

ATTACHMENT R-11

WHARF MINE 2012 WILDLIFE MONITORING

PREPARED FOR:

Wharf Resources (USA), Inc.
10928 Wharf Road
Lead, South Dakota 57754-9710
Contact: Ron Waterland
605-584-4155

PREPARED BY:

ICF International
405 West Boxelder Road, Suite A-5
Gillette, Wyoming 82718
Contact: Amanda Hohnhorst
307-687-4769

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Acronyms and Abbreviations

monitoring program	Wharf wildlife monitoring program
R#E	Range East
SDGFP	South Dakota Department of Game, Fish, and Parks
SDNHD	South Dakota Natural Heritage Database
T#N	Township North
Wharf	Wharf Resources (USA), Inc.

Executive Summary

Annual wildlife monitoring has been conducted at Wharf Resources, Inc.'s Wharf Mine since 1982, and has included both standardized surveys and records of incidental sightings. A variety of baseline inventories for mine expansions have also been conducted since 1990. ICF biologists have conducted all wildlife monitoring, including several baseline wildlife studies, in the Wharf Mine area from 1994 through 2012.

From 1994 through 2002, the Wharf annual wildlife monitoring program included a thorough search for game bird breeding activity, point counts for breeding birds, and monitoring of known raptor nests combined with searching for new raptor nests in the wildlife survey area. All monitoring was conducted throughout the wildlife survey area, which includes the permit area and approximately a 0.5-mile perimeter (Figure 1). Prior to the 2003 surveys, modifications to the Wharf annual wildlife monitoring program allowed for the discontinuation of upland game bird and songbird surveys. Consequently, only surveys for raptor nests were conducted in the wildlife survey area from 2003 through 2005.

In 2006, Wharf reinstated surveys for upland game bird breeding activity around the proposed Summit Flats expansion area (within the current permit boundary) and a 0.5-mile perimeter. In 2007, Wharf expanded the upland game bird surveys to include the proposed Two Johns expansion area and a 0.5-mile perimeter, which overlaps with the extreme northern extent of the permit area. In 2008 and 2009, Wharf voluntarily conducted upland game bird surveys throughout the entire wildlife survey area, but discontinued the surveys in 2010. Surveys for nesting raptors, however, continued throughout the wildlife survey area from 2006 through 2012.

Raptor nesting activity within the Wharf monitoring area was limited during 2012, but slightly greater than the two previous years. Three nests (BWH5c/CH1e, BWH6a, and CH5a/GHO2) were confirmed active during the breeding season. A Cooper's hawk (*Accipiter cooperii*) was heard calling and observed on two different occasions (May and July) near the BWH5c/CH1e nest, a former broad-winged hawk (*Buteo platypterus*) nest, and whitewash was found directly under the nest tree. Based on these observations, the nest was presumably tended, but not occupied. In late May, a broad-winged hawk was observed incubating in nest BWH6a. In July, an adult broad-winged hawk was actively defending the nest site; however, no young were present in or around the nest. These observations infer that the nesting attempt at this site either failed due to natural causes, or the young fledged in between surveys. A great horned owl (*Bubo virginianus*) was observed incubating in CH5a/GHO2 in late May; however no activity was documented at the nest during the subsequent survey in July. Since great horned owls nest early relative to other raptor species, it is possible that this nest was successful and the young fledged prior to the second survey. Thus, the productivity for this nest remained uncertain.

Evidence of raptor activity was also recorded in the CH2 and CH4 territories in 2012. Although no active nests could be located, whitewash from raptors was identified in both areas, and biologist observed a raptor near the CH2b nest. Although this raptor was flying too fast through dense woodland to identify the species, it's likely that the territory was active during the breeding season. On May 10, a northern goshawk (*Accipiter gentilis*) and a mobbing broad-winged hawk were incidentally observed flying north through the western extreme of the survey area; however, no new nests were found in this area for either species during the 2012 surveys.

Introduction

Annual wildlife monitoring has been conducted at Wharf Resources, Inc.'s (Wharf) Wharf Mine from 1982 through 2012. Various wildlife baseline inventories have also been conducted for Wharf on adjacent lands during that period. In 1990, a baseline study (Mariah 1990) was conducted for the proposed Clinton expansion area located in the current eastern portion of the Wharf Mine. That expansion area was enlarged in 1992, and additional wildlife baseline data was collected that year (Powder River Eagle Studies 1992). Separate reports were prepared for the Clinton expansion and Wharf Mine through 1998, but were merged in 1999 when the expansion area became part of the Wharf Mine. Enhanced survey efforts and/or baseline inventories were also conducted in 2006 and 2007 for the proposed Summit Flats and Two Johns areas, respectively, and from 2009 through 2010 for an expansion of the Wharf and Golden Reward mines. The Wharf and Golden Reward mines expansion areas were incorporated into the annual monitoring program in 2012, as they became part of the Wharf Mine at that time.

ICF International (formerly Jones & Stokes, Thunderbird Wildlife Consulting, and Powder River Eagle Studies) conducted all monitoring for the Wharf annual wildlife monitoring program (monitoring program) beginning in 1994. The monitoring program has included both standardized surveys and observations of incidental sightings. Annual surveys conducted from 1994 through 2002 consisted of thorough searches for game bird breeding activity, point counts for breeding birds, and monitoring of known raptor nests combined with searching for new raptor nests throughout the wildlife survey area.

The monitoring program was modified in 2003 to allow for the discontinuation of surveys for game birds and songbirds. Consequently, only surveys for nesting raptors were conducted in the wildlife survey area from 2003 through 2005. Those efforts included visits to known nests to document raptor breeding activity and surveys for new nests within the known territories. In 2006, Wharf reinstated surveys for upland game bird breeding activity around the proposed Summit Flats expansion area (within the current permit boundary) and a 0.5-mile perimeter. In 2007, Wharf expanded surveys for upland game birds into the proposed Two Johns expansion area and a 0.5-mile perimeter, which overlaps with the northern extreme portion of the Wharf permit area. In 2008 and 2009, Wharf voluntarily conducted surveys for upland game birds throughout the entire wildlife survey area, but discontinued these surveys in 2010. Surveys for nesting raptors, however, continued throughout the wildlife survey area (Figure 1) from 2006 through 2012.

This report focuses on the results of the 2012 surveys, with references to previous years' data for discussions of long-term trends.

Survey Area

The Wharf Mine permit area is located approximately 2.0 miles west of Lead, Lawrence County, South Dakota. The permit area occupies approximately 1,980 acres in Townships (T) 4 and 5 North (N), and Range (R) 2 and 3 East (E). The wildlife survey area includes the entire permit area and approximately a 0.5-mile perimeter extending beyond the permit area (Figure 1). Surface ownership is primarily private, but also consists of small inclusions of federal land. In the past, this

general area was part of an active underground mining district. The current principal land uses are mineral development, recreation, logging, and residential activities.

The wildlife survey area is roughly bounded by McKinley Gulch on the west, Elk Mountain and the former Bald Mountain Mine on the north, Bald Mountain on the southeast, and Lost Camp Gulch and Terry Peak on the south. The wildlife survey area lies at the head of several drainages, including: False Bottom Creek, Deadwood Creek, Nevada Gulch, Annie Creek, Ross Creek, McKinley Gulch, Labrador Gulch, and Squaw Creek. Elevations range from approximately 5,500 to 6,600 feet above sea level. Numerous occupied residences and a ski lodge are located beyond the permit area in the south central portion of the wildlife survey area. New residential developments are also being planned and developed north of the wildlife survey area.

The principal habitats in the wildlife survey area include ponderosa pine (*Pinus ponderosa*), white spruce (*Picea glauca*), and trembling or quaking aspen (*Populus tremuloides*). Pine and spruce are the most prevalent native habitats in the area, while aspen habitat is somewhat less common. Limited meadow and riparian habitats, as well as grassland reclamation and disturbed areas are also present.

Pine habitat generally occupies the upper inclines of ridges, and the south- and west-facing slopes. Ponderosa pine is the dominant canopy species, though white spruce and trembling aspen are locally abundant within some pine habitats. The understory in the pine stands is generally open and sparse, with relatively few shrubs or herbaceous plants.

Spruce habitat exists primarily on north- and east-facing slopes. The dominant tree species is the white spruce, but a significant secondary component of paper birch (*Betula papyrifera*) and/or trembling aspen is often present in these stands. Understory characteristics vary according to stand development. Older stands that have undergone self-thinning include a mixture of pine and spruce, and support relatively diverse understory strata. The closed canopy of younger spruce stands tends to limit understory species. Large amounts of precipitation combined with strong winds have uprooted some spruce trees, particularly those on north-facing slopes.

As mentioned above, trembling aspen habitat is less common in the area than pine and spruce. Like spruce, aspen is generally restricted to north- and east-facing slopes, although it also occurs in areas that have previously been disturbed. This habitat generally contains some birch, spruce, and pine in the canopy, and diverse shrub and herbaceous strata.

Meadow habitat is quite limited in the wildlife survey area. These grassy, open areas can be natural or the result of human disturbances such as mining and logging. As implied, meadow habitat is characterized by the absence of woody overstory vegetation and an abundance of grasses and forbs. Riparian habitat is also limited, and occurs only in the actively flowing portions of Squaw Creek, Annie Creek, Deadwood Creek, False Bottom Creek, and Ross Valley.

Reclamation is found in the wildlife survey area where mining, backfilling, re-grading, and seeding have been completed. Extensive areas of reclamation occur in upper Ross Valley and at the headwaters of the Annie Creek and Squaw Creek drainages. Another significant reclaimed area is associated with the former Bald Mountain Mine and has been covered with barren rock, graded, topsoiled, and seeded by Wharf.

Disturbed areas are often characterized by an almost complete absence of vegetation. A large portion of the disturbed area is associated with the Wharf Mine facility. Mining activity has

occurred, or is occurring, in portions of Sections 1-4 and 12 T4N:R2E, Sections 26 and 33-36 T5N:R2E, and Section 6 T4N:R3E. Other substantial disturbances include development associated with the county roads that extend throughout the survey area and the Terry Peak ski facilities, residences, and other scattered buildings located in the southeastern portion of the wildlife survey area.

Methods

In 2012, ICF biologists visited Wharf during May 29-31 and July 27-30. During all fieldwork, personnel maintained a list of all vertebrate wildlife species encountered in the wildlife survey area. Species were identified with the aid of standard field guides and regional faunal texts and checklists (Burt and Grossenheider 1976, Baxter and Stone 1980, Jones et al. 1983, Sharps and Benzon 1984, Houtcooper et al. 1985, Stebbins 1985, Clark and Stromberg 1987, U.S. Forest Service 1988, Peterson 1990, South Dakota Ornithologist's Union 1991, Kiesow 2006).

