruginous hawk, red crossbill, house wren, long-billed curlew, red-headed woodpecker, and Woodhouse's toad). One of the management requirements for the Medicine Bow National Forest is to manage and provide habitat for recovery of endangered and threatened species. Alternative B would cross land designated for reintroduction of black-footed ferrets and so would be inconsistent with the Forest Plan. Unless adequate mitigation could be developed, it is anticipated that the railroad passing through prairie dog colonies at the Rosecrans Area would render the site unsuitable for reintroduction of black-footed ferrets because of habitat fragmentation and noise (see Table 4-15). While Alternative B would not affect peregrine falcons, it would possibly affect wintering bald eagle habitats along the Cheyenne River, Black Thunder Creek, Little Thunder Creek and Antelope Creek (see Table 4-11).

Medicine Bow Forest Plan management area prescriptions that would be affected by Alternative B are provided in Table 1-2 and discussed in detail in Table 6 through Table 12 in Appendix A. Estimates of where and how much of Alternative B would impact known or potential habitats utilized by recovery and ecological indicator species are provided in Table 4-15. Effects of Alternative B on the remaining MIS will be discussed in Section 4.18.

The only Nebraska Forest Plan general direction that would be affected by Alternative B with some certainty would be disturbances to prairie dog colonies that would diminish the amount and suitability of essential habitat for the black-footed ferret. Other MIS that are somewhat dependant on prairie dog colonies for nesting habitat or

Table 4-14 Forest Service Management Indicator Species and Species with Special Designations on BGNG That Could be Impacted by Alternative B in Potential Habitats				
Species	**Species Designation**	**Miles of Alternative in Potential Habitat on BGNG**	**Evidence for Occurrence in Project Area by Habitat**	**Potential for Impact by Alternative (1)**
Black-footed Ferret	Federally Listed Endangered	prairie dog colonies - 0.2 mi	Introduced in black-tailed prairie dog complex in Conata Basin/Badlands	Unknown
Peregrine Falcon	Delisted as Endangered	None	None	No
Whooping Crane	Federally Listed Endangered	None	None	No
Bald Eagle	Federally Listed Threatened	forested wetland - 0.8 mi	Documented wintering habitat and potential nesting habitat in riparian cottonwood woodland	Probably
Swift Fox	Federal Candidate Forest Service Sensitive SD Threatened	prairie dog colonies - 0.2 mi herbaceous range - 15.3 mi	Documented denning habitats in short-grass prairie, unlikely occurrence in cottonwood riparian woodlands	Possibly
Spiny Softshell Turtle	Formerly SD Threatened	forested wetland - 0.8 mi nonforested wetland - 0.2 mi	Documented occurrence in mud flats, sandbars, soft sand-mud bottoms with aquatic vegetation in lakes, rivers, streams	Probably

1 = Potential for impact by Alternative B was judged as:
No: the species is not likely to occur on BGNG.
Unknown: although the management indicator species may occur on BGNG, there is no documented occurrence of the species within specified habitats or the presence of those habitats have not been documented in areas crossed by Alternative B.
Possibly: the management indicator species is known to occur in specified habitats on BGNG that would be crossed by Alternative B but the species has not been documented proximate to the alternative.
Probably: Alternative B crosses specified habitat on BGNG with documented use by the management indicator species.
Yes: Alternative B crosses the specified habitat on BGNG and would directly impact the management indicator species.

on prairie dogs as prey could also be impacted by Alternative B. These include the mountain plover, long-billed curlew, and ferruginous hawk. Impacts from Alternative B to other species, including upland sandpiper, red-headed woodpecker and Brewer's sparrow are possible but unknown with any certainty since the distribution of those species in suitable habitats are unknown.

Management area prescriptions under the recently proposed grassland plans for TBNG and BGNG (Forest Service 1999a and 1999b) that would be affected by Alternative B are provided in Table 1-2 and discussed in detail in Table 13 through Table 23 in Appendix A. In the process of updating plans to manage national grasslands, the Forest Service prepared a Draft Biological Assessment and Evaluation that included analyses of effects of their plans on numerous plant and animal species.

Animal and plant species that are likely to inhabit TBNG and/or BGNG and which have been identified as at-risk of range-wide imperilment (extinction or extirpation) or at-risk of local or region imperilment were assessed by the Forest Service (1999c) in the Draft Biological Assessment and Evaluation. Estimates of where and how much of Alternative B would impact known or potential habitats utilized by those imperilled plant and animal species are provided in Table 4-16. In some instances, the species probably does not occur on either TBNG or BGNG but rather occurs in habitats directly adjacent to the national grasslands. One example would be the sturgeon chub which is found in the Cheyenne River in South Dakota but not on BGNG, per se.

4.17.5 Alternative C (Modified Proposed Action). Short-term impacts due to construction of Alternative C to Federally-listed threatened or endangered species, species proposed for listing, candidate species, species petitioned for listing, and species with special status are anticipated to be similar to those described for Alternative B. They include direct mortality by field vehicles and construction machinery, avoidance of habitats that are utilized near construction sites and/or temporary habitat loss, and potential short-term degradation of habitats, especially aquatic habitats at sites and downstream from sediment discharge and accidental release of toxic substances. As noted earlier, locations of habitats known to be occupied by these species are not defined with a few exceptions.

Known prairie dog colonies crossed by Alternative C are more complete than for either Alternatives B or D since colonies were mapped from recent aerial photo-

Table 4-15
Forest Service Management Indicator Species on TBNG That Could be Impacted by Alternative B in Potential Habitats

Forest Management Indicator Species	Species Designation	Miles of Alternative in Potential Habitat on TBNG	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative (1)
Recovery Species				
Black-footed Ferret	Federally Listed Endangered	prairie dog colonies - 1.8 mi	Habitat suitable for reintroduction	Yes
Peregrine Falcon	Delisted as Endangered	None	None	No
Bald Eagle	Federally Listed Threatened	None	Documented wintering and potential nesting habitat in ponderosa pine woodlands and riparian cottonwood woodland	Unknown
Ecological Indicator Species				
Mountain Plover	Federal Proposed for Listing as Threatened Forest Service Sensitive	prairie dog colonies - 1.8 mi herbaceous range - 34.5 mi mixed rangeland - 0.2 mi cropland/pasture - 0.7 mi	Documented nesting habitats in short-grass prairie and black-tailed prairie dog colonies	Possibly
Black-tailed Prairie Dog	Federal Candidate	prairie dog colonies - 1.8 mi	Documented prairie dog colonies in project area	Yes
Upland Sandpiper	USFWS Species of Concern; Forest Service Sensitive	herbaceous range - 34.5 mi mixed rangeland - 0.2 mi cropland/pasture - 0.7 mi	Documented occurrence during breeding on short-grass prairie	Possibly
Long-billed Curlew	USFWS Species of Concern; Forest Service Sensitive	herbaceous range - 34.5 mi shrub/brush range - 0.1 mi mixed rangeland - 0.2 mi cropland/pasture - 0.7 mi	Documented presence - possibly nesting - in sagebrush steppe, meadow, grasslands, native hay meadow	Possibly
Ferruginous Hawk	USFWS Species of Concern; Forest Service Sensitive	herbaceous range - 34.5 mi shrub/brush range - 0.1 mi mixed rangeland - 0.2 mi cropland/pasture - 0.7 mi	Documented nesting habitat in short-grass prairie and sagebrush steppe	Probably
Red-headed Woodpecker	USFWS Species of Concern	None	Possible occurrence during breeding, probably in riparian cottonwood woodland	Unknown
Brewer's Sparrow	USFWS Species of Concern	shrub/brush range - 0.1 mi mixed rangeland - 0.2 mi	Documented occurrence during breeding in sagebrush steppe	Possibly

1 = Potential for impact by Alternative B was judged as:
No: the species is not likely to occur on TBNG.
Unknown: although the management indicator species may occur on TBNG, there is no documented occurrence of the species within specified habitats or the presence of those habitats have not been documented in areas crossed by Alternative B.
Possibly: the management indicator species is known to occur in specified habitats on TBNG that would be crossed by Alternative B but the species has not been documented proximate to the alternative.
Probably: Alternative B crosses specified habitat on TBNG with documented use by the management indicator species.
Yes: Alternative B crosses the specified habitat on TBNG and would directly impact the management indicator species.

graphy along the length of Alternative C. Results of that mapping effort are included in Table 3-85. However, those colonies have not been field-checked to determine whether they are currently active. Likewise, activity status is unknown for the colonies tabulated from TBNG, BGNG, and WGFD data sets for Alternative B, above. At least 17.5 miles of Alternative C would pass through prairie dog colonies in South Dakota and Wyoming compared to at least 11.5 miles of Alternative B and 6.2 miles of Alternative D. Beyond these comparisons, levels of short-term impacts to any of the terrestrial vertebrate species likely to occur in black-tailed prairie dog colonies can not be estimated.