Raptors

Raptor nest monitoring was conducted during each of the site visits in May and July, 2012. During each visit, biologists watched and listened for evidence of nesting raptors. All known raptor territories in the wildlife survey area were monitored for activity. Searches for new nest sites were conducted in existing territories and where adults exhibited nesting behavior (e.g., defensive flight and calls) in new locations.

Nest monitoring and searches were conducted using a variety of methods. Each previously identified nest site was checked early in the nesting season to determine activity. Nests were initially observed from a parked vehicle using a spotting scope or on foot from a hidden vantage point with binoculars to avoid disturbing potential activity at the nest sites. Nest searches involved walking and/or driving throughout the wildlife study area while looking for raptors and nests, and by using manual or CD-recorded raptor calls (great horned owl and broad-winged hawk) in an attempt to elicit defensive behavioral responses, especially in heavily wooded areas where visibility was limited. During and after calling, biologists watched and listened for raptors for several minutes with the vehicle engine turned off to enhance the opportunity to hear a response. Areas where raptors had been observed and areas where raptors responded to calls were thoroughly searched on foot. Nests were not directly approached until the appropriate timing when young would be hatched or the site was determined to be inactive. When a nest was found, the tree was flagged with either pink-and-black striped or solid pink survey tape and marked "WILDLIFE TREE-DO NOT CUT." The distances to nearest regular human disturbances were estimated and recorded for each intact nest during the breeding season.

Nest searching was also concentrated in locations targeted for mine expansion. In May and/or July 2012, pedestrian surveys were conducted in conjunction with the other survey protocols described above throughout portions of the expanding Golden Reward and Wharf mines. Specifically, those areas intensively surveyed included NE NW Section 35 T5N:R2E, NW NW Section 1 and NE NE Section 12 T4N:R2E.

Results

Appendix I lists all mammalian, avian, reptilian, and amphibian species that could potentially occur in the Wharf Mine wildlife survey area, as well as those actually detected during all previous years' surveys and in 2012.

Raptors

Since 1990, five broad-winged hawk territories have been identified in the Wharf Mine wildlife survey area. Two of those territories (BWH1 and BWH2) were active and first identified in 1990. Two others (BWH4 and BWH5) were documented in 1997, and one more (BWH6) was located in 1998. In addition, five Cooper's hawk territories (CH1-5), three red-tailed hawk (*Buteo jamaicensis*) territories (RTH1-3), and four nests built by an undetermined raptor species (UNK3-6) have been documented in the wildlife survey area over the years. Six nests (REL1-6) have been relocated to new sites beyond proposed disturbance areas. Additional territories and/or nest sites have occasionally been identified beyond the survey area; however, those nests are not included in the annual wildlife reports.

Raptor nest locations are depicted in Figure 1 and their histories (from 1994 through 2012) are summarized in Table 1. Because none of the relocated nests have been used at their new locations (including in 2012), they are not included in Table 1; however, they are discussed in further detail in the *Raptor Nest Relocations* section below. The distance from each intact nest to the nearest source of human disturbance in 2012 is presented in Table 2.

Broad-winged Hawk Territory BWH1

Studies in other broad-winged hawk populations have demonstrated that this species rarely uses the same nest within a given territory in consecutive years (Goodrich et al. 1996, Johnsgard 1990). The same has been generally true for nests in the Wharf Mine wildlife survey area. Six natural nests and one relocated nest site have been identified or created, respectively, in the BWH1 territory north of Green Mountain in S½ Section 35 T5N:R2E (Figure 1). Three of the natural nests (BWH1a, BWH1c, and BWH1d) were removed and relocated outside the territory prior to the 1998 breeding season (see the *Raptor Nest Relocations* section below). In August 1999, a fourth nest was moved from the BWH1e site to a pine tree north of the pit development area (REL6, Figure 1) to avoid mine disturbance. The remaining two nests (BWH1b and BWH1f) were destroyed by natural causes prior to the 1994 and 2003 breeding seasons, respectively. Therefore, only the relocated nest, REL6, was still intact in the BWH1 territory during the 2012 nesting season.

Nesting activity was documented during 6 of the 21 years that the BWH1 territory has been monitored (see Table 1 for activity documented from 1994-2012). The pair successfully fledged chicks during 4 of those years. In the other 2 years, the pair incubated eggs but failed to hatch young. No nesting activity has been observed in the territory since 1999.

In 2012, the only remaining nest (REL6) in the BWH1 territory was in particularly poor condition. No broad-winged hawks were observed in or near the BWH1 territory, and no new nests were documented.

Broad-winged Hawk Territory BWH2

The BWH2 territory is located in Section 2 T4N:R2E (Figure 1), between Foley Mountain to the west and Terry Peak to the southeast, and in an area with heavy existing and increasing residential and recreational development. Broad-winged hawks nested at the BWH2a nest when the territory was first recorded in 1990, but no active nests were recorded in that area again until 1999 (Table 1). A pair nested in this territory 4 of the 5 years from 1999 through 2003, and fledged young in 3 of those 4 years. Although multiple intact nests have persisted, no active nests have been documented in the BWH2 territory since 2003.

Seven nests have been identified in the BWH2 territory during the multiple years of monitoring for the Wharf Mine (Table 1). As indicated above, the first nest (BWH2a) was discovered in 1990. The nest was successful that year, but was inactive in each subsequent year through 2000. The nest was destroyed by natural causes sometime between the 2000 and 2001 breeding seasons. No nesting hawks were documented in the BWH2 territory from 1991 through 1998, though new nest sites were discovered during that period.

Nest BWH2b was found by a Wharf geologist in late August 1995. This nest was documented just adjacent to the road that leads into the Terry Peak residential subdivision, approximately 0.25 mile south-southeast of the BWH2a nest. Although the nest was obviously built by broad-winged hawks prior to the 1995 breeding season, hawks have never been documented using or even tending the BWH2b nest.

Three inactive nests, tentatively identified as those of broad-winged hawks, were discovered in 1997. Nests BWH2c, BWH2d, and BWH2e (Figure 1) were all within 0.25 mile of each other, and within 300 feet of the northern-most road through the Terry Peak subdivision. By 1999, both the BWH2d and BWH2e nests had been destroyed by natural causes, and the BWH2c nest was no longer present in 2007. Broad-winged hawks rebuilt the BWH2e nest in 2001 and laid eggs, but did not hatch any young. Prior to the 2009 breeding season, the BWH2e nest had once again been destroyed by natural causes.

In 1998, nesting material was seen in a pine tree approximately 250 feet west of the BWH2c nest and 60 feet from a gravel residential road in the Terry Peak subdivision, though no birds were observed in the area that year. Broad-winged hawks improved the nest site (BWH2f) in 1999, and fledged one chick during both 1999 and 2000. The nest has been inactive since then.

A seventh nest (BWH2g) was discovered in the territory in late May 2003. That nest was in a ponderosa pine approximately 100 feet east-southeast of BWH2e (Figure 1). The pair fledged one chick from the nest that year, but the nest has been inactive since then.

When biologists visited the territory in 2004, the lots on which the BWH2c, e, f, and g nests were located had been logged during the previous fall or early winter. Although all nest trees were flagged and still standing, approximately 90% of the surrounding trees had been removed from the lots. Consequently, the nests were exposed to and clearly visible from the residential roads, which has likely influenced the lack of activity since 2003. Despite annual searches and calling efforts throughout the area, no hawks or new nests have been detected in recent years, including in 2012.

Broad-winged Hawk Territory BWH4

The BWH4 territory was first discovered at the northeast extent of the permit area in 1997 (Figure 1). Broad-winged hawks successfully nested each year from 1997 through 1999, using a different nest each year (BWH4a, 4b, and 4c, respectively, Table 1). However, the pair was active in only one of the subsequent 9 years, fledging one young from a new nest (BWH4d) in 2003.

As indicated above, activity has not been documented for more than 1 year at any of the four known nests in the BWH4 territory. BWH4a was first identified in 1997 east of the Bald Mountain Mine. The nest was active when it was discovered in an area slated for developmental drilling. Wharf modified its scheduled drilling program that year to avoid disturbing the nesting pair, which fledged one chick. In 1998, the BWH4a nest was removed and relocated (see the *Raptor Nest Relocations* section below). That same year, one new nest (BWH4b) was found less than 0.25 mile east of the former BWH4a site and along the same drainage. Three young fledged from the BWH4b nest in 1998, but it has not been used since then. In 2011, the BWH4b nest was in very poor condition with only remnants of the original nesting material remaining. In 2012, the nest was no longer present and considered destroyed due to natural causes.

In 1999, a new active nest (BWH4c) was found between the former BWH4a site and the BWH4b nest. Three young fledged that year, but the nest was never used again. Adult hawks were occasionally seen and heard north of the BWH4c area each year from 2000 through 2002, and again in 2004. Despite repeated searches and calling efforts in that area, no broad-winged hawks have responded nor demonstrated any further activity at that nest site since 2004.

The fourth nest (BWH4d) was discovered in a large ponderosa pine in July 2003, approximately 180 feet up a side drainage from the BWH4c nest. One chick fledged from the nest that year. The nest site was inactive during 2004 and 2005, and was destroyed by natural causes prior to the 2006 breeding season. In fall 2005, selective logging occurred in the immediate vicinity of BWH4d and encroached upon both the BWH4b and BWH4c nests. Selective logging in summer 2009 again occurred in the vicinity of both nests. No nesting activity has been documented in the BWH4 territory from 2004 through 2012.

Broad-winged Hawk Territory BWH5

The BWH5 territory has been monitored for the last 15 years (1997 through 2012). Broad-winged hawks nested in this territory during 3 of those years, and fledged young in 2 years (Table 1). Four nests have been documented in the BWH5 territory (Figure 1) since it was discovered in 1997.

Nest BWH5a was found in 1997, northwest of the Bald Mountain Mine and roughly 400 feet east of the road that led to the Richmond Hill Mine. The nest was atypically situated in a pine tree, nearly 6 feet out from the trunk on a large limb rather than against the main trunk or in a primary fork of the tree. One young fledged from the nest that year, but the nest was then destroyed by natural causes during the winter of 1997/1998. A new nest (BWH5b) was found less than 150 feet north of the original nest site in 1999. Like the former nest, the BWH5b nest was located in an atypical position away from the trunk on a lateral limb of another pine tree. Two young fledged from the BWH5b nest that year. Adult hawks were observed in the territory sporadically during each of the next 3 years, but no new or active nests were found during that period. No broad-winged hawks were heard or seen in the immediate vicinity of the BWH5b nest site from 2003 through 2006, and the nest was destroyed by natural causes prior to 2007.