Construction during winter within TBNG and along the Cheyenne River corridor in South Dakota and its major tributaries in Wyoming (Black Thunder Creek, Little Thunder Creek and Antelope Creek) is likely to displace

Table 4-16
Animal and Plant Species Identified as at Risk by the Forest Service in the Northern Great Plains That Potentially Occur on TBNG and BGNG and Could Be Impacted by Alternative B in Potential Habitats

Species At -Risk (1)	National Grasslands Occurrence	Miles of Alternative in Potential Habitat in National Grasslands	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative (2)
Species Protected Under the ESA and at Risk of Rangewide Imperilment:				
Ute ladies'-tresses	TBNG	None	No known occurrence or recent observations although potential habitat is possible on TBNG and BGNG	Unknown
	BGNG	None		
Whooping crane	BGNG	None	Known occurrences but only incidentally during migrations	No
Bald eagle	TBNG	None	Documented wintering and potential nesting habitat in ponderosa pine woodlands and riparian cottonwood woodland	Probably
	BGNG	forested wetland - 0.8 mi		
Peregrine falcon (before delisting)	TBNG	None	Known occurrences but only incidentally during migrations.	No
	BGNG	None		
Black-footed ferret	TBNG	prairie dog colonies - 1.8 mi	Introduced in black-tailed prairie dog complex in Conata Basin, potential habitat for reintroduction on TBNG	Possibly
	BGNG	prairie dog colonies - 0.2 mi		
Mountain plover	TBNG	prairie dog colonies - 1.8 mi herbaceous rangeland - 34.5 mi mixed rangeland - 0.2 mi cropland/pasture - 0.7 mi	Documented nesting habitats in short-grass prairie and black-tailed prairie dog colonies on TBNG, unknown occurrence on BGNG but potential habitat exists	Probably
	BGNG	prairie dog colonies - 0.2 mi herbaceous rangeland - 15.3 mi		
Species That may be at Risk of Rangewide Imperilment but are not Protected Under the ESA:				
Dakota buckwheat	BGNG	Unknown	Known occurrence in badlands, barren clay mounds and outwash in BGNG	Unknown
Barr orphacea	TBNG	Unknown	Known occurrence on clay hills in NE WY and present in Custer and Shannon Cos., SD	Unknown
	BGNG	Unknown		
Sturgeon Chub	TBNG	None	Documented in Cheyenne River, Custer, Pennington Cos., SD; appears absent in WY	Possibly
	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi		
Swift Fox	TBNG	prairie dog colonies - 1.8 mi herbaceous rangeland - 34.5 mi mixed rangeland - 0.2 mi	Documented denning habitats in short-grass prairie on TBNG and BGNG	Possibly
	BGNG	prairie dog colonies - 0.2 mi herbaceous rangeland - 15.3 mi		
Species That may be at Risk of Regional or More Local Imperilment:				
Marsh bellflower	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Nodding buckwheat	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG and BGNG	Unknown
	BGNG	Unknown		
Lanceleaf cottonwood	TBNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG and BGNG	Unknown
	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi		
Torrey's crypthantha	TBNG	Unknown	Suspected to occur in suitable habitats on Buttes in TBNG	Unknown

Table 4-16 Continued				
Species At -Risk (1)	**National Grasslands Occurrence**	**Miles of Alternative in Potential Habitat in National Grasslands**	**Evidence for Occurrence in Project Area by Habitat**	**Potential for Impact by Alternative (2)**
Marsh fern	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Lady-fern	BGNG	None	Suspected to occur in suitable habitats in deciduous woodlands on BGNG	Unknown
Frostweed	BGNG	Unknown	Suspected to occur in suitable habitats in sandhills on BGNG	Unknown
Meadow horsetail	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Sand lily	TBNG	Unknown	Suspected occurrence on TBNG and BGNG on sandy areas on mixed grass prairie, on hillsides, open coniferous woods	Unknown
	BGNG	Unknown		
Blue lips	TBNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG and BGNG	Unknown
	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi		
Alyssum-leaf phlox	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG and BGNG	Unknown
	BGNG	Unknown		
Alkali sacaton	TBNG	Unknown	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG	Unknown
Tawny Crescent Butterfly	TBNG	None	Suspected occurrence on TBNG in ponderosa pine savannah with riparian habitats	Unknown
Flathead Chub	TBNG	None	Documented occurrence in Cheyenne River, BGNG and Antelope Creek, TBNG	Possibly
	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi		
Plains topminnow	TBNG	None	Documented occurrence in tributaries to Cheyenne River on BGNG and TBNG	Possibly
	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi		
Northern leopard frog	TBNG	None	Known to occur in emergent wetland vegetation on TBNG and BGNG	Possibly
	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi		
American bittern	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi	Known to occur in emergent wetland vegetation on BGNG	Possibly
Yellow-billed cuckoo	TBNG	None	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
	BGNG	forested wetland - 0.8 mi		
Long-billed curlew	TBNG	herbaceous rangeland - 34.5 mi mixed rangeland - 0.2 mi	Known occurrence on TBNG and BGNG in short-grass and low mixed-grass prairie	Possibly
	BGNG	herbaceous rangeland - 15.3 mi		
Disckcissel	TBNG	herbaceous rangeland - 34.5 mi mixed rangeland - 0.2 mi	Known occurrence on TBNG in moderately tall mixed-grass/ tall-grass prairie	Possibly
Northern Goshawk	TBNG	None	Possible nesting on TBNG in ponderosa pine, may be on BGNG during migrations	Unknown
	BGNG	None		

Table 4-16 Continued				
Species At -Risk (1)	**National Grasslands Occurrence**	**Miles of Alternative in Potential Habitat in National Grasslands**	**Evidence for Occurrence in Project Area by Habitat**	**Potential for Impact by Alternative (2)**
Sage Grouse	TBNG	shrub/brush rangeland - 0.1 mi mixed rangeland - 0.2 mi	Documented occurrence in sagebrush steppe on TBNG and BGNG with leks present	Yes
	BGNG	None		
Ferruginous hawk	TBNG	herbaceous rangeland - 34.5 mi shrub/brush rangeland - 0.1 mi mixed rangeland - 0.2 mi	Documented nesting on TBNG and BGNG in trees, on ground and rocks in grasslands and shrublands	Probably
	BGNG	herbaceous rangeland - 15.3 mi		
Swainson's hawk	TBNG	herbaceous rangeland - 34.5 mi shrub/brush rangeland - 0.1 mi mixed rangeland - 0.2 mi	Documented nesting on TBNG and BGNG in trees in grasslands and shrublands	Probably
	BGNG	herbaceous rangeland - 15.3 mi forested wetland - 0.8 mi		
Merlin	BGNG	forested wetland - 0.8 mi	Moist habitats below 8,500 feet, cottonwood-riparian and ponderosa pine	Unknown
Short-eared owl	TBNG	herbaceous rangeland - 34.5 mi mixed rangeland - 0.2 mi	Known occurrence on TBNG and BGNG in moderately tall mixed-grass/ tall-grass prairie	Possibly
	BGNG	herbaceous range - 15.3 mi		
Burrowing Owl	TBNG	prairie dog colonies - 1.8 mi herbaceous rangeland - 34.5 mi mixed rangeland - 0.2 mi	Prairie dog colonies, grasslands, basin-prairie shrublands, agricultural areas documented on BGNG and TBNG	Possibly
	BGNG	prairie dog colonies - 0.2 mi herbaceous rangeland - 15.3 mi		
Loggerhead shrike	TBNG	shrub/brush rangeland - 0.1 mi	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
	BGNG	forested wetland - 0.8 mi		
Baird's sparrow	TBNG	herbaceous rangeland - 34.5 mi mixed rangeland - 0.2 mi	Known occurrence on TBNG in moderately tall mixed-grass/tall-grass prairie	Possibly
Fox sparrow	TBNG	shrub/brush rangeland - 0.1 mi	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
Trumpeter swan	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi	Known to occur in emergent wetland vegetation on BGNG	Possibly
Black tern	TBNG	None	Known to occur in emergent wetland vegetation on TBNG and BGNG	Possibly
	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi		
Lewis' Woodpecker	TBNG	None	Ponderosa pine savannah and cottonwood-riparian floodplains	Unknown
Fringe-tailed myotis	TBNG	None	Known to occur near emergent wetland vegetation & woody shrub/tree overstory riparian vegetation on TBNG and BGNG	Possibly
	BGNG	forested wetland - 0.8 mi nonforested wetland - 0.2 mi		
Black-tailed prairie dog	TBNG	prairie dog colonies - 1.8 mi	Prairie dog colonies	Yes
	BGNG	prairie dog colonies - 0.2 mi		

Table 4-16 Concluded				
Species At -Risk (1)	National Grasslands Occurrence	Miles of Alternative in Potential Habitat in National Grasslands	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative (2)

Notes:
1 = Species at-risk were included if they were identified on BGNG and TBNG and analyzed by the Forest Service in the Draft Biological Assessment and Evaluation for Proposed Land and Resource Management Plans, Dakota Prairie Grasslands, Nebraska National Forest and Associated Units, Thunder Basin National Grassland.
2 = Potential for impact by Alternative B was judged as:
No: the at-risk species is not likely to occur on TBNG and/or BGNG.
Unknown: although the at-risk species may occur on TBNG and/or BGNG, there is no documented occurrence of the species within specified habitats or the presence of those habitats have not been documented in areas crossed by Alternative B.
Possibly: the at-risk species is known to occur in specified habitats on TBNG and/or BGNG that would be crossed by Alternative B but the species has not been documented proximate to the alternative.
Probably: Alternative B crosses specified habitat on TBNG and/or BGNG with documented use by the at-risk species.
Yes: Alternative B crosses the specified habitat on TBNG and/or BGNG and would directly impact the at-risk species.

Table 4-17
Miles of Alternative C Within 0.5 and 1 Mile of the Cheyenne River, Black Thunder Creek, Little Thunder Creek and Antelope Creek That Are Potential Bald Eagle Wintering Habitats

County, State (ordered west to east)	Miles Within 0.5 Mile of Potential Habitat	Miles Within 1 Mile of Potential Habitat
Campbell, WY	10.0	12.7
Converse, WY	6.4	8.6
Weston, WY	12.8	19.0
Niobrara, WY	4.2	7.1
Fall River, SD	11.0	21.2
Custer, SD	0	2.0
Pennington, SD	14.1	22.8
Alternative C Total	58.5	93.4

Table 4-18
Number of Miles Where Alternative C Intersects Suitable Soils and Habitats Potentially Inhabited by American Burying Beetles in South Dakota

South Dakota County (ordered west to east)	Suitable Soil Type	Distance (miles) Crossed in Potential Habitats per Suitable Soil Type				
		Cropland, Pasture	Herbaceous Rangeland	Forested Wetland	Deciduous Forest	County Total
Fall River	Sandy, Erosive	1.2	5.0	0.1	0	6.3
	Prime Farmland	5.8	13.8	0.7	0	20.3
Custer	Sandy, Erosive	0	0	0	0	0
	Prime Farmland	2.9	1.0	0	0	3.9
Pennington	Sandy, Erosive	0	0.8	0	0.5	1.3
	Prime Farmland	0.9	1.6	0	0	2.5
Alternative C Total		10.8	22.2	0.8	0.5	34.3

wintering bald eagles from perches and feeding areas or make those sites temporarily unsuitable within at least a 0.5-mile up to a 1-mile zone surrounding construction activities. Estimates of potential bald eagle wintering habitats within 0.5-mile and 1-mile zones of the Cheyenne River and major tributaries that could be affected by Alternative C are provided in Table 4-17. Over 58 miles of Alternative C passes within 0.5-mile of potential bald eagle winter habitats in the affected counties in Wyoming and South Dakota. This is less than the 85 miles for Alternative B that is estimated to be within 0.5-mile of potential winter habitats. If short-term construction related disturbances affected wintering bald eagles 1 mile away, almost 94 miles of Alternative C would be within that distance from potential habitats (see Table 4-17), which is less than the 129 miles of Alternative B that would be located within the 1-mile zone. Disturbances to wintering bald eagles could thus occur

along 58 to 94 miles of Alternative C during the short-term and long-term if bald eagles are affected by noise associated with train traffic 0.5 mile to 1 mile away. Potential bald eagle nest-ing habitats are within the same areas where there are cottonwood riparian woodlands. Though no bald eagles are currently nesting in the project area, they may in the future as nesting populations expand their range. How-ever, the degree to which Alternative C limits future nesting by this species can not be determined.

Construction of Alternative C during spring and early summer along the Cheyenne River corridor, primarily in Pennington County, could displace interior least terns if they select sand bars or islands within the river to nest. The actual amount of nesting habitat available will change from year to year. As in the past, high water flows in the Cheyenne River during some years would obliterate any potential nesting habitats. If that was the case during construction, there would be no short-term impacts to interior least terns.

American burying beetles could occur in suitable soils along Alternative C in South Dakota that include those with high sand content and those with relatively deep topsoil. The amount of these soils which would be crossed by Alternative C are provided in Table 4-18. Surface disturbances to these soils during construction would probably contribute short- and long-term impacts to burying beetles if they actually occur.

There are approximately 34 miles in South Dakota where Alternative C would pass through suitable soils in potential habitats that might be used by American burying beetles, 2 miles more than Alternative B. Nearly 27 miles of Alternative C passes through soils with prime farmland characteristics, but whether all or some are irrigated and/or cultivated is unknown. If those prime farmland soils are taken out of production by Alternative C, they would probably be more suitable for use by burying beetles, if they occur and if appropriate sized carrion is available.

Short-term impacts to listed (pallid sturgeon), candidate (sturgeon chub) and sensitive (plains topminnow, flathead chub, finescale dace, longnose sucker) fish species could occur during construction with increased sedimentation due to runoff from construction sites near waterways. During operation, short-term impacts could occur downstream if there were derail-ments and accidental release of diesel fuels and other petroleum products into the Cheyenne River or its tributaries. Both types of impacts would be most likely if potential discharge sites are within 500 feet of surface waters. In addition, bald eagles and least terns could be impacted by widespread fish-kills that would adversely affect food sources and piping plovers nesting down-stream could be affected if aquatic invertebrates were killed.

There are 206 sites on the Cheyenne River and perennial tributary streams, combined, where Alternative C is within 500 feet of the river/stream (see Table 4-19). More than 20 miles of Alternative C is within 500 feet of the Cheyenne River and tributaries, only 1 mile less than Alternative B. These sites are believed to be those most likely where sediments and/or accidental releases of toxic compounds could be discharged.

As a result of past surveys, there are 4 sites along Alternative C that have been evaluated as potential habitat for Ute ladies'-tresses, 2 sites in Wyoming (Lodgepole Creek and School Creek) and 2 sites in South Dakota (Hay Canyon South and Dry Creek). Two other sites in South Dakota (French Creek and Plum Creek) and 3 in Wyoming (East Fork Coal Creek, Belle Fourche River, and Caballo Creek) could not be evaluated because access was denied. In Wyoming, Alternative C would cross a total of 0.16 mile of wet meadows, palustrine emergent wetland temporarily and seasonally flooded, that could be potential habitat for the orchid (see Table 3-75). In South Dakota, Alternative C would cross 0.7 mile of the same wetland type. In both states, most all wet meadows impacted by the alternative are on private lands. Individuals of Ute ladies'-tresses inhabiting construction sites would be eliminated, at least for the short-term. Occurrence along Alternative C of other sensitive plant species that are included in Table 3-86 is unknown. Individuals of any sensitive plant species inhabiting construction sites would be eliminated, at least during the short-term.

Long-term impacts due to the presence, operation and maintenance of Alternative C to Federally-listed threatened or endangered species, species proposed for listing, candidate species, species petitioned for listing, and species with special status are similar to short-term impacts described above and are expected to be nearly identical to those described under Alternative B. They include direct mortality by trains and maintenance vehicles, avoidance of habitats that are near the tracks, and potential long-term deterioration of habitats, especially aquatic habitats at sites and downstream from sediment discharge and accidental release of toxic sub-stances.

For the life of the project, there is the potential for direct mortalities to terrestrial vertebrates by trains. Locations and numbers of mortalities are impossible to estimate except where tracks would intersect suitable habitats that are known to be used or may potentially be used. Potential indirect long-term impacts to ground nesting birds (interior least terns, piping plovers, mountain plovers) could also occur if predators are drawn to a nesting area because of carrion concentrations along

Table 4-19 Number of Sites and Total Distance (miles) Where Alternative C is Within 500 Feet of the Cheyenne River or Tributary Streams				
County, State	Cheyenne River		Perennial Tributary Streams	
	Number of Sites	Total Distance	Number of Sites	Total Distance
Campbell, WY	0	0	17	1.1
Converse, WY	0	0	0	0
Niobrara, WY	1	0.3	0	0
Weston, WY	0	0	0	0
Custer, SD	0	0	31	6.6
Fall River, SD	3	0.9	20	3.0
Pennington, SD	62	4.0	72	4.9
Alternative C Total	66	5.2	140	15.6

Table 4-20 Forest Service Management Indicator Species and Species with Special Designations on BGNG That Could be Impacted by Alternative C in Potential Habitats				
Species	Species Designation	Miles of Alternative in Potential Habitat on BGNG	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative (1)
Black-footed Ferret	Federally Listed Endangered	None	Introduced in black-tailed prairie dog complex in Conata Basin/Badlands	No
Peregrine Falcon	Delisted as Endangered	None	None	No
Whooping Crane	Federally Listed Endangered	None	None	No
Bald Eagle	Federally Listed Threatened	None	Documented wintering habitat and potential nesting habitat in riparian cottonwood woodland	No
Swift Fox	Federal Candidate Forest Service Sensitive SD Threatened	herbaceous range - 5.2 mi	Documented denning habitats in short-grass prairie, unlikely occurrence in cottonwood riparian woodlands	Possibly
Spiny Softshell Turtle	Formerly SD Threatened	None	Documented occurrence in mud flats, sandbars, soft sand-mud bottoms with aquatic vegetation in lakes, rivers, streams	No

1 = Potential for impact by Alternative C was judged as:
No: the species is not likely to occur on BGNG.
Unknown: although the management indicator species may occur on BGNG, there is no documented occurrence of the species within specified habitats or the presence of those habitats have not been documented in areas crossed by Alternative C.
Possibly: the management indicator species is known to occur in specified habitats on BGNG that would be crossed by Alternative C but the species has not been documented proximate to the alternative.
Probably: Alternative C crosses specified habitat on BGNG with documented use by the management indicator species.
Yes: Alternative C crosses the specified habitat on BGNG and would directly impact the management indicator species.

the tracks. Again, locations and intensities of that potential impact are impossible to predict.

Long-term impacts to habitats used by terrestrial and aquatic species due to surface disturbances are expected to be similar to those described under short-term impacts, above. However, once construction activity is complete and revegetation is successful, the total amount of some habitats affected by surface disturbance is expected to be less over the long-term.

The degree to which anticipated noise levels displace species is unknown and undoubtedly varies by species and local conditions. Abandonment of occupied habitats within some distance of the railroad is likely, particularly by nesting birds. If they inhabit nest sites near Alternative C in the future, bald eagle, interior least terns, piping plovers and mountain plovers could avoid those sites or other, potential nest sites. Wintering bald eagles may avoid suitable feeding and perch sites if long-term noise levels are too high. It is possible that between 58

miles and 94 miles of potential bald eagle winter habitats could be affected by Alternative C (see Table 4-17).

Long-term runoff of sediments and toxic compounds could impact aquatic organisms downstream in much the same way as described under short-term impacts. Those same sites that were evaluated in Table 4-19 are likely to be those where chronic discharges occur with risk to listed and sensitive fish species, other aquatic vertebrates and organisms that are components of aquatic food chains downstream.