In 2004, biologists found nest BWH5c/CH1e in a ponderosa pine approximately 650 feet northeast and downslope of BWH5b. Although evidence of nesting was observed early in the season, lack of activity during later visits determined that the nesting attempt had likely failed due to natural causes. The nest has been inactive every year from 2004 to 2009. However, in 2010, the nest showed signs of recent activity, as new nesting material was documented at the site and adult raptors (a broad-winged hawk and Cooper's hawk) displaying territorial behavior were seen in the general vicinity during both survey visits that year. However, no further activity could be confirmed, and the nest was determined to be tended (by an unknown species), but not likely occupied. In 2011, biologists documented Cooper's hawks incubating in the BWH5c/CH1e nest during the early survey, but surmised that the nesting attempt failed due to natural causes, as no birds were present and adult feathers and eggshell fragments were found below the nest during the later survey that year. Some level of activity was again documented in 2012. On May 29, no activity was observed at the nest site; however, a Cooper's hawk was observed perched along a drainage just southwest of BWH5c. Again on July 30, a juvenile Cooper's hawk was observed perched in the vicinity of the nest site, and whitewash was also located directly under the BWH5c nest. The presence of a Cooper's hawk(s) and whitewash directly under the BWH5c nest tree suggest that the nest was again tended in 2012, but not likely occupied.

A fourth nest (BWH5d) was discovered in a ponderosa pine in 2005 (Figure 1). Although at least two broad-winged hawks were seen and heard when the nest was found, no sign (e.g., fresh nesting material) of recent activity was documented at the site itself. Additional sightings of the pair occurred that year at a considerable distance from any known nests in the BWH5 territory, primarily north of the wildlife survey area in NE Section 26 T5N:R2E. No broad-winged hawks were reported in the BWH5 territory from 2006 through 2009. However, Cooper's hawks actively nested at the BWH5d nest (now BWH5d/CH1d) and fledged four young in 2007. Cooper's hawks again utilized the nest in 2009 and fledged three young. No activity or new nest material was documented at the nest site from 2010 to 2012.

Broad-winged Hawk Territory BWH6

Only two nests have been discovered in the BWH6 territory (Figure 1). In early June 1998, an active broad-winged hawk nest (BWH6a) was found 0.5 mile north of the permit area at the head of Labrador Gulch. The nest was in a pine tree in an area dominated by small aspen and scattered pines. The pair was incubating when the nest was first discovered, but they had abandoned it by early July. In 1999, the pair fledged three young from a new nest (BWH6b) located slightly north of the previous nest site and farther down Labrador Gulch. During the non-breeding season between 2001 and 2002, the pine stands surrounding the BWH6 nests were selectively logged, resulting in a much more open canopy. No nesting activity was documented in the BWH6 territory from 2000 through 2002. In 2003, biologist saw and heard two broad-winged hawks in the vicinity; however, no new nests could be located that year. By spring 2004, many trees in the logged stands had been toppled by wind and nesting activity was again absent in the territory from 2004 through 2008.

Table 1. Raptor Nest Histories¹ in the Wharf Mine Wildlife Survey Area (1994 through 2012).

Nest #	¼ ¼ Sec T(N):R(E) (substrate)	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
BWH1a*	SE SW 35 5N:2E (ponderosa pine)	I	Alt	Alt	Alt	Rel	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BWH1b*	SE SW 35 5N:2E (ponderosa pine)	D/N	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BWH1c*	SW SE 35 5N:2E (ponderosa pine)	—	A 1f	A 3e, 0h	Alt	Rel	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BWH1d*	NE SE 35 5N:2E (ponderosa pine)	—	—	—	A, 3e,0h	Rel	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BWH1e	NE SE 35 5N:2E (ponderosa pine)	—	—	—	—	I	Rel	—	—	—	—	—	—	—	—	—	—	—	—	—
BWH1f	NE SE 35 5N:2E (ponderosa pine)	—	—	—	—	—	A 2e, 2f	I	I	I	D/N	—	—	—	—	—	—	—	—	—
BWH2a	SW NE 2 4N:2E (ponderosa pine)	I	I	I	I	I	Alt	Alt	D/N	—	—	—	—	—	—	—	—	—	—	—
BWH2b	NW SE 2 4N:2E (ponderosa pine)	—	I	I	I	I	Alt	Alt	Alt	I	Alt	I	I	I	I	I	I	I	I	I
BWH2c	NE SW 2 4N:2E (ponderosa pine)	—	—	—	I	I	Alt	Alt	Alt	I	Alt ³	I	I	I	D/N	—	—	—	—	—
BWH2d	NW SE 2 4N:2E (ponderosa pine)	—	—	—	I	I	D/N	—	—	—	—	—	—	—	—	—	—	—	—	—
BWH2e	SE NW 2 4N:2E (ponderosa pine)	—	—	—	I	I	D/N	—	A 1h, 0f	I	Alt ³	I	I	I	I	I	D/N	—	—	—
BWH2f	NE SW 2 4N:2E (ponderosa pine)	—	—	—	—	I	A 1f	A 1f	Alt	I	Alt ³	I	I	I	I	I	I	I	I	I
BWH2g	NW SE 2 4N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	A ³ 1f	I	I	I	I	I	I	I	I	I

Table 1. Continued.

Nest #	$\frac{1}{4}$ $\frac{1}{4}$ Sec T(N):R(E) (substrate)																			
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
BWH4a	NW NW 5N:2E 36 (ponderosa pine)	—	—	—	A 1e,1f	Rel	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BWH4b	SW SW 25 5N:2E (ponderosa pine)	—	—	—	—	A 3f	Alt	I	I	I	Alt	I	I ³	I	I	I	I ³	I	I	D/N
BWH4c	NW NW 36 5N:2E (ponderosa pine)	—	—	—	—	—	A 3f	I	I	I	Alt	I	I ³	I	I	I	I ³	I	I	I
BWH4d	NW NW 36 5N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	A 1f	I	I ³	D/N	—	—	—	—	—	—
BWH5a	SW SE 26 5N:2E (ponderosa pine)	—	—	—	A 1f	D/N	—	—	—	—	—	—	—	—	—	—	—	—	—	—
BWH5b	SW SE 26 5N:2E (ponderosa pine)	—	—	—	—	—	A 2f	I	I	I	I	Alt	I	I	D/N	—	—	—	—	—
BWH5c/ CH1e	NW SE 26 5N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	—	A 0f	I	I	I	I	I	A-T	A ^{CH} 0h,0f	A-T
BWH5d/ CH1d	NW SE 26 5N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	—	—	I	I	A ^{CH} 4f	I	A ^{CH} 3f	Alt	I	I
BWH6a	NW NW 34 5N:2E (ponderosa pine)	—	—	—	—	A 3e, 0h	Alt	I	I ³	I	I	I	I	I	I	I	Alt	I	I	A/?
BWH6b	NW NW 34 5N:2E (ponderosa pine)	—	—	—	—	—	A 3e,3f	I	I ³	I	I	I	I	I	I	I	A-T	I	I	Alt
CH1a	NW SE 26 5N:2E (aspen)	I	I	I	I	I	I	I	I	I	I	I	I	D/N	—	—	—	—	—	—
CH1b	NW SE 26 5N:2E (aspen)	I	I	I	I	I	I	I	I	I	I	I	I	D/N	—	—	—	—	—	—
CH1c	SW SE 26 5N:2E (aspen)	I	I	I	I	I	I	I	I	I	I	I ³	I	I	I	I	D/N	—	—	—
CH2a	SE NW 4 4N:2E (ponderosa pine)	—	—	A 2f	A 1f	I	Alt	I	I	Alt	I	I ³	I	I	I	I	I	I	I	I

Table 1. Continued.

Nest #	¼ ¼ Sec T(N):R(E) (substrate)	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
CH2b	NE NW 4 4N:2E (ponderosa pine)	—	—	—	—	—	A 1f	I	I	Alt	I	I	I	I	I	I	I	I	I	I	I
CH2c	NE NW 4 4N:2E (ponderosa pine)	—	—	—	—	—	I	I	I	Alt	I	I	I	I	I	I	I	I	I	I	I
CH2d/ GH01a	SE NW 4 4N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	A/U	I	I	I	A-T ^{CH}	A ^{GH0} 2f	I	I	I	I	I	I
CH2e/ GH01b	NW NE 4 4N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	—	—	—	I	I	A ^{GH0} 2f	I	I	I	I	I
CH4a	NW NW 34 5N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	— ³	I	I	I	Alt	I	D/N	—	—	—	—
CH4b	NW NW 34 5N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	— ³	A 2f	I	I	A-T	I	Alt	I	I	I	I
CH4c	NW NW 34 5N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	A/?	I	I	I	I
CH5a/ GH02	SE SW 25 5N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	—	A 4f	I ³	I	Alt	I	I ³	I	I	A/?	A/?
CH5b	NW NW 36 5N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	—	—	—	—	A, 1+h, 0f	I	D/N	—	—	—	—
RTH1 ²	NW SE 4 4N:2E (ponderosa pine)	I	I	A 1f	A 1f	A/U	D/N	—	—	—	—	—	—	—	—	ND	ND	ND	ND	ND	ND
RTH2 ²	NE NE 1 4N:2E (ponderosa pine)	—	—	A 0f	I	I	I	I	I	D/N	—	—	—	—	—	ND	ND	ND	ND	ND	—
RTH3	SW NE 34 4N:2E (spruce)	—	—	—	—	—	—	—	—	—	—	—	—	—	A-T	I	I	I	I	I	I
UNK1 ²	NE SW 3 4N:2E (ponderosa pine)	I	I	I	D/N	—	—	—	—	—	—	—	—	—	ND	ND	ND	ND	ND	ND	ND
UNK3/ CH3	SW NW 36 5N:2E (paper birch)	—	—	—	I	Rel	—	—	—	—	—	I ⁴	I	I	I	I	I	I	I	I	I

Table 1. Continued.

Nest #	¼ ¼ Sec T(N):R(E) (substrate)	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
		UNK4	NE NW 4 4N:2E (ponderosa pine)	—	—	—	—	—	I, D/N	—	—	—	—	—	—	—	—	—	—	—
UNK5	NW NW 4 4N:2E (ponderosa pine)	—	—	—	—	—	I, D/N	—	—	—	—	—	—	—	—	—	—	—	—	—
UNK6	SW NW 36 5N:2E (ponderosa pine)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	I	I	I	I

¹ None of the relocated nest sites have been used during monitoring for the Wharf Mine and are, therefore, not included in this table.

² Nest site has not been consistently within the wildlife survey area.

³ Selective logging occurred around or near the nest tree after or during the breeding season.