Wildlife MIS identified on BGNG were noted above. Nebraska Forest Plan management area prescriptions that would be affected by Alternative C are provided in Table 1-2 and discussed in detail in Appendix A. Estimates of where and how much of Alternative C would impact known or potential habitats utilized by MIS species are provided in Table 4-20. Alternative C would only cross 5.2 miles of herbaceous rangeland in BGNG, potential habitat for swift fox. Unlike Alternative B, no other habitats potentially used by other species in Table 4-17 would be directly disturbed. Effects of Alternative C on the remaining MIS will be discussed and evaluated in Section 4.18.

Wildlife MIS identified on TBNG were listed above under Alternative B. Alternative C would not cross land designated for reintroduction of black-footed ferrets and so would not be inconsistent with the Forest Plan. While Alternative C would not affect peregrine falcons, it would possibly affect wintering bald eagle habitats along the Cheyenne River, Black Thunder Creek, Little Thunder Creek and Antelope Creek.

Medicine Bow Forest Plan Management Area Prescriptions that would be affected by Alternative C are provided in Table 1-2 and discussed in detail in Appendix A. Estimates of where and how much of Alternative C would impact known or potential habitats utilized by recovery and ecological indicator species are provided in Table 4-21. Effects of Alternative C on the remaining MIS will be discussed and evaluated in Section 4.18.

Management area prescriptions under the proposed grassland plans for TBNG and BGNG that would be affected by Alternative C are provided in Table 1-2 and discussed in detail in Table 13 through Table 23 in Appendix A. Animal and plant species that are likely to inhabit the TBNG and/or BGNG and which have been identified as at-risk of range-wide imperilment (extinction or extirpation) or at-risk of local or region imperilment were assessed by the Forest Service (1999c) in the Draft Biological Assessment and Evaluation. Estimates of where and how much of Alternative C would impact known or potential habitats utilized by those imperilled plant and animal species are provided in Table 4-22.

4.17.6 Alternative C With the Phiney Flat Route Variation. Short-term impacts due to construction of Alternative C with the Phiney Flat Route Variation to Federally-listed threatened or endangered species, species proposed for listing, candidate species, species petitioned for listing, and species with special status are anticipated to be nearly identical to those described for Alternative C. The amount of habitats potentially utilized by least terns, American burying beetles, piping plovers, bald eagle, mountain plovers, sturgeon chub, swift fox and black-tailed prairie dogs that would be crossed or affected by this route variation in South Dakota barely differs from the Alternative C route.

Prairie dog colonies mapped along the Alternative C (see Table 3-85), potentially inhabited by mountain plovers and swift fox, would be similarly affected by the Phiney Flat Route Variation in South Dakota.

Twenty-six miles of Alternative C with the Phiney Flat Route Variation passes within 0.5-mile of potential bald eagle winter habitats in affected counties in South Dakota, nearly 1 mile more than Alternative C where it passes through the same counties. If short-term construction related disturbances affected wintering bald eagles 1 mile away, 50 miles of Alternative C with the Phiney Flat Route Variation would be within that distance from potential habitats in South Dakota (see Table 4-23), nearly 4 miles more than Alternative C in South Dakota.

Construction of Alternative C with the Phiney Flat Route Variation during spring and early summer along the Cheyenne River, primarily in Pennington County, could displace interior least terns if they select sand bars or islands within the river to nest. American burying beetles could occur in suitable soils along route in South Dakota that include those with high sand content and those with relatively deep topsoil. The amount of disturbances by Alternative C with the Phiney Flat Route Variation in these soils and potentially suitable habitats is provided in Table 4-24.

Overall disturbance by Alternative C with the Phiney Flat Route Variation to suitable soils and potential habitats used by American burying beetles is over 3 miles more than disturbance by Alternative B but about 1.3 miles more than Alternative C.

Short-term impacts to listed, candidate, and sensitive fish species could occur during construction with increased sedimentation due to runoff from construction sites near waterways. During operation, short-term impacts could occur downstream if there were derailments and accidental release of diesel fuels and other petroleum products into the Cheyenne River or its tributaries. Both types of impacts would be most likely

Table 4-21
Forest Service Management Indicator Species on TBNG That Could be Impacted by the Location of Alternative C in Potential Habitats

Forest Management Indicator Species	Species Designation	Miles of Alternative in Potential Habitat on TBNG	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative C (1)
Recovery Species				
Black-footed Ferret	Federally Listed Endangered	prairie dog colonies - 1.7 mi	Habitat suitable for reintroduction	Unknown
Peregrine Falcon	Delisted as Endangered	None	None	No
Bald Eagle	Federally Listed Threatened	evergreen forest - 0.3 mi	Documented wintering and potential nesting habitat in ponderosa pine woodlands and riparian cottonwood woodland	Probably
Ecological Indicator Species				
Mountain Plover	Federal Proposed for Listing as Threatened Forest Service Sensitive	prairie dog colonies - 1.7 mi herbaceous range - 31.8 mi cropland/pasture - 0.7 mi	Documented nesting habitats in short-grass prairie and black-tailed prairie dog colonies	Possibly
Black-tailed Prairie Dog	Federal Candidate	prairie dog colonies - 1.7 mi	Documented colonies in project area	Yes
Upland Sandpiper	USFWS Species of Concern; Forest Service Sensitive	herbaceous range - 31.8 mi cropland/pasture - 0.7 mi	Documented occurrence during breeding on short-grass prairie	Possibly
Long-billed Curlew	USFWS Species of Concern; Forest Service Sensitive	herbaceous range - 31.8 mi cropland/pasture - 0.7 mi	Documented presence - possibly nesting - in sagebrush steppe, meadow, grasslands, native hay meadow	Possibly
Ferruginous Hawk	USFWS Species of Concern; Forest Service Sensitive	herbaceous range - 31.8 mi cropland/pasture - 0.7 mi evergreen forest - 0.3 mi	Documented nesting habitat in short-grass prairie and sagebrush steppe	Probably
Red-headed Woodpecker	USFWS Species of Concern	None	Possible occurrence during breeding, probably in riparian cottonwood woodland	No
Brewer's Sparrow	USFWS Species of Concern	None	Documented occurrence during breeding in sagebrush steppe	No

1 = Potential for impact by Alternative C was judged as:
No: the species is not likely to occur on TBNG.
Unknown: although the management indicator species may occur on TBNG, there is no documented occurrence of the species within specified habitats or the presence of those habitats have not been documented in areas crossed by Alternative C.
Possibly: the management indicator species is known to occur in specified habitats on TBNG that would be crossed by Alternative C but the species has not been documented proximate to the alternative.
Probably: Alternative C crosses specified habitat on TBNG with documented use by the management indicator species.
Yes: Alternative C crosses the specified habitat on TBNG and would directly impact the management indicator species.

if potential discharge sites are within 500 feet of surface waters. In addition, bald eagles and least terns could be impacted by widespread fish-kills that would adversely affect food sources and piping plovers nesting downstream could be affected if aquatic and burrowing invertebrate were killed. Table 4-25 indicates the number of sites and/or distances at which Alternative C with the Phiney Flat Route Variation would be within 500 feet of the Cheyenne River or tributary stream with perennial flows.

In South Dakota there are 164 sites on the Cheyenne River and perennial tributary streams, combined, where the Phiney Flat Route Variation is within 500 feet of the drainages where impacts to aquatic resources could occur. That would be 2 sites fewer than Alternative B

Table 4-22
Animal and Plant Species Identified as At Risk by the Forest Service in the Northern Great Plains That Potentially Occur on TBNG and BGNG and Could be Impacted by Alternative C in Potential Habitats

Species At -Risk (1)	National Grasslands Occurrence	Miles of Alternative in Potential Habitat in National Grasslands	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative (2)
Species Protected Under the ESA and at Risk of Rangewide Imperilment:				
Ute ladies'-tresses	TBNG	wet meadow - 0.04 mi	No known occurrence or recent observations although potential habitat is possible on TBNG and BGNG	Unknown
	BGNG	None		
Whooping crane	BGNG	None	Known occurrences but only incidentally during migrations	No
Bald eagle	TBNG	evergreen forest land - 0.3 mi	Documented wintering and potential nesting habitat in ponderosa pine woodlands and riparian cottonwood woodland	Probably
	BGNG	None		
Peregrine falcon (before delisting)	TBNG	None	Known occurrences but only incidentally during migrations.	No
	BGNG	None		
Black-footed ferret	TBNG	prairie dog colonies - 1.7 mi	Introduced in black-tailed prairie dog complex in Conata Basin, potential habitat for reintroduction on TBNG	Possibly
	BGNG	None		
Mountain plover	TBNG	prairie dog colonies - 1.7 mi herbaceous rangeland - 31.8 mi cropland/pasture - 0.7 mi	Documented nesting habitats in short-grass prairie and black-tailed prairie dog colonies on TBNG, unknown occurrence on BGNG but potential habitat exists	Probably
	BGNG	herbaceous rangeland - 5.2 mi		
Species That may be at Risk of Rangewide Imperilment but are not Protected Under the ESA:				
Dakota buckwheat	BGNG	Unknown	Known occurrence in badlands, barren clay mounds and outwash in BGNG	Unknown
Barr orphacea	TBNG	Unknown	Known occurrence on clay hills in NE WY and present in Custer and Shannon Cos., SD	Unknown
	BGNG	Unknown		
Sturgeon Chub	TBNG	None	Documented in Cheyenne River, Custer, Pennington Cos., SD; appears absent in WY	Possibly
	BGNG	None		
Swift Fox	TBNG	prairie dog colonies - 1.7 mi herbaceous rangeland - 31.8 mi	Documented denning habitats in short-grass prairie on TBNG and BGNG	Possibly
	BGNG	herbaceous rangeland - 5.2 mi		
Species That may be at Risk of Regional or More Local Imperilment:				
Marsh bellflower	BGNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Nodding buckwheat	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG and BGNG	Unknown
	BGNG	Unknown		
Lanceleaf cottonwood	TBNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG and BGNG	Unknown
	BGNG	None		
Torrey's crypthantha	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG	Unknown