⁴ The nest was rebuilt prior to the breeding season.

* Nest location is within the Wharf Mine permit area (2012).

Species Codes:

- BWH = broad-winged hawk
- CH = Cooper's hawk
- GHO = great horned owl
- RTH = red-tailed hawk
- UNK = unknown raptor species

Nest Status Codes:

- A = active
- Alt = alternate to an active nest
- A-T = active, tended
- D/N = destroyed by natural causes
- I = inactive
- ND = no data
- Rel = relocated
- U = unsuccessful
- = nest undiscovered or non-existent
- ? = status uncertain
- #e = number of eggs
- #h = number of hatched young
- #f = number of fledged young

Table 2. Nearest Anthropogenic Disturbance to Intact Raptor Nests in the Wharf Mine Wildlife Survey Area (2012 Nesting Season).

Nest #	Disturbance Type	Distance	2012 Status
BWH2b	Residential and ski area paved access road/ski and vacation condominiums	50 feet/ 500 feet	Inactive
BWH2f	Residential dirt road/ residence(s)	60 feet/ 225 feet	Inactive
BWH2g	Residential dirt road/ residence	300 feet/ 1,080 feet	Inactive
BWH4c	Recreational and logging trail	35 feet	Inactive
BWH5c/ CH1e	Recreational trail	100 feet	Active ^{CH}
BWH5d/ CH1d	Recreational trail	375 feet	Inactive
BWH6a	Recreational and logging trail	2 feet	Active ^{BWH}
BWH6b	Recreational and logging trail	975 feet	Inactive
CH2a	Recreational and logging trail/ mine activity	15 feet/ 1,500 feet	Inactive
CH2b	Low-use recreational and logging trail/ mine activity	325 feet/ 2,000 feet	Inactive
CH2c	Recreational and logging trail/ mine activity	50 feet/ 1,500 feet	Inactive
CH2d/ GH01a	Recreational and logging trail/ mine activity	265 feet/ 1,700 feet	Inactive
CH2e/ GH01b	Low-use recreational and logging trail/ mine activity	15 feet/ 1,000 feet	Inactive
CH4b	Recreational and logging trail	1,070 feet	Inactive
CH4c	Recreational and logging trail	1,000 feet	Inactive
CH5a/GH02	Recreational and logging trail	300 feet	Active ^{GH0}
RTH3	Transmission line	500 feet	Inactive
UNK3/CH3	Logging trail/ mine activity	150 feet/ 2,000 feet	Inactive
UNK6	Transmission line/ Recreational and logging road	350 feet/ 250 feet	Inactive

Raptor Species Codes:

BWH = Broad-winged hawk
CH = Cooper's hawk

GH0 = Great horned owl
RTH = Red-tailed hawk

UNK = Unknown species

In 2009, broad-winged hawks were observed calling and defending in the territory. No active nests were located in the area; however, the BWH6b nest appeared to have been minimally tended based on new nesting material that had been sparsely added. In 2010, a broad-winged hawk was observed soaring in the vicinity of the BWH6 territory, but did not display any territorial behavior. No broad-winged hawks were observed within the BWH6 territory, and no new nests were found during 2011 surveys. On May 29, 2012, the BWH6a nest was active with an incubating broad-winged hawk. Although no chicks were observed at a later survey data in 2012, one adult broad-winged hawk was flying and calling in defense of the BWH6a nest site. It is possible that the young may have fledged in between surveys, or the nest failed due to natural causes.

Cooper's Hawk Territory CH1

Three distinct accipiter nests have been found along False Bottom Creek in SE Section 26 T5N:R2E, north of the former Bald Mountain Mine (Figure 1). All are in large aspen trees and are assumed to be Cooper's hawk nests due to their small size, location within the tree, and the presence of the species in the vicinity of the nests. Nest CH1a was first identified in 1992, while nests CH1b and CH1c were both found in 1994. Although Cooper's hawks were observed in the area during some years, all three nests have been inactive since their discovery. The area around nest CH1c was selectively logged sometime between August 2004 and June 2005, and nests CH1a and b were destroyed by natural causes prior to the 2006 breeding season. Prior to the 2009 breeding season, the CH1c nest tree toppled, and this nest was also destroyed. In 2007, Cooper's hawks took over nest BWH5d (now BWH5d/CH1d) and fledged four young. No activity was documented at this nest in 2008, but Cooper's hawks again nested at this location in 2009 and fledged three young.

As detailed above, adult raptors (broad-winged hawk or Cooper's hawk) displaying territorial behavior were seen in this general vicinity and possibly associated with the BWH5c/CH1e nest during both visits in 2010. Although it could not be determined which species may have been associated with the BWH5c/CH1e nest in 2010, ICF biologists confirmed an incubating Cooper's hawk using the nest during the first visit in 2011. This nesting attempt presumably failed as the nest was abandoned, and eggshells were documented below the nest during the subsequent visit. During the first survey in 2012, a Cooper's hawk was observed flying and perching in close proximity to the nest. During the second 2012 survey, a confirmed juvenile Cooper's hawk was calling, flying, and perching just east of the nest site, and whitewash was located directly under the nest.

Cooper's Hawk Territory CH2

Since 1996, five nests have been discovered south of Elk Mountain in the CH2 territory (Figure 1). In 1996, nest CH2a was discovered about 0.25 mile southwest of the active mine area. The nest is in a large pine tree at the site of a former breeding bird survey plot. Two young fledged from the nest in 1996, and one additional young fledged in 1997. The nest has been inactive from 1998 through 2012.

In 1999, two new nests (CH2b and CH2c) were discovered in the same general area (Figure 1). One chick fledged from the CH2b nest that year. Nest CH2c may have been built and used in 1998, but was not likely detected earlier because of its inconspicuous location and the secretive behavior of Cooper's hawks. This nest has been inactive since its discovery. Selective logging occurred in the area north of the CH2c nest between the 2004 and 2005 breeding seasons, and in close proximity to the nest between the 2005 and 2006 breeding seasons.

Nest CH2d/GH01a was discovered in 2002, approximately 150 feet west of the CH2a nest. The nest was in poor condition, but downy feathers were visible on the nest and the remains of two broken eggs were found at the base of the tree. Those items indicated that the nest was used that year and failed, possibly due to damage from strong winds. No nesting activity was documented in the territory from 2003 through 2005, but nest CH2d appeared to have been improved and in good condition when checked in May 2006. A single Cooper's hawk was also observed in the area for an extended duration that year but was never documented at the nest itself. In 2007, the CH2d nest (now CH2d/GH01a) was used by great horned owls, which produced two fledglings. That was the first record of nesting great horned owls in the Wharf Mine wildlife survey area.

One additional nest (CH2e) was discovered in May 2006. The nest was in a ponderosa pine approximately 650 feet southeast of nest CH2c. The nest was in good condition, but no activity was observed at or near the nest on that date or during subsequent visits that year. In 2008, a pair of great horned owls occupied the nest, and it was renamed as CH2e/GH01b. The nesting owls were discovered by Wharf personnel in mid-May and two large downy young were present at that time. With guidance from the South Dakota Department of Game, Fish, and Parks (SDGFP), Wharf established a 400-foot buffer around the nest site that year to minimize disturbance while the nest was active. Activities were limited or ceased in the area until a biologist confirmed that both young had fledged. No activity was documented at the nest from 2009 through 2012.

In 2011, adult broad-winged hawks exhibited a defensive response to conspecific broadcast calls near the CH2c nest on both survey dates. The adult hawk called several times and remained perched in the area for an extended period and eventually retreated back into the woodlands. Despite thorough searching on both survey dates, no new nests were found, and no nesting activity or sign of activity was documented at the CH2c nest (it remained in poor condition) or any other nest in the CH2 territory. However, due to the territorial response it was assumed that broad-winged hawk nesting activity is likely to have occurred within or in close proximity to the CH2 territory in 2011. No activity was documented at the CH2c nest during 2012 surveys, but biologists did record an unidentified raptor near the CH2b nest in May. The raptor was observed flying quickly through dense trees and did not vocalize with any alarm calls. Whitewash was also located approximately 85 meters south-southwest of the CH2b nest. The CH2 territory was more than likely active again in 2012, and continued efforts to confirm nesting activity and/or locate new broad-winged hawk nests in this area will be a priority in subsequent years.

Cooper's Hawk Territory CH3

Nest UNK3/CH3 (Figure 1) was first discovered in 1997. At that time, it was in poor condition and had presumably not been used for a number of years. Biologists removed and relocated the nest in 1998 (see the *Raptor Nest Relocations* section below). In 2004, biologists discovered that the nest had been rebuilt at the original location sometime before that year. Repeated site visits that year indicated that the nest was inactive, and no raptor activity was documented at or near the nest. Although the original use was unknown, the size and composition of the nest documented in 2004 suggested that it had been rebuilt by Cooper's hawks. The nest has been inactive in each of the following years through 2012.

Cooper's Hawk Territory CH4

This territory was discovered in 2004 when biologists found two nests (CH4a and CH4b) in NW NW Section 34 T5N:R2E (Figure 1). Both nests were located approximately 300 feet northwest of the BWH6 nests and situated in ponderosa pine trees just beyond a recently logged area along Labrador Gulch. In 2004, nest CH4a was inactive, and the CH4b nest was active with the pair fledging two young. Both nests were inactive between 2005 and 2008, with the exception of the CH4b nest being tended in 2007. The CH4a nest had been destroyed due to natural causes prior to the 2009 breeding season; however, in July 2009, a new active nest (CH4c) was discovered approximately 275 feet north of the CH4a nest site. The CH4c nest was discovered when a female Cooper's hawk was flushed from the nest tree and proceeded to exhibit a lengthy territorial response by flying and calling from multiple perch sites surrounding the nest. Due to the limited visibility inside the nest and the vigorous defense from the adult, the productivity at the nest could not be determined that year. During 2010 and 2011, no activity was documented within the CH4 territory, and no new nests were found. During 2012 surveys, no new nests were found and no raptors were seen, but whitewash was located approximately 20 meters north-northwest of CH4b.

Cooper's Hawk Territory CH5

A single Cooper's hawk nest (CH5a) was discovered near the broad-winged hawk nest BWH4b in 2004 (Figure 1). Nest CH5a was located in the fork of a large ponderosa pine in a mixed stand of mature pine, poplar, and birch trees. The structure and placement of the nest was quite similar to that of a broad-winged hawk nest, but four Cooper's hawk young fledged from the nest that year. The drainage was selectively logged during the winter of 2005 and spring of 2006. Again in summer 2009, selective logging in the adjacent drainage and surrounding tree stands resulted in a significant change to the canopy cover. The nest had been inactive since 2005 until great horned owls were observed incubating in the nest on May 30, 2012. During the subsequent survey in July, no activity was documented at the nest. Great horned owls nest early relative to other raptor species, and it is possible that the young fledged prior to the July survey. Thus, productivity for this nest remains uncertain. To reflect the use of this nest by multiple species, it is now referred to as CH5a/GHO2, and is only the second great horned owl territory documented in the Wharf survey area.