Table 4-22 Continued				
Species At -Risk (1)	**National Grasslands Occurrence**	**Miles of Alternative in Potential Habitat in National Grasslands**	**Evidence for Occurrence in Project Area by Habitat**	**Potential for Impact by Alternative (2)**
Marsh fern	BGNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Lady-fern	BGNG	None	Suspected to occur in suitable habitats in deciduous woodlands on BGNG	Unknown
Frostweed	BGNG	Unknown	Suspected to occur in suitable habitats in sandhills on BGNG	Unknown
Meadow horsetail	BGNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Sand lily	TBNG	Unknown	Suspected occurrence on TBNG and BGNG on sandy areas on mixed grass prairie, on hillsides, open coniferous woods	Unknown
	BGNG	Unknown		
Blue lips	TBNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG and BGNG	Unknown
	BGNG	None		
Alyssum-leaf phlox	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG and BGNG	Unknown
	BGNG	Unknown		
Alkali sacaton	TBNG	Unknown	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG	Unknown
Tawny Crescent Butterfly	TBNG	None	Suspected occurrence on TBNG in ponderosa pine savannah with riparian habitats	Unknown
Flathead Chub	TBNG	None	Documented occurrence in Cheyenne River, BGNG and Antelope Creek, TBNG	Possibly
	BGNG	None		
Plains topminnow	TBNG	None	Documented occurrence in tributaries to Cheyenne River on BGNG and TBNG	Possibly
	BGNG	None		
Northern leopard frog	TBNG	None	Known to occur in emergent wetland vegetation on TBNG and BGNG	Possibly
	BGNG	None		
American bittern	BGNG	None	Known to occur in emergent wetland vegetation on BGNG	Possibly
Yellow-billed cuckoo	TBNG	None	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
	BGNG	None		
Long-billed curlew	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG and BGNG in short-grass and low mixed-grass prairie	Possibly
	BGNG	herbaceous rangeland - 5.2 mi		
Disckcissel	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG in moderately tall mixed-grass/ tall-grass prairie	Possibly

Table 4-22 Continued				
Species At -Risk (1)	**National Grasslands Occurrence**	**Miles of Alternative in Potential Habitat in National Grasslands**	**Evidence for Occurrence in Project Area by Habitat**	**Potential for Impact by Alternative (2)**
Northern Goshawk	TBNG	evergreen forest 0.3 mi	Possible nesting on TBNG in ponderosa pine, may be on BGNG during migrations	Possibly
	BGNG	None		
Sage Grouse	TBNG	None	Documented occurrence in sagebrush steppe on TBNG and BGNG with leks present	Yes
	BGNG	None		
Ferruginous hawk	TBNG	herbaceous rangeland - 31.8 mi	Documented nesting on TBNG and BGNG in trees, on ground and rocks in grasslands and shrublands	Probably
	BGNG	herbaceous rangeland - 5.2 mi		
Swainson's hawk	TBNG	herbaceous rangeland - 31.8 mi	Documented nesting on TBNG and BGNG in trees in grasslands and shrublands	Probably
	BGNG	herbaceous rangeland - 5.2 mi		
Merlin	BGNG	None	Moist habitats below 8,500 feet, cottonwood-riparian and ponderosa pine	Unknown
Short-eared owl	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG and BGNG in moderately tall mixed-grass/ tall-grass prairie	Possibly
	BGNG	herbaceous rangeland - 5.2 mi		
Burrowing Owl	TBNG	prairie dog colonies - 1.7 mi herbaceous rangeland - 31.8 mi	Prairie dog colonies, grasslands, basin-prairie shrublands, agricultural areas documented on BGNG and TBNG	Possibly
	BGNG	herbaceous rangeland - 5.2 mi		
Loggerhead shrike	TBNG	None	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
	BGNG	None		
Baird's sparrow	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG in moderately tall mixed-grass/ tall-grass prairie	Possibly
Fox sparrow	TBNG	None	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
Trumpeter swan	BGNG	None	Known to occur in emergent wetland vegetation on BGNG	Possibly
Black tern	TBNG	None	Known to occur in emergent wetland vegetation on TBNG and BGNG	Possibly
	BGNG	None		
Lewis' Woodpecker	TBNG	evergreen forest 0.3 mi	Ponderosa pine savannah and cottonwood-riparian floodplains	Possibly
Fringe-tailed myotis	TBNG	None	Known to occur near emergent wetland vegetation & woody shrub/tree overstory riparian vegetation on TBNG and BGNG	Possibly
	BGNG	None		
Black-tailed prairie dog	TBNG	prairie dog colonies - 1.7 mi	Prairie dog colonies	Yes
	BGNG	None		

Table 4-22
Concluded

Species At -Risk (1)	National Grasslands Occurrence	Miles of Alternative in Potential Habitat in National Grasslands	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative (2)

Notes:
1 = Species at-risk were included if they were identified on BGNG and TBNG and analyzed by the Forest Service in the Draft Biological Assessment and Evaluation for Proposed Land and Resource Management Plans, Dakota Prairie Grasslands, Nebraska National Forest and Associated Units, Thunder Basin National Grassland.
2 = Potential for impact by Alternative C was judged as:
No: the at-risk species is not likely to occur on TBNG and/or BGNG.
Unknown: although the at-risk species may occur on TBNG and/or BGNG, there is no documented occurrence of the species within specified habitats or the presence of those habitats have not been documented in areas crossed by Alternative C.
Possibly: the at-risk species is known to occur in specified habitats on TBNG and/or BGNG that would be crossed by Alternative C but the species has not been documented proximate to the alternative.
Probably: Alternative C crosses specified habitat on TBNG and/or BGNG with documented use by the at-risk species.
Yes: Alternative C crosses the specified habitat on TBNG and/or BGNG and would directly impact the at-risk species.

Table 4-23
Miles of Alternative C With the Phiney Flat Route Variation Within 0.5 and 1 mile of the Cheyenne River That is Potential Bald Eagle Wintering Habitat in South Dakota

County, State (ordered west to east)	Miles Within 0.5 Mile of Potential Habitat	Miles Within 1 Mile of Potential Habitat
Fall River, SD	11.0	21.2
Custer, SD	0.8	5.6
Pennington, SD	14.1	23.4
Phiney Flat Route Variation Total	25.9	50.2

Table 4-24
Number of Miles Where Alternative C With the Phiney Flat Route Variation Intersects Suitable Soils and Habitats Potentially Inhabited by American Burying Beetles in South Dakota

South Dakota County (ordered west to east)	Suitable Soil Type	Distance (miles) Crossed in Potential Habitats per Suitable Soil Type				
		Cropland, Pasture	Herbaceous Rangeland	Forested Wetland	Deciduous Forest	County Total
Fall River	Sandy, Erosive	1.2	5.0	0.1	0	6.3
	Prime Farmland	5.8	13.8	0.7	0	20.3
Custer	Sandy, Erosive	0	0	0	0	0
	Prime Farmland	3.8	1.4	0	0	5.2
Pennington	Sandy, Erosive	0	0.8	0	0.5	1.3
	Prime Farmland	0.9	1.6	0	0	2.5
Phiney Flat Route Variation Total		11.7	22.6	0.8	0.5	35.6

Table 4-25
Number of Sites and Total Distance (miles) Where Alternative C With the Phiney Flat Route Variation is Within 500 Feet of the Cheyenne River or Tributary Streams in South Dakota

County, State	Cheyenne River		Perennial Tributary Streams	
	Number of Sites	Total Distance	Number of Sites	Total Distance
Custer, SD	0	0	5	1.5
Fall River, SD	3	0.9	20	3.0
Pennington, SD	62	4.0	74	5.0
Phiney Flat Route Variation Total	65	4.9	99	9.5

Table 4-26 Forest Service Management Indicator Species and Species with Special Designations on BGNG That Could be Impacted by Alternative C With the Phiney Flat Route Variation in Potential Habitats				
Species	**Species Designation**	**Miles of Alternative in Potential Habitat on BGNG**	**Evidence for Occurrence in Project Area by Habitat**	**Potential for Impact by Alternative (1)**
Black-footed Ferret	Federally Listed Endangered	None	Introduced in black-tailed prairie dog complex in Conata Basin/Badlands	No
Peregrine Falcon	Delisted as Endangered	None	None	No
Whooping Crane	Federally Listed Endangered	None	None	No
Bald Eagle	Federally Listed Threatened	None	Documented wintering habitat and potential nesting habitat in riparian cottonwood woodland	No
Swift Fox	Federal Candidate Forest Service Sensitive SD Threatened	herbaceous range - 4.4 mi	Documented denning habitats in short-grass prairie, unlikely occurrence in cottonwood riparian woodlands	Possibly
Spiny Softshell Turtle	Formerly SD Threatened	None	Documented occurrence in mud flats, sandbars, soft sand-mud bottoms with aquatic vegetation in lakes, rivers, streams	No

1 = Potential for impact by Alternative C with the Phiney Flat Route Variation was judged as:
No: the species is not likely to occur on BGNG.
Unknown: although the management indicator species may occur on BGNG, there is no documented occurrence of the species within specified habitats or the presence of those habitats have not been documented in areas crossed by Alternative C with the Phiney Flat Route Variation.
Possibly: the management indicator species is known to occur in specified habitats on BGNG that would be crossed by Alternative C with the Phiney Flat Route Variation but the species has not been documented proximate to the alternative.
Probably: Alternative C with the Phiney Flat Route Variation crosses specified habitat on BGNG with documented use by the management indicator species.
Yes: Alternative C with the Phiney Flat Route Variation crosses the specified habitat on BGNG and would directly impact the management indicator species.

and 24 fewer sites than Alternative C in the same South Dakota counties.