In 2007, a new nest (CH5b) was discovered near the former BHW4a nest site. Whitewash was observed around the base of the tree, but no other nesting evidence (e.g., prey remains) was documented. That observation indicated the nest had been active, but presumably failed shortly after hatching young. The nest was inactive in 2008 and no longer present in 2009, most likely from natural causes.

Red-tailed Hawk Nest RTH1

In 1991, a red-tailed hawk nest (RTH1) was found in a large ponderosa pine approximately 0.3 mile beyond the southwestern corner of the Wharf Mine permit area. More specifically, the nest was found on the east-facing slope of a draw above Annie Creek (Figure 1). The nest was not monitored again until 1994, and it was inactive in 1994 and 1995. One chick fledged from the nest site during both 1996 and 1997. In 1998, a pair of red-tailed hawks defended the nest area during the breeding season, but no young were evident. When the nest was checked in June 1999, it was designated as "destroyed by natural causes." No hawks have been observed during periodic monitoring of the

area since 1998, and no new nests have been found. This nest location was not monitored from 2008 to 2012, because it is located beyond the 0.5-mile wildlife survey perimeter.

Red-tailed Hawk Nest RTH2

In 1996, Wharf personnel followed a pair of red-tailed hawks flying through the area and discovered nest RTH2 east of Bald Mountain (Figure 1). The nest was active but unsuccessful in 1996, and inactive in the following 2 years. During the summers of 1999 and 2000, a few isolated sightings of individual red-tailed hawks were recorded in the vicinity of Bald Mountain, but no pairs were observed and the RTH2 nest remained inactive. The nest was also inactive in 2001, but one mildly defensive red-tailed hawk was seen in the vicinity in July of that year. The nest could not be found in 2002 and was assumed to have been destroyed by natural causes. Since then, including in 2012, no red-tailed hawks or new nests were documented in the area.

Red-tailed Hawk Nest RTH3

In 2007, one new red-tailed hawk nest (RTH3) was found in a spruce tree in SW NE Section 34 T5N:R2E (Figure 1). The nest had new material during the May visit, but no active nesting (i.e., eggs laid or young hatched) was confirmed at the site. The nest has been inactive from 2008 through 2012, and no red-tailed hawks have been observed in the area during that time. In 2012, extensive logging has occurred in close proximity to RTH3; however, it will continue to be monitored for raptor activity during future surveys.

Nests of Unknown Species (UNK)

Nest UNK1 was a stick nest of unknown origin located approximately 0.3 mile south of the permit area in NE SW Section 3 T4N:R2E (Figure 1). It was inactive and dilapidated when found during a search of the Copperhead EXNI area in 1994. Based on its physical characteristics and general setting, the nest was likely built by either broad-winged hawks or sharp-shinned hawks (*Accipiter striatus*). The nest remained inactive during subsequent years and continued to deteriorate. In 1997, it was designated as “destroyed by natural causes.” This nest location has not been monitored since 2006 because it is located beyond the current wildlife survey area.

In 2004, biologists discovered that raptors had built a new nest in the original UNK3 nest tree prior to that year. As noted in the aforementioned description of the CH3 territory, the new nest was presumably built by Cooper’s hawks based on its size and the material used in the nest. The nest was inactive each year from 2004 through 2012, and no recent raptor activity has been detected in the vicinity.

Two remnant nests (UNK4 and UNK5) of unknown raptor species were found in 1999. Both sites were west of the Wharf Mine and south of Elk Mountain (Figure 1). Both nests had been built low in pine trees, on limbs away from the trunk (similar to BWH5a and BWH5b). Even though the nests were dilapidated to the point that they were unusable, the trees were marked so biologists could monitor the sites in the future. Due to their poor condition, no species label was assigned to them, and they were both designated as “destroyed by natural causes” in 1999. No confirmed raptor activity has been associated with either of these nests since they were discovered.

One newly identified stick nest of unknown raptor origin (UNK6) was discovered east of the Wharf Mine in 2009. The nest was located in a mature ponderosa pine in SW NW Section 34 T5N:R2E, in

between the BWH1 and BWH4 territories (Figure 1). Based on its physical characteristics and general setting, the nest was likely built by broad-winged hawks; however, no activity was recorded at the site to confirm a species designation. When first found, the nest was in relatively good condition and may have been built in recent years. The nest was still in fair condition when it was monitored in 2012, but no raptor activity was documented at the site.

Raptor Nest Relocations

Prior to the 1998 breeding season, five raptor nests (BWH1a, BWH1c, BWH1d, BWH4a, and UNK3) were relocated to non-mining areas. Relocation sites were randomly designated (i.e., relocation numbers did not systematically correspond to the original nest numbers) as REL1 through REL5 (Figure 1). In August 1999, nest BWH1e was also relocated to a pine tree north of the pit development area and designated as nest REL6 (Figure 1). No nests have been relocated since 1999. All nests were relocated into trees with a natural fork formed by the trunk or branches that provided support. Where necessary, additional support for the nests was provided by placing strips of poultry netting at the base of the nesting material. The height and aspect of the relocated nests varied, but were all well within the range of those parameters found at natural nest sites. As described previously, none of the relocated nests are included in Table 1 because raptor activity has never been documented at any of the nests during the subsequent annual monitoring.

Intact, relocated nests have been visited each year to determine if they were being used by raptors. To date, no raptor activity has been documented at any of the relocation sites, and only three of the relocated nests (REL1, REL5, and REL6) remain intact. Prior to the 1999 breeding season, the tree that supported nest REL2 was inadvertently cut down by loggers clearing a path to relocate a mine access road. Nothing remained of the nest to salvage. In 2002, nest REL4 could not be found and was assumed it to have been destroyed by natural causes. In 2009, the top of the nest tree holding REL3 was toppled (likely from high winds) and the nest was destroyed.

Other Raptor Observations

Three additional raptors, beyond those identified at the active nests or territories, were documented in 2012. On May 10, one adult northern goshawk followed by one adult broad-winged hawk were observed in the western extreme of the wildlife survey area in NW SE Section 33 T5N:R2E. The broad-winged hawk was flying at tree-top level and mobbing (i.e., alarm calling) the goshawk as it flew northwest, just above ground level, through the pine habitats in the area. These hawks did not appear to be associated with any known nest or territory, and no new nests were documented in the vicinity. One red-tailed hawk was observed several times on June 13 soaring over the NW SW, NE SW, and SW NE Section 1, T4N:R2E. In 2011, a red-tailed hawk was documented in the same general area, perched along Nevada Gulch in SW NW Section 1 T4N:R2E. Biologists will continue to monitor the area for raptor activity during 2013 surveys.

Proposed Mine-Related Disturbance in 2012/2013

In 2008, SDGFP requested that Wharf include a section in its annual wildlife report describing all known raptor nests within 0.25 to 0.5 mile (depending on the species) of proposed disturbance activities and their timing. The purpose of this section is to allow adequate time to conduct clearance surveys and develop a mitigation plan to address areas of potential concern prior to the initiation of disturbance activities.

In 2012, raptor surveys associated with the annual monitoring efforts were extended to the Wharf Mine and Golden Reward Mine amendment areas located in NE SE Section 33 T5N:R2E, Section 1 and NE Section 12 T4N:R2E, and SW Section 6 T4N:R3E, as those areas and the associated 0.5-mile perimeter were incorporated into the mine permit area and annual wildlife survey area, respectively, that year. In particular, the area south of the Nevada Gulch Road in SE NW Section 1 T4N:R2E was searched extensively, as logging and subsequent work to move the county road was in preparation. As mentioned above, one red-tailed hawk was observed several times on June 13 soaring over the NW SW, NE SW, and SW NE Section 1, T4N:R2E.

Wharf continued unloading and loading Pad 5 in 2012, which is between 0.25 and 0.5 mile of all intact nest sites in the CH2 territory in N ½ Section 4 T4N:R2E. That work started prior to the 2009 breeding season, and has been continuous and ongoing. Cooper's hawks have not actively nested (laid eggs) in this territory since 2002, though a pair tended the CH2d/GH01a nest in 2006. Great horned owls fledged young from two of the nest sites closest to the Pad 5 disturbance in 2 of the last 6 years, with nesting activities initiated despite ongoing and continuous mine-related disturbance in 2008. Although territorial responses from broad-winged hawks were documented in this area in 2011, and an unidentified raptor was observed flying through the trees in 2012, no new nests were found and no nesting activity was documented at any of the known nests in the area. Regardless, efforts to confirm nesting activity and/or locate new broad-winged hawk nests in the area will be continued in subsequent years. Due to the absence of broad-winged hawk nests documented in this area to date, the lack of activity by Cooper's hawks in the CH2 territory for the last 5 years, and evidence that the recent active pair of nesting owls has a demonstrated tolerance for mining operations, no mitigation was proposed for the Pad 5 area during 2012. Furthermore, the planned disturbance will remain at least 0.25 mile (a standard buffer distance for most raptor species) from the nearest known nest. Wharf will continue to be vigilant in this area during annual wildlife surveys and during the Pad 5 loading process. If nesting raptors move into the vicinity, Wharf will contact SDGFP immediately to develop an appropriate course of action.

Wharf will also continue to mine the Trojan Pit and Summit Flats Pit areas, which are within 0.25 to 0.5 mile of the UNK3/CH3, UNK6, REL1, and REL6 nests. Raptors have not actively nested (i.e., laid eggs) at any of these sites since they were discovered or created. Hawks rebuilt the UNK3/CH3 nest sometime between 1998 and 2004, but no raptors were seen or heard in the area during annual monitoring from 2004 through 2012. The UNK6 nest was discovered in 2009, and has been inactive in each year since its discovery. It cannot be determined when the nest was last tended and/or built, but it has no confirmed record of activity. Because these territories have been inactive since their discovery, and because active mining has been ongoing and continuous in these two areas for several years, no mitigation was proposed for the Trojan Pit or Summit Flats Pit areas during 2012. However, Wharf will continue to be vigilant in this area during annual wildlife surveys and during mining activities. If an active nest is discovered within 0.25 to 0.5 mile of either pit, Wharf will contact SDGFP immediately to develop an appropriate course of action.