As a result of past surveys, there are 3 sites along Alternative C with the Phiney Flat Route Variation in South Dakota that have been evaluated as potential habitat for Ute ladies'-tresses. Those sites are Hay Canyon South and Dry Creek. Occurrence of other sensitive plant species along the Phiney Flat Route Variation is unknown. In South Dakota, the Phiney Flat Route Variation would cross a total of 0.7 mile of wet meadows, palustrine emergent wetland temporarily and seasonally flooded, that could be potential habitat for the orchid (see Table 3-76). The route in Wyoming would cross 0.16 mile of the same wetland type. In both states, most all wet meadows impacted by the alternative are on private lands. Individuals of Ute ladies'-tresses or other sensitive plant species inhabiting the construction sites would be eliminated, at least in the short-term.

Long-term impacts due to the presence, operation and maintenance of Alternative C with the Phiney Flat Route Variation to Federally-listed threatened or endangered species, species proposed for listing, candidate species, species petitioned for listing, and species with special status are similar to short-term impacts described above and are expected to be nearly identical to those described under Alternative C.

Wildlife MIS identified on BGNG were noted above. Nebraska Forest Plan management area prescriptions that would be affected by Alternative C with the Phiney Flat Route Variation are provided in Table 1-2 and discussed in detail in Appendix A. Estimates of where and how much of the Phiney Flat Route Variation would impact known or potential habitats utilized by MIS species are provided in Table 4-26. The route would only cross 4.4 miles of herbaceous rangeland in BGNG, potential habitat for swift fox. Unlike Alternative B, no other habitats potentially used by other species in Table 4-26 would be directly disturbed. Effects of the Phiney Flat Route Variation on the remaining MIS will be discussed and evaluated in Section 4.18.

Alternative C with the Phiney Flat Variation would not affect TBNG differently than Alternative C discussed above. Management area prescriptions under the proposed grassland plans for TBNG and BGNG that

Table 4-27
Animal and Plant Species Identified as At Risk by the Forest Service in the Northern Great Plains That Potentially Occur on TBNG and BGNG and Could be Impacted by Alternative C With the Phiney Flat Route Variation in Potential Habitats

Species At -Risk (1)	National Grasslands Occurrence	Miles of Alternative in Potential Habitat in National Grasslands	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative (2)
Species Protected Under the ESA and at Risk of Rangewide Imperilment:				
Ute ladies'-tresses	TBNG	wet meadow - 0.04 mi	No known occurrence or recent observations although potential habitat is possible on TBNG and BGNG	Unknown
	BGNG	None		
Whooping crane	BGNG	None	Known occurrences but only incidentally during migrations	No
Bald eagle	TBNG	evergreen forest land - 0.3 mi	Documented wintering and potential nesting habitat in ponderosa pine woodlands and riparian cottonwood woodland	Probably
	BGNG	None		
Peregrine falcon (before delisting)	TBNG	None	Known occurrences but only incidentally during migrations.	No
	BGNG	None		
Black-footed ferret	TBNG	prairie dog colonies - 1.7 mi	Introduced in black-tailed prairie dog complex in Conata Basin, potential habitat for reintroduction on TBNG	Possibly
	BGNG	None		
Mountain plover	TBNG	prairie dog colonies - 1.7 mi herbaceous rangeland - 31.8 mi cropland/pasture - 0.7 mi	Documented nesting habitats in short-grass prairie and black-tailed prairie dog colonies on TBNG, unknown occurrence on BGNG but potential habitat exists	Probably
	BGNG	herbaceous rangeland - 4.4 mi		
Species That may be at Risk of Rangewide Imperilment but are not Protected Under the ESA:				
Dakota buckwheat	BGNG	Unknown	Known occurrence in badlands, barren clay mounds and outwash in BGNG	Unknown
Barr orphacea	TBNG	Unknown	Known occurrence on clay hills in NE WY and present in Custer, Shannon Cos., SD	Unknown
	BGNG	Unknown		
Sturgeon Chub	TBNG	None	Documented in Cheyenne River, Custer, Pennington Cos., SD; appears absent in WY	Possibly
	BGNG	None		
Swift Fox	TBNG	prairie dog colonies - 1.7 mi herbaceous rangeland - 31.8 mi	Documented denning habitats in short-grass prairie on TBNG and BGNG	Possibly
	BGNG	herbaceous rangeland - 4.4 mi		
Species That may be at Risk of Regional or More Local Imperilment:				
Marsh bellflower	BGNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Nodding buckwheat	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG and BGNG	Unknown
	BGNG	Unknown		
Lanceleaf cottonwood	TBNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG and BGNG	Unknown
	BGNG	None		
Torrey's crypthantha	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG	Unknown
Marsh fern	BGNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown

Table 4-27 Continued				
Species At -Risk (1)	**National Grasslands Occurrence**	**Miles of Alternative in Potential Habitat in National Grasslands**	**Evidence for Occurrence in Project Area by Habitat**	**Potential for Impact by Alternative (2)**
Lady-fern	BGNG	None	Suspected to occur in suitable habitats in deciduous woodlands on BGNG	Unknown
Frostweed	BGNG	Unknown	Suspected to occur in suitable habitats in sandhills on BGNG	Unknown
Meadow horsetail	BGNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Sand lily	TBNG	Unknown	Suspected occurrence on TBNG and BGNG on sandy areas on mixed grass prairie, on hillsides, open coniferous woods	Unknown
	BGNG	Unknown		
Blue lips	TBNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG and BGNG	Unknown
	BGNG	None		
Alyssum-leaf phlox	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG and BGNG	Unknown
	BGNG	Unknown		
Alkali sacaton	TBNG	Unknown	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG	Unknown
Tawny Crescent Butterfly	TBNG	None	Suspected occurrence on TBNG in ponderosa pine savannah with riparian habitats	Unknown
Flathead Chub	TBNG	None	Documented occurrence in Cheyenne River, BGNG and Antelope Creek, TBNG	Possibly
	BGNG	None		
Plains topminnow	TBNG	None	Documented occurrence in tributaries to Cheyenne River on BGNG and TBNG	Possibly
	BGNG	None		
Northern leopard frog	TBNG	None	Known to occur in emergent wetland vegetation on TBNG and BGNG	Possibly
	BGNG	None		
American bittern	BGNG	None	Known to occur in emergent wetland vegetation on BGNG	Possibly
Yellow-billed cuckoo	TBNG	None	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
	BGNG	None		
Long-billed curlew	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG and BGNG in short-grass and low mixed-grass prairie	Possibly
	BGNG	herbaceous rangeland - 4.4 mi		
Disckcissel	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG in moderately tall mixed-grass/ tall-grass prairie	Possibly
Northern Goshawk	TBNG	evergreen forest 0.3 mi	Possible nesting on TBNG in ponderosa pine, may be on BGNG during migrations	Possibly
	BGNG	None		
Sage Grouse	TBNG	None	Documented occurrence in sagebrush steppe on TBNG and BGNG with leks present	Yes
	BGNG	None		
Ferruginous hawk	TBNG	herbaceous rangeland - 31.8 mi	Documented nesting on TBNG and BGNG in trees, on ground and rocks in grasslands and shrublands	Probably
	BGNG	herbaceous rangeland - 4.4 mi		

Table 4-27
Continued

Species At -Risk (1)	National Grasslands Occurrence	Miles of Alternative in Potential Habitat in National Grasslands	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative (2)
Swainson's hawk	TBNG	herbaceous rangeland - 31.8 mi	Documented nesting on TBNG and BGNG in trees in grasslands and shrublands	Probably
	BGNG	herbaceous rangeland - 4.4 mi		
Merlin	BGNG	None	Moist habitats below 8,500 feet, cottonwood-riparian and ponderosa pine	Unknown
Short-eared owl	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG and BGNG in moderately tall mixed-grass/ tall-grass prairie	Possibly
	BGNG	herbaceous rangeland - 4.4 mi		
Burrowing Owl	TBNG	prairie dog colonies - 1.7 mi herbaceous rangeland - 31.8 mi	Prairie dog colonies, grasslands, basin-prairie shrublands, agricultural areas documented on BGNG and TBNG	Possibly
	BGNG	herbaceous rangeland - 4.4 mi		
Loggerhead shrike	TBNG	None	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
	BGNG	None		
Baird's sparrow	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG in moderately tall mixed-grass/tall-grass prairie	Possibly
Fox sparrow	TBNG	None	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
Trumpeter swan	BGNG	None	Known to occur in emergent wetland vegetation on BGNG	Possibly
Black tern	TBNG	None	Known to occur in emergent wetland vegetation on TBNG and BGNG	Possibly
	BGNG	None		
Lewis' Woodpecker	TBNG	evergreen forest 0.3 mi	Ponderosa pine savannah and cottonwood-riparian floodplains	Possibly
Fringe-tailed myotis	TBNG	None	Known to occur near emergent wetland vegetation & woody shrub/tree overstory riparian vegetation on TBNG and BGNG	Possibly
	BGNG	None		
Black-tailed prairie dog	TBNG	prairie dog colonies - 1.7 mi	Prairie dog colonies	Yes
	BGNG	None		

Notes:
1 = Species at-risk were included if they were identified on BGNG and TBNG and analyzed by the Forest Service in the Draft Biological Assessment and Evaluation for Proposed Land and Resource Management Plans, Dakota Prairie Grasslands, Nebraska National Forest and Associated Units, Thunder Basin National Grassland.
2 = Potential for impact by Alternative C with the Phiney Flat Route Variation was judged as:
No: the at-risk species is not likely to occur on TBNG and/or BGNG.
Unknown: although the at-risk species may occur on TBNG and/or BGNG, there is no documented occurrence of the species within specified habitats or the presence of those habitats have not been documented in areas crossed by Alternative C with the Phiney Flat Route Variation.
Possibly: the at-risk species is known to occur in specified habitats on TBNG and/or BGNG that would be crossed by Alternative C with the Phiney Flat Route Variation but the species has not been documented proximate to the alternative.
Probably: Alternative C with the Phiney Flat Route Variation crosses specified habitat on TBNG and/or BGNG with documented use by the at-risk species.
Yes: Alternative C with the Phiney Flat Route Variation crosses the specified habitat on TBNG and/or BGNG and would directly impact the at-risk species.

would be affected by Alternative C with the Phiney Flat Route Variation are provided in Table 1-2 and discussed in detail in Table 13 through Table 23 in Appendix A.

Animal and plant species that are likely to inhabit TBNG and/or BGNG and which have been identified as at-risk of range-wide imperilment (extinction or extirpation) or at-risk of local or region imperilment were assessed by the Forest Service (1999c) in the Draft Biological Assessment and Evaluation. Estimates of where and how much of Alternative C with the Phiney Flat Route Variation would impact known or potential habitats utilized by those imperilled plant and animal species are provided in Table 4-27.

4.17.7 Alternative C with the W G Flat Route Variation. Short-term impacts due to construction of Alternative C with the W G Flat Route Variation to Federally-listed threatened or endangered species, species proposed for listing, candidate species, species petitioned for listing, and species with special status are anticipated to be nearly identical to those described for Alternative C. The amount of habitats potentially utilized by least terns, American burying beetles, piping plovers, bald eagle, mountain plovers, sturgeon chub, swift fox and black-tailed prairie dogs that would be crossed or affected by this route variation in South Dakota barely differs from Alternative C. Prairie dog colonies mapped along Alternative C (see Table 3-85), potentially inhabited by mountain plovers and swift fox, would be similarly affected by the W G Flat Route Variation in South Dakota.

Nearly 26 miles of the W G Flat Route Variation passes within 0.5-mile of potential bald eagle winter habitats in the counties in South Dakota, the same as Alternative C with the Phiney Flat Route Variation and about 1 mile more than Alternative C where it passes through the same counties. If short-term construction-related disturbances affected wintering bald eagles 1 mile away, over 48 miles of the W G Flat Route Variation would be within that distance from potential habitats (see Table 4-28), almost 2 miles less than Alternative C with the Phiney Flat Route Variation but 2 miles more than Alternative C in South Dakota.

Construction of the Alternative C with the W G Flat Route Variation during spring and early summer along the corridor of the Cheyenne River, primarily in Pennington County could displace interior least terns if they select sand bars or islands within the river to nest. American burying beetles could occur in suitable soils and potentially suitable habitats along the W G Flat Route Variation in South Dakota. Those potentially affected areas are provided in Table 4-29. Overall disturbance by the W G Flat Route Variation to suitable soils and potential habitats used by American burying beetles is nearly 5 miles more than disturbance by Alternative B, about 3 miles more than Alternative C and 1.7 miles more than Alternative C with the Phiney Flat Route Variation.

Short-term impacts to listed, candidate, and sensitive fish species could occur during construction with increased sedimentation due to runoff from construction sites near waterways. During operation, short-term impacts could occur downstream if there were derailments and accidental release of diesel fuels and other petroleum products into the Cheyenne River or its tributaries. Both types of impacts would be most likely if potential discharge sites are within 500 feet of surface waters. In addition, bald eagles and least terns could be impacted by widespread fish-kills that would adversely affect food sources and piping plovers nesting downstream could be affected if aquatic and burrowing invertebrate were killed. Table 4-30 indicates the number of sites and/or distances at which the W G Flat Route Variation would be within 500 feet of the Cheyenne River or tributary stream with perennial flows in South Dakota.

In South Dakota there are 192 sites on the Cheyenne River and perennial tributary streams, combined, where Alternative C with the W G Flat Route Variation is within 500 feet of the drainages where impacts to aquatic resources could occur. That would be 28 sites more than Alternative C with the Phiney Flat Route Variation and 26 sites fewer than Alternative B and about 4 sites more than Alternative C in the same South Dakota counties.

As a result of past surveys, there is only 1 site along Alternative C with the W G Flat Route Variation in South Dakota that was been evaluated as potential habitat for Ute ladies'-tresses. That site is at Dry Creek. In South Dakota, Alternative C with the W G Flat Route Variation would cross a total of 0.57 mile of wet meadows, palustrine emergent wetland temporarily and seasonally flooded, that could be potential habitat for the orchid (see Table 3-77). The route in Wyoming would cross 0.16 mile of that wetland type, the same amount affected as Alternative C, above. In both states, most all wet meadows impacted by the alternative are on private lands. Occurrence of other sensitive plant species along Alternative C with the W G Flat Route Variation is unknown but individuals of any sensitive plant species, including Ute ladies'-tresses, that inhabit construction sites would be eliminated, at least in the short-term.

Long-term impacts due to the presence, operation and maintenance of Alternative C with the W G Flat Route Variation to Federally-listed threatened or endangered species, species proposed for listing, candidate species, species petitioned for listing, and species with special status are similar to short-term impacts described above are expected to be nearly identical to those described under Alternative C.

Wildlife MIS identified on BGNG were noted above. Nebraska Forest Plan management area prescriptions that would be affected by Alternative C with the W G Flat Route Variation are provided in Table 1-2 and discussed in detail in Table 1 through Table 5 in Appendix A.

Table 4-28 Miles of Alternative C With the W G Flat Route Variation Within 0.5 and 1 mile of the Cheyenne River That is Potential Bald Eagle Wintering Habitats in South Dakota		
County, State (ordered west to east)	**Miles Within 0.5 Mile of Potential Habitat**	**Miles Within 1 Mile of Potential Habitat**
Fall River, SD	11.5	23.4
Custer, SD	0	2.0
Pennington, SD	14.1	22.8
W G Flat Route Variation Total	25.6	48.2

Table 4-29 Number of Miles Where Alternative C With the W G Flat Route Variation Intersects Suitable Soils and Habitats Potentially Inhabited by American Burying Beetles in South Dakota.						
South Dakota County (ordered west to east)	**Suitable Soil Type**	**Distance (miles) Crossed in Potential Habitats per Suitable Soil Type**				
		Cropland, Pasture	**Herbaceous Rangeland**	**Forested Wetland**	**Deciduous Forest**	**County Total**
Fall River	Sandy, Erosive	1.5	6.9	0.1	0	8.5
	Prime Farmland	8.0	11.8	0.7	0	20.5
Custer	Sandy, Erosive	0	0	0	0	0
	Prime Farmland	3.3	1.2	0	0	4.5
Pennington	Sandy, Erosive	0	0.8	0	0.5	1.30
	Prime Farmland	0.9	1.6	0	0	2.5
W G Flat Route Variation Total		13.7	22.3	0.8	0.5	37.3

Table 4-30 Number of Sites and Total Distance (miles) Where Alternative C With the W G Flat Route Variation is Within 500 Feet of the Cheyenne River or Tributary Streams in South Dakota.				
County, State	**Cheyenne River**		**Perennial Tributary Streams**	
	Number of Sites	**Total Distance**	**Number of Sites**	**Total Distance**
Custer, SD	0	0	31	6.6
Fall River, SD	5	0.9	22	3.0
Pennington, SD	62	4.0	72	4.9
W G Flat Route Variation Total	67	4.9	125	14.5

Estimates of where and how much of the W G Flat Route Variation would impact known or potential habitats utilized by MIS species are provided in Table 4-31. The route would only cross 5.2 miles of herbaceous rangeland in BGNG, potential habitat for swift fox. Unlike Alternative B, no other habitats potentially used by other species in Table 4-31 would be directly disturbed. Effects of the W G Flat Route Variation on the remaining MIS will be discussed and evaluated in Section 4.18.

Alternative C with the W G Flat Route Variation would not affect TBNG differently than Alternative C. Proposed grassland management area prescriptions under the proposed grassland plans for TBNG and BGNG that would be affected by Alternative C with the W G Flat Route Variation are provided in Table 1-2 and discussed in detail in Table 13 through Table 23 in Appendix A. Animal and plant species that are likely to inhabit the TBNG and/or BGNG and which have been identified as at-risk of range-wide imperilment (extinction or extirpation) or at-risk of local or region imperilment were assessed by the Forest Service (1999c) in the Draft Biological Assessment and Evaluation. Estimates of where and how much of Alternative C with the W G Flat Route Variation would impact known or potential habitats utilized by those imperilled plant and animal species are provided in Table 4-32.