Threatened, Endangered, and High-Interest Species

Appendix I lists all vertebrate wildlife species (including any federally or state-listed species) that could potentially occur in the Wharf Mine wildlife survey area, as well as those actually detected during the 2012 surveys.

Appendix II presents the federal (USFWS 2012) and state (SDNHD 2012) threatened and endangered species and other vertebrate species of concern listed in the South Dakota Natural Heritage Database (SDNHD 2012) that could potentially occur in the Wharf Mine wildlife survey area based on species' ranges and the available habitats present. No threatened and endangered (federal and/or state) species were documented during the annual wildlife monitoring in 2012.

Despite their presence in Appendix II, many SDNHD species are not actually rare but are merely at the edge of their natural range. Nevertheless, a listing by the SDNHD is often an indication of possible concern and/or the need for more information on a species' range or its preferred habitats in South Dakota.

Four avian SDNHD species were documented during surveys in 2012. These species include the broad-winged hawk, Cooper's hawk, and northern goshawk and were detailed in the previous sections of this report. A Clark's nutcracker was observed in ponderosa pine habitat on May 31.

Conclusion

In addition to mining activities, wildlife species in the Wharf Mine wildlife survey area are exposed to numerous other types of year-round human activity. Other disturbances include occupied residential dwellings, vehicular traffic on public roads, logging, and recreation (e.g., ski-related activity, off-road vehicles, hiking, and biking). Despite the presence of these activities, long-term monitoring indicates that a variety of resident and seasonal vertebrate species continue to inhabit the wildlife survey area.

Historically, a variety of other common vertebrate species have been documented in the Wharf Mine wildlife survey area, and several of these species were recorded again in 2012 (Appendix I). No state or federally threatened and/or endangered species were documented in 2012, but four SDNHD species were detected. Those species include the broad-winged hawk, Cooper's hawk, northern goshawk, and Clark's nutcracker. Habitats throughout the wildlife survey area are suitable to support these species during significant portions of the year.

In 2012, three nests (BWH5c/CH1e, BWH6a, and CH5a/GH02) were confirmed active during the breeding season. A Cooper's hawk (*Accipiter cooperii*) was observed on two different occasions (May and July) near BWH5c/CH1e, and whitewash was located directly under the nest tree. This nest was presumably tended, but not occupied. In late May, a broad-winged hawk was observed incubating in nest BWH6a. Again in July, an adult broad-winged hawk was actively defending the nest site; however, no young were present in or around the nest. These observations infer that either the nesting attempt at this site failed due to natural causes, or the young fledged in between survey dates. A great horned owl (*Bubo virginianus*) was incubating in CH5a/GH02 in late May; however no activity was documented at the nest during the subsequent survey in July. The productivity for this nest was undetermined, as the young may have fledged from the nest in between survey dates.

Raptor nesting activity was also possible in the CH2 and CH4 territories in 2012. Although no new nests were found, whitewash from raptors was documented in each, and biologists documented a raptor near the CH2b nest. On May 10, a northern goshawk (*Accipiter gentilis*) and a broad-winged hawk were also observed in the western extreme of the survey area. Likewise, for consecutive years (2011 and 2012) red-tailed hawks have been observed soaring above Nevada Gulch, east and

southeast of Bald Mountain. Proposed activities at the Wharf Mine in the next 3 to 4 months are not anticipated to have direct impacts on any known nest sites, and no mitigation is proposed at this time. Wharf will continue to be vigilant in this area for nesting raptors throughout their active and proposed disturbance areas and will contact SDGFP immediately if any conflicts arise.

References

- Baxter, G. T. and M. D. Stone. 1980. Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Department, Cheyenne, WY. Bulletin No. 16.
- Burt, W. H. and R. P. Grossenheider. 1976. A Field Guide to the Mammals. Boston, MA: Houghton Mifflin Company.
- Clark, T. W. and M. R. Stromberg. 1987. Mammals in Wyoming. Lawrence, KS: Museum of Natural History, University of Kansas.
- Goodrich, L. J., S. T. Crocoll, and S. E. Senner. 1996. Broad-winged hawk (*Buteo platypterus*). In A. Poole and F. Gill (eds.), The Birds of North America, No. 218. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.
- Houtcooper, W. C., D. J. Ode, J. A. Pearson, and G. M. Vandel III. 1985. Rare animals and plants of South Dakota. *Prairie Naturalist* 17:143-165.
- Johnsgard, P. A. 1990. Hawks, Eagles and Falcons of North America. Biology and Natural History. Washington, DC: Smithsonian Institution Press.
- Jones, J. K., Jr., D. M. Armstrong, R. S. Hoffmann, and C. Jones. 1983. Mammals of the Northern Great Plains. Lincoln, NE: University of Nebraska Press.
- Kiesow, A.M. 2006. Field Guide to Amphibians and Reptiles of South Dakota. Pierre, SD: South Dakota Game, Fish and Parks.
- Mariah Associates, Inc. 1990. Wildlife Report: Clinton Baseline Area. Prepared for Wharf Resources, Inc., Lead, SD.
- Peterson, R. T. 1990. A Field Guide to the Western Birds. Boston, MA: Houghton Mifflin Company.
- Powder River Eagle Studies, Inc. 1992. Clinton area 1992 wildlife baseline studies. Prepared for Wharf Resources Partnership, Lead, SD.
- Sharps, J. C. and T. A. Benzon. 1984. A compiled list of South Dakota wildlife. South Dakota Department of Game, Fish and Parks, Rapid City, SD.
- South Dakota Game, Fish and Parks. (n.d.). Rare, threatened, or endangered animals. Retrieved October 19, 2012, from <http://gfp.sd.gov/wildlife/threatened-endangered/rare-animal.aspx>
- South Dakota Ornithologists' Union (The). 1991. The Birds of South Dakota. Aberdeen, SD: Northern State University Press.
- Stebbins, R. C. 1985. A Field Guide to Western Reptiles and Amphibians. Boston, MA: Houghton Mifflin Company.

- U.S. Fish and Wildlife Service. (2012). *South Dakota listed species by county list*. Pierre, SD: South Dakota Ecological Services Field Office. Retrieved from <http://www.fws.gov/southdakotafieldoffice/SpeciesByCounty.pdf>
- U.S. Forest Service. 1988. Black Hills National Forest checklist of birds. USDA Forest Service, Custer, SD.

WHARF MINE 2012 WILDLIFE MONITORING

APPENDIX I

POTENTIAL AND OBSERVED VERTEBRATE SPECIES

Table AI-1. Potential[†] and observed mammalian species in the Wharf Mine survey area.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity^{††}
Insectivores			
Hayden's shrew	<i>Sorex haydeni</i>	---	---
Masked shrew	<i>Sorex cinereus</i>	---	W,R,C
Merriam's shrew	<i>Sorex merriami</i>	---	---
Bats			
Big brown bat	<i>Eptesicus fuscus</i>	---	G,W
Fingert myotis	<i>Myotis thysandoes</i>	---	---
Hoary bat	<i>Lasirus cinereus</i>	---	G,W
Keen's myotis	<i>Myotis keeni</i>	---	---
Little brown myotis	<i>Myotis lucifugus</i>	---	R
Long-eared myotis	<i>Myotis evotis</i>	---	---
Long-legged myotis	<i>Myotis volans</i>	---	---
Northern myotis	<i>Myotis septentrionalis</i>	---	G,W
Red bat	<i>Lasiurus borealis</i>	---	---
Silver-haired bat	<i>Lasionycteris noctivagans</i>	---	G,W
Western small-footed myotis	<i>Myotis ciliolabrum</i>	---	G,W
Townsend's big-eared bat	<i>Plecotus townsendii</i>	---	G,W
Unknown bat species			G,W
Hares and Rabbits			
Desert cottontail	<i>Sylvilagus audubonii</i>	---	---
Mountain cottontail	<i>Sylvilagus nuttallii</i>	---	R
White-tailed jackrabbit	<i>Lepus townsendii</i>	---	G,W,R,C
Cottontail species	<i>Sylvilagus spp.</i>	---	W,C
Rodents			
Bushy-tailed woodrat	<i>Neotoma cinerea</i>	---	R,M
Deer mouse	<i>Peromyscus maniculatus</i>	---	W,R,C
House mouse	<i>Mus musculus</i>	---	---

Table AI-1. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity ^{††}
Rodents (continued)			
Least chipmunk	<i>Tamias minimus</i>	X	G,W,R,M,C
Long-tailed vole	<i>Microtus longicaudus</i>	---	R,C
Meadow jumping mouse	<i>Zapus hudsonius</i>	---	W,C
Meadow vole	<i>Microtus pennsylvanicus</i>	---	R,C
Northern flying squirrel	<i>Glaucomys sabrinus</i>	---	---
Northern pocket gopher	<i>Thomomys talpoides</i>	---	G
Norway rat	<i>Rattus norvegicus</i>	---	---
Porcupine	<i>Erethizon dorsatum</i>	---	G,W,C
Prairie vole	<i>Microtus ochrogaster</i>	---	---
Red squirrel	<i>Tamiasciurus hudsonicus</i>	X	G,W,R,M,C
Southern red-backed vole	<i>Clethrionomys gapperi</i>	---	W,R,C
Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>	---	---
Vole species	<i>Microtus spp.</i>	---	W
White-footed mouse	<i>Peromyscus leucopus</i>	---	W,C
Yellow-bellied marmot	<i>Marmota flaviventris</i>	X	G,W,R
Carnivores			
Badger	<i>Taxidea taxus</i>	---	---
Black bear	<i>Ursus americanus</i>	---	---
Bobcat	<i>Lynx rufus</i>	---	---
Coyote	<i>Canis latrans</i>	---	G,W,R,M,C
Eastern spotted skunk	<i>Spilogale putorius</i>	---	---
Ermine	<i>Mustela erminea</i>	---	R,C
Gray fox	<i>Urocyon cinereoargenteus</i>	---	---
Long-tailed weasel	<i>Mustela frenata</i>	---	---
Lynx	<i>Lynx canadensis</i>	---	---
Mink	<i>Mustela vison</i>	---	---

Table AI-1. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity^{††}
Carnivores (continued)			
Mountain lion	<i>Felis concolor</i>	---	W
Pine marten	<i>Martes americana</i>	---	W,C
Raccoon	<i>Procyon lotor</i>	---	G,W,C
Red fox	<i>Vulpes vulpes</i>	---	---
Striped skunk	<i>Mephitis mephitis</i>	---	W,C
Weasel species	<i>Mustela spp.</i>	---	W,C
Ungulates			
Elk	<i>Cervus elaphus</i>	---	R
Mule deer	<i>Odocoileus hemionus</i>	---	G,W,R,M,C
Pronghorn	<i>Antilocapra americana</i>	---	W
White-tailed deer	<i>Odocoileus virginianus</i>	X	G,W,R,M,C

[†] POTENTIAL OCCURRENCE--list derived from range and habitat information in Sharps and Benzon (1984), Jones et al. (1983), Clark and Stromberg (1987), and Burt and Grossenheider (1976)

^{††} RECORDED IN VICINITY--based on observations from the following studies in the Wharf area: Golden Reward baselines or monitoring (G), Wharf baselines or monitoring (W), Clinton expansion baselines or monitoring (C), Ragged Top Project baseline (R), and Minerva Project baseline (M).

Table AI-2. Potential[†] and observed avian species in the Wharf Mine survey area.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity^{††}
Loons and Grebes			
Common loon	<i>Gavia immer</i>	---	W
Eared grebe	<i>Podiceps nigricollis</i>	---	W
Horned grebe	<i>Podiceps auritus</i>	---	---
Pied-billed grebe	<i>Podilymbus podiceps</i>	---	---
Hérons and Bitterns			
American bittern	<i>Botaurus lentiginosus</i>	---	---
Black-crowned night heron	<i>Nycticorax nycticorax</i>	---	---
Great blue heron	<i>Ardea herodias</i>	---	W
Ibises			
White-faced ibis	<i>Plegadis chihi</i>	---	---
Swans, Geese, and Ducks			
American wigeon	<i>Anas Americana</i>	---	---
Blue-winged teal	<i>Anas discors</i>	---	W
Bufflehead	<i>Bucephala albeola</i>	---	W
Canada goose	<i>Branta Canadensis</i>	---	W
Canvasback	<i>Aythya valisineria</i>	---	W
Cinnamon teal	<i>Anas cyanoptera</i>	---	---
Common merganser	<i>Mergus merganser</i>	---	W
Gadwall	<i>Anas strepera</i>	---	W
Green-winged teal	<i>Anas crecca</i>	---	W
Lesser scaup	<i>Aythya affinis</i>	---	W
Mallard	<i>Anas platyrhynchos</i>	X	G,W,C
Northern pintail	<i>Anas acuta</i>	---	---
Northern shoveler	<i>Anas clypeata</i>	---	W
Redhead	<i>Aythya Americana</i>	---	W
Ring-necked duck	<i>Aythya collaris</i>	---	W

Table AI-2. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity ^{††}
Swans, etc. (continued)			
Snow goose	<i>Chen caerulescens</i>	---	---
Vultures			
Turkey vulture	<i>Cathartes aura</i>	X	G,W,R,M,C
Diurnal Raptors			
American kestrel	<i>Falco sparverius</i>	---	W,C
Bald eagle	<i>Haliaeetus leucocephalus</i>	---	W
Broad-winged hawk	<i>Buteo platypterus</i>	X	G,W,C
Cooper's hawk	<i>Accipiter cooperii</i>	X	G,W,M,C
Ferruginous hawk	<i>Buteo regalis</i>	---	G,W
Golden eagle	<i>Aquila chrysaetos</i>	---	W
Merlin	<i>Falco columbarius</i>	---	W
Northern goshawk	<i>Accipiter gentilis</i>	X	W
Northern harrier	<i>Circus cyaneus</i>	---	W
Osprey	<i>Pandion haliaetus</i>	---	W
Peregrine falcon	<i>Falco peregrines</i>	---	W
Prairie falcon	<i>Falco mexicanus</i>	---	W,C
Red-tailed hawk	<i>Buteo jamaicensis</i>	X	G,W,R,M,C
Rough-legged hawk	<i>Buteo lagopus</i>	---	---
Sharp-shinned hawk	<i>Accipiter striatus</i>	---	G,W,C
Swainson's hawk	<i>Buteo swainsoni</i>	---	W
Gallinaceous Birds			
Ruffed grouse	<i>Bonasa umbellus</i>	---	G,W,M,C
Sharp-tailed grouse	<i>Tympanuchus cupido</i>	---	W
Wild turkey	<i>Meleagris gallopavo</i>	X	G,W,R,M,C
Cranes			
Sandhill crane	<i>Grus canadensis</i>	---	W

Table AI-2. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity ^{††}
Coots, Gallinules, and Rails			
American coot	<i>Fulica americana</i>	---	---
Sora	<i>Porzana carolina</i>	---	---
Virginia rail	<i>Rallus limicola</i>	---	W
Shorebirds, Gulls, and Terns			
American avocet	<i>Recurvirostra americana</i>	---	W
Common snipe	<i>Gallinago gallinago</i>	---	---
Greater yellowlegs	<i>Tringa melanoleuca</i>	---	---
Killdeer	<i>Charadrius vociferus</i>	X	G,W,C
Lesser yellowlegs	<i>Tringa flavipes</i>	---	---
Solitary sandpiper	<i>Tringa solitaria</i>	---	---
Spotted sandpiper	<i>Actitis macularia</i>	X	G,W
Upland sandpiper	<i>Bartramia longicauda</i>	---	---
Willet	<i>Catoptrophorus semipalmatus</i>	---	---
Wilson's phalarope	<i>Phalaropus tricolor</i>	---	W
Pigeons and Doves			
Mourning dove	<i>Zenaida macroura</i>	---	G,W,R,M,C
Rock dove	<i>Columba livia</i>	---	G,W
Cuckoos			
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>	---	---
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	---	---
Owls			
Eastern screech owl	<i>Otus asio</i>	---	G
Great horned owl	<i>Bubo virginianus</i>	X	G,W,R,M,C
Long-eared owl	<i>Asio otus</i>	---	---
Northern saw-whet owl	<i>Aegolius acadicus</i>	---	G,W

Table AI-2. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity ^{††}
Goatsuckers			
Common nighthawk	<i>Chordeiles minor</i>	---	---
Common poorwill	<i>Phalaenoptilus nuttallii</i>	---	W
Swifts			
White-throated swift	<i>Aeronautes saxatalis</i>	---	G,W,M,C
Hummingbirds			
Broad-tailed hummingbird	<i>Selasphorus platycercus</i>	---	G
Calliope hummingbird	<i>Stellula calliope</i>	---	---
Rufous hummingbird	<i>Selasphorus rufus</i>	---	---
Kingfishers			
Belted kingfisher	<i>Ceryle alcyon</i>	---	G,W
Woodpeckers			
Black-backed woodpecker	<i>Picoides arcticus</i>	---	G,W
Downy woodpecker	<i>Picoides pubescens</i>	---	G,W,R,C
Hairy woodpecker	<i>Picoides villosus</i>	X	G,W,R,M,C
Lewis' woodpecker	<i>Melanerpes lewis</i>	---	---
Northern flicker	<i>Colaptes auratus</i>	X	G,W,R,M,C
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	---	G,W,C
Red-naped sapsucker	<i>Sphyrapicus nuchalis</i>	X	G,W,C
Three-toed woodpecker	<i>Picoides tridactylus</i>	---	G
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>	---	G,W,R,M,C
Flycatchers			
Cordilleran flycatcher	<i>Empidonax occidentalis</i>	---	G,W,R,C
Dusky flycatcher	<i>Empidonax oberholseri</i>	---	G,W,R,C
Eastern kingbird	<i>Tyrannus tyrannus</i>	---	---
Eastern phoebe	<i>Sayornis phoebe</i>	---	---
Hammond's flycatcher	<i>Empidonax hammondii</i>	---	W

Table AI-2. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity ^{††}
Flycatchers (continued)			
Least flycatcher	<i>Empidonax minimus</i>	---	G,W,C
Olive-sided flycatcher	<i>Contopus cooperi</i>	---	W
Say's phoebe	<i>Sayornis saya</i>	---	---
Western kingbird	<i>Tyrannus verticalis</i>	---	G,M
Western wood pewee	<i>Contopus sordidulus</i>	---	G,W,R
Larks			
Horned lark	<i>Eremophila alpestris</i>	---	M
Swallows			
Barn swallow	<i>Hirundo rustica</i>	X	G,W,C
Cliff swallow	<i>Hirundo pyrrhonota</i>	---	G,W,C
Tree swallow	<i>Tachycineta bicolor</i>	X	G,W
Violet-green swallow	<i>Tachycineta thalassina</i>	---	G,W,R,M,C
Jays, Magpies, and Crows			
American crow	<i>Corvus brachyrhynchos</i>	X	G,W,C
Black-billed magpie	<i>Pica pica</i>	---	---
Blue jay	<i>Cyanocitta cristata</i>	X	G,W,R,M,C
Clark's nutcracker	<i>Nucifraga columbiana</i>	X	---
Common Raven	<i>Corvus corax</i>	---	G,W
Gray jay	<i>Perisoreus canadensis</i>	---	G,W,R,M,C
Pinyon jay	<i>Gymnorhinu cyanocephalus</i>	---	---
Chickadees			
Black-capped chickadee	<i>Parus atricapillus</i>	X	G,W,R,M,C
Nuthatches			
Pygmy nuthatch	<i>Sitta pygmaea</i>	---	---
Red-breasted nuthatch	<i>Sitta canadensis</i>	X	G,W,R,M,C
White-breasted nuthatch	<i>Sitta carolinensis</i>	---	G,W,R,M,C

Table AI-2. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity^{††}
Creepers			
Brown creeper	<i>Certhia americana</i>	---	G,W,C
Wrens			
Canyon wren	<i>Catherpes mexicanus</i>	---	W,R
House wren	<i>Troglodytes aedon</i>	---	G,W,C
Rock wren	<i>Salpinctes obsoletus</i>	---	G,W,R,C
Winter wren	<i>Troglodytes troglodytes</i>	---	---
Dippers			
American dipper	<i>Cinclus mexicanus</i>	---	W
Gnatcatchers and Kinglets			
Golden-crowned kinglet	<i>Regulus satrapa</i>	---	G,W,C
Ruby-crowned kinglet	<i>Regulus calendula</i>	X	G,W,C
Thrushes			
American robin	<i>Turdus migratorius</i>	X	G,W,R,M,C
Eastern bluebird	<i>Sialia sialis</i>	---	W
Mountain bluebird	<i>Sialia currucoides</i>	X	G,W,M,C
Swainson's thrush	<i>Catharus ustulatus</i>	---	G,W,R,C
Townsend's solitaire	<i>Myadestes townsendi</i>	X	G,W,R,M,C
Veery	<i>Catharus fuscescens</i>	---	G,W,R,C
Mimic Thrushes			
Brown thrasher	<i>Toxostoma rufum</i>	---	---
Gray catbird	<i>Dumetella carolinensis</i>	---	---
Wagtails and Pipits			
American pipit	<i>Anthus rubescens</i>	---	W
Waxwings			
Bohemian waxwing	<i>Bombycilla garrulus</i>	---	W