4.17.8 Alternative D (Existing Corridors Alternative). Short-term impacts due to construction of Alternative D to Federally-listed threatened or endangered species, species proposed for listing, candidate species, species petitioned for listing, and species with special status are anticipated to be similar to those described for Alternative B even though Alternative D would be located, for the most part, within and existing

Table 4-31 Forest Service Management Indicator Species and Species with Special Designations on BGNG That Could be Impacted by Alternative C with the W G Flat Route Variation in Potential Habitats				
Species	**Species Designation**	**Miles of Alternative in Potential Habitat on BGNG**	**Evidence for Occurrence in Project Area by Habitat**	**Potential for Impact by Alternative (1)**
Black-footed Ferret	Federally Listed Endangered	None	Introduced in black-tailed prairie dog complex in Conata Basin/Badlands	No
Peregrine Falcon	Delisted as Endangered	None	None	No
Whooping Crane	Federally Listed Endangered	None	None	No
Bald Eagle	Federally Listed Threatened	None	Documented wintering habitat and potential nesting habitat in riparian cottonwood woodland	No
Swift Fox	Federal Candidate Forest Service Sensitive SD Threatened	herbaceous range - 5.2 mi	Documented denning habitats in short-grass prairie, unlikely occurrence in cottonwood riparian woodlands	Possibly
Spiny Softshell Turtle	Formerly SD Threatened	None	Documented occurrence in mud flats, sandbars, soft sand-mud bottoms with aquatic vegetation in lakes, rivers, streams	No

Notes:
1 = Potential for impact by Alternative C with the W G Flat Route Variation was judged as:
No: the species is not likely to occur on BGNG.
Unknown: although the management indicator species may occur on BGNG, there is no documented occurrence of the species within specified habitats or the presence of those habitats have not been documented in areas crossed by Alternative C with the W G Flat Route Variation.
Possibly: the management indicator species is known to occur in specified habitats on BGNG that would be crossed by Alternative C with the W G Flat Route Variation but the species has not been documented proximate to the alternative.
Probably: Alternative C with the W G Flat Route Variation crosses specified habitat on BGNG with documented use by the management indicator species.
Yes: Alternative C with the W G Flat Route Variation crosses the specified habitat on BGNG and would directly impact the management indicator species.

rail corridor. Short-term impacts include direct mortality by field vehicles and construction machinery, avoidance of habitats that are utilized near construction sites and/or temporary habitat loss, and potential short-term degradation of habitats, especially aquatic habitats at sites and downstream from sediment discharge and accidental release of toxic substances. As noted earlier, locations of habitats known to be occupied by these species are not defined except for a few exceptions.

Known prairie dog colonies crossed by Alternative D are less complete than for either Alternatives B or C since only those colonies that were mapped by state or Federal agencies have been identified in Table 3-85. However, those colonies have not been field-checked to determine whether they are currently active. Likewise, activity status is unknown. At least 6.2 miles of Alter-native D would pass through prairie dog colonies in South Dakota and Wyoming compared to at least 11.6 miles of Alternative B and 17.5 miles of Alternative C. Beyond these comparisons, levels of short-term impacts to any of the terrestrial vertebrate species likely to occur in black-tailed prairie dog colonies can not be estimated. But since Alternative D is mostly within an existing railroad corridor, few prairie dog colonies may be affected, particularly if vegetation growth within the existing corridor has been minimized by maintenance and/or prairie dog colonies have subjected to treatments with rodenticides.

Construction during winter within TBNG and along the Cheyenne River in South Dakota and its major tributaries in Wyoming (Black Thunder Creek, Little Thunder Creek and Antelope Creek) is likely to displace wintering bald eagles from perches and feeding areas or make those sites temporarily unsuitable within at least a 0.5-mile up to a 1-mile zone surrounding construction activities. Estimates of potential bald eagle wintering habitats within 0.5-mile and 1-mile zones of the Cheyenne River and major tributaries that could be affected by Alternative D are provided in Table 4-33.

Nearly 30 miles of Alternative D passes within 0.5-mile of potential bald eagle winter habitats in two counties in Wyoming and two in South Dakota. This is less than

Table 4-32
Animal and Plant Species Identified as At Risk by the Forest Service in the Northern Great Plains That Potentially Occur on TBNG and BGNG and Could be Impacted by Alternative C With the W G Flat Route Variation in Potential Habitats

Species At -Risk (1)	National Grasslands Occurrence	Miles of Alternative in Potential Habitat in National Grasslands	Evidence for Occurrence in Project Area by Habitat	Potential for Impact by Alternative (2)
Species Protected Under the ESA and at Risk of Rangewide Imperilment:				
Ute ladies'-tresses	TBNG	wet meadow - 0.04 mi	No known occurrence or recent observations although potential habitat is possible on TBNG and BGNG	Unknown
	BGNG	None		
Whooping crane	BGNG	None	Known occurrences but only incidentally during migrations	No
Bald eagle	TBNG	evergreen forest land - 0.3 mi	Documented wintering and potential nesting habitat in ponderosa pine woodlands and riparian cottonwood woodland	Probably
	BGNG	None		
Peregrine falcon (before delisting)	TBNG	None	Known occurrences but only incidentally during migrations.	No
	BGNG	None		
Black-footed ferret	TBNG	prairie dog colonies - 1.7 mi	Introduced in black-tailed prairie dog complex in Conata Basin, potential habitat for reintroduction	Possibly
	BGNG	None		
Mountain plover	TBNG	prairie dog colonies - 1.7 mi herbaceous rangeland - 31.8 mi cropland/pasture - 0.7 mi	Documented nesting habitats in short-grass prairie and black-tailed prairie dog colonies on TBNG, unknown occurrence on BGNG but potential habitat exists	Probably
	BGNG	herbaceous rangeland - 5.2 mi		
Species That may be at Risk of Rangewide Imperilment but are not Protected Under the ESA:				
Dakota buckwheat	BGNG	Unknown	Known occurrence in badlands, barren clay mounds and outwash in BGNG	Unknown
Barr orphacea	TBNG	Unknown	Known occurrence on clay hills in ne WY and present in Custer, Shannon Cos., SD	Unknown
	BGNG	Unknown		
Sturgeon Chub	TBNG	None	Documented in Cheyenne River, Custer, Pennington Cos., SD; appears absent in WY	Possibly
	BGNG	None		
Swift Fox	TBNG	prairie dog colonies - 1.7 mi herbaceous rangeland - 31.8 mi	Documented denning habitats in short-grass prairie on TBNG and BGNG	Possibly
	BGNG	herbaceous rangeland - 5.2 mi		
Species That may be at Risk of Regional or More Local Imperilment:				
Marsh bellflower	BGNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Nodding buckwheat	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG and BGNG	Unknown
	BGNG	Unknown		
Lanceleaf cottonwood	TBNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG and BGNG	Unknown
	BGNG	None		
Torrey's crypthantha	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG	Unknown
Marsh fern	BGNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown

Table 4-32 Continued				
Species At -Risk (1)	**National Grasslands Occurrence**	**Miles of Alternative in Potential Habitat in National Grasslands**	**Evidence for Occurrence in Project Area by Habitat**	**Potential for Impact by Alternative (2)**
Lady-fern	BGNG	None	Suspected to occur in suitable habitats in deciduous woodlands on BGNG	Unknown
Frostweed	BGNG	Unknown	Suspected to occur in suitable habitats in sandhills on BGNG	Unknown
Meadow horsetail	BGNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on BGNG	Unknown
Sand lily	TBNG	Unknown	Suspected occurrence on TBNG and BGNG on sandy areas on mixed grass prairie, on hillsides, open coniferous woods	Unknown
	BGNG	Unknown		
Blue lips	TBNG	None	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG and BGNG	Unknown
	BGNG	None		
Alyssum-leaf phlox	TBNG	Unknown	Suspected to occur in suitable habitats on buttes in TBNG and BGNG	Unknown
	BGNG	Unknown		
Alkali sacaton	TBNG	Unknown	Suspected to occur in suitable habitats in wetlands and riparian zones on TBNG	Unknown
Tawny Crescent Butterfly	TBNG	None	Suspected occurrence on TBNG in ponderosa pine savannah with riparian habitats	Unknown
Flathead Chub	TBNG	None	Documented occurrence in Cheyenne River, BGNG and Antelope Creek, TBNG	Possibly
	BGNG	None		
Plains topminnow	TBNG	None	Documented occurrence in tributaries to Cheyenne River on BGNG and TBNG	Possibly
	BGNG	None		
Northern leopard frog	TBNG	None	Known to occur in emergent wetland vegetation on TBNG and BGNG	Possibly
	BGNG	None		
American bittern	BGNG	None	Known to occur in emergent wetland vegetation on BGNG	Possibly
Yellow-billed cuckoo	TBNG	None	Known occurrence on TBNG and BGNG in woody shrub/tree overstory riparian vegetation	Possibly
	BGNG	None		
Long-billed curlew	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG and BGNG in short-grass and low mixed-grass prairie	Possibly
	BGNG	herbaceous rangeland - 5.2 mi		
Disckcissel	TBNG	herbaceous rangeland - 31.8 mi	Known occurrence on TBNG in moderately tall mixed-grass/tall-grass prairie	Possibly
Northern Goshawk	TBNG	evergreen forest 0.3 mi	Possible nesting on TBNG in ponderosa pine, may be on BGNG during migrations	Possibly
	BGNG	None		
Sage Grouse	TBNG	None	Documented occurrence in sagebrush steppe on TBNG and BGNG with leks present	Yes
	BGNG	None		
Ferruginous hawk	TBNG	herbaceous rangeland - 31.8 mi	Documented nesting on TBNG and BGNG in trees, on ground and rocks in grasslands and shrublands	Probably
	BGNG	herbaceous rangeland - 5.2 mi		