Table AI-2. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity ^{††}
Waxwings (continued)			
Cedar waxwing	<i>Bombycilla cedrorum</i>	---	W,C
Shrikes			
Northern shrike	<i>Lanius excubitor</i>	---	W,G
Loggerhead shrike	<i>Lanius ludovicianus</i>	---	W,M,C
Starlings			
European starling	<i>Sturnus vulgaris</i>	---	---
Vireos			
Bell's vireo	<i>Vireo bellii</i>	---	G,W
Red-eyed vireo	<i>Vireo olivaceus</i>	---	G,W,M
Solitary vireo	<i>Vireo solitarius</i>	---	G,W,C
Warbling vireo	<i>Vireo gilvus</i>	X	G,W,R,M,C
Warblers			
American redstart	<i>Setophaga ruticilla</i>	---	W,C
Black-and-white warbler	<i>Mniotilta varia</i>	---	---
Blackburnian warbler	<i>Dendroica fusca</i>	---	G
Blackpoll warbler	<i>Dendroica striata</i>	---	M
Common yellowthroat	<i>Geothlypis trichas</i>	---	G
MacGillivray's warbler	<i>Oporornis tolmiei</i>	X	G,W,C
Orange-crowned warbler	<i>Vermivora celata</i>	---	W
Ovenbird	<i>Seiurus aurocapillus</i>	X	G,W,R,M,C
Tennessee warbler	<i>Vermivora peregrina</i>	---	W
Townsend's warbler	<i>Dendroica townsendi</i>	---	C
Wilson's warbler	<i>Wilsonia pusilla</i>	---	---
Yellow warbler	<i>Dendroica petechia</i>	X	G,W,C
Yellow-breasted chat	<i>Icteria virens</i>	---	G
Yellow-rumped warbler	<i>Dendroica coronata</i>	X	G,W,R,M,C

Table AI-2. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity^{††}
Tanagers			
Western tanager	<i>Piranga ludoviciana</i>	---	G,W,R,M,C
Grosbeaks and Buntings			
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	X	W,C
Blue grosbeak	<i>Guiraca caerulea</i>	---	---
Dickcissel	<i>Spiza americana</i>	---	---
Indigo bunting	<i>Passerina cyanea</i>	---	---
Lazuli bunting	<i>Passerina amoena</i>	---	---
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	---	---
Towhees, Sparrows, Juncos, and Longspurs			
American tree sparrow	<i>Spizella arborea</i>	---	---
Chestnut-collared longspur	<i>Calcarius ornatus</i>	---	W
Chipping sparrow	<i>Spizella passerina</i>	X	G,W,R,M,C
Clay-colored sparrow	<i>Spizella pallida</i>	---	---
Dark-eyed junco	<i>Junco hyemalis</i>	X	G,W,R,M,C
Field sparrow	<i>Spizella pusilla</i>	---	---
Harris' sparrow	<i>Zonotrichia querula</i>	---	W
Lark bunting	<i>Calamospiza melanocorys</i>	---	W
Lark sparrow	<i>Chondestes grammacus</i>	---	W
Snow bunting	<i>Plectrophenax nivalis</i>	---	W
Song sparrow	<i>Melospiza melodia</i>	---	G,W
Spotted towhee	<i>Pipilo maculatus</i>	---	W
Vesper sparrow	<i>Pooecetes gramineus</i>	X	W
White-crowned sparrow	<i>Zonotrichia leucophrys</i>	---	---
White-throated sparrow	<i>Zonotrichia albicollis</i>	---	---
Blackbirds, Meadowlarks, and Orioles			
Brewer's blackbird	<i>Euphagus cyanocephalus</i>	---	G,W

Table AI-2. Continued.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity^{††}
Blackbirds, Meadowlarks, and Orioles (continued)			
Brown-headed cowbird	<i>Molothrus ater</i>	---	G,W,M,C
Common grackle	<i>Quiscalus quiscula</i>	X	G,W
Northern oriole	<i>Icterus galbula</i>	---	G,W,C
Orchard oriole	<i>Icterus spurius</i>	---	---
Red-winged blackbird	<i>Agelaius phoeniceus</i>	---	G,W
Western meadowlark	<i>Sturnella neglecta</i>	---	W
Finches			
American goldfinch	<i>Carduelis tristis</i>	---	W,R,C
Cassin's finch	<i>Carpodacus cassinii</i>	---	G,W,R
Common redpoll	<i>Carduelis flammea</i>	---	W
Evening grosbeak	<i>Coccothraustes vespertinus</i>	---	G, W, C
House finch	<i>Carpodacus mexicanus</i>	---	---
Pine grosbeak	<i>Pinicola enucleator</i>	---	W
Pine siskin	<i>Carduelis pinus</i>	---	G,W,R,C
Purple finch	<i>Carpodacus purpureus</i>	---	---
Red crossbill	<i>Loxia curvirostra</i>	X	G,W,R,C
Rosy finch	<i>Leucosticte arctoa</i>	---	W
White-winged crossbill	<i>Loxia leucoptera</i>	---	---
Weaver Finches			
House sparrow	<i>Passer domesticus</i>	---	---

[†] POTENTIAL OCCURRENCE--list derived from range and habitat information in Sharps and Benzon (1984), SDOU (1991), and Peterson (1990). The species listed include those which might pass through the study area, or vicinity, during migration.

^{††} RECORDED IN VICINITY--based on observations from the following studies in the Wharf area: Golden Reward baselines or monitoring (G), Wharf baselines or monitoring (W), Ragged Top Project baseline (R), Minerva Project baseline (M), and Clinton baselines or monitoring (C).

Table AI-3. Potential[†] and observed reptilian and amphibian species in the Wharf Mine survey area.

Common Name	Latin Name	Recorded in 2012	Historic Records in Vicinity ^{††}
Salamanders			
Tiger salamander	<i>Ambystoma tigrinum</i>	---	---
Frogs and Toads			
Boreal chorus frog	<i>Pseudacris triseriata</i>	---	G,W,C
Northern leopard frog	<i>Rana pipiens</i>	---	G,W
Lizards			
Short-horned lizard	<i>Phrynosoma hernandesi</i>	---	---
Snakes			
Black hills redbelly snake	<i>Storeria occipitomaculata pahasapae</i>	---	W
Bullsnake	<i>Pituophis melanoleucas sayi</i>	---	---
Common garter snake	<i>Thamnophis sirtalis</i>	---	---
Eastern yellowbelly racer	<i>Coluber constrictor</i>	---	---
Pale milk snake	<i>Lampropeltis triangulum multistriata</i>	---	---
Smooth green snake	<i>Opheodrys vernalis</i>	---	G,W
Western terrestrial (wandering) garter snake	<i>Thamnophis elegans</i>	---	G,W

[†] POTENTIAL OCCURRENCE--list derived from range and habitat information in Sharps and Benzon (1984), Baxter and Stone (1980) and Stebbins (1985).

^{††} RECORDED IN VICINITY--based on observations from the following studies in the Wharf area: Golden Reward baselines or monitoring since 1994 (G), Wharf baselines or monitoring since 1994 (W), Clinton baselines and monitoring (C).

WHARF MINE 2012 WILDLIFE MONITORING

APPENDIX II

THREATENED, ENDANGERED, AND HIGH-INTEREST SPECIES

Table All-1. Current vertebrate species from the South Dakota Natural Heritage Database that could occur in the Wharf Mine survey area and the 2012 records (*shown in bold font*).

<u>Common Name (Latin Name)</u>	<u>State Status[^]/State Rank[†]</u>
<i>BIRDS</i>	
American dipper (<i>Cinclus mexicanus</i>)	ST, S2
Bald eagle (<i>Haliaeetus leucocephalus</i>)	ST, S1B, S2N
Black-backed woodpecker (<i>Picoides arcticus</i>)	S3
Black-crowned night heron (<i>Nycticorax nycticorax</i>)	S3S4B, SZN
Black-and-white warbler (<i>Mniotilta varia</i>)	S2S3B, SZN
Broad-winged hawk (<i>Buteo platypterus</i>)	S2B, SZN
Brown creeper (<i>Certhia americana</i>)	S2B, S3N
Bufflehead (<i>Bucephala albeola</i>)	S1B, S2N
Cassin's finch (<i>Carpodacus cassinii</i>)	S2B, S2N
Clark's nutcracker (<i>Nucifraga columbiana</i>)	S2B, S2N
Common merganser (<i>Mergus merganser</i>)	S2B, S3N
Common poorwill (<i>Phalaenoptilus nuttallii</i>)	S3B, SZN
Cooper's hawk (<i>Accipiter cooperii</i>)	S3B, SZN
Great blue heron (<i>Ardea herodias</i>)	S4B, SZN
Golden eagle (<i>Aquila chrysaetos</i>)	S3S4B, S3N
Hooded merganser (<i>Lophodytes cucullatus</i>)	S2B, SZN
Horned grebe (<i>Podiceps auritus</i>)	S2B, SZN
Lewis' woodpecker (<i>Melanerpes lewis</i>)	S3B, S3N
Long-eared owl (<i>Asio otus</i>)	S3B, S3N
Merlin (<i>Falco columbarius</i>)	S3B, S3N
Northern goshawk (<i>Accipiter gentilis</i>)	S3B, S2N
Northern saw-whet owl (<i>Aegolius acadicus</i>)	S3B, S3N
Olive-sided flycatcher (<i>Contopus cooperi</i>)	SUB, SZN
Osprey (<i>Pandion haliaetus</i>)	ST, S1B, SZN
Peregrine falcon (<i>Falco peregrinus</i>)	SE, SXB, SZN
Prairie falcon (<i>Falco mexicanus</i>)	S3S4B, S4N
Pygmy nuthatch (<i>Sitta pygmaea</i>)	S2S3
Sharp-shinned hawk (<i>Accipiter striatus</i>)	S3B, S3N
Swainson's hawk (<i>Buteo swainsoni</i>)	S4B, SZN
Three-toed woodpecker (<i>Picoides tridactylus</i>)	S2
Veery (<i>Catharus fuscescens</i>)	S2B, SZN
Virginia's warbler (<i>Vermivora virginiae</i>)	S3B, SZN
White-faced ibis (<i>Plegadis chihi</i>)	S2B, SZN

Table All-1. Continued.

<u>Common Name (Latin Name)</u>	<u>State Status[^]/State Rank[†]</u>
<i>MAMMALS</i>	
Black bear (<i>Ursus americanus</i>)	S1
Dwarf shrew (<i>Sorex nanus</i>)	S1
Fringe-tailed myotis (<i>Myotis thysanodes pahasapensis</i>)	S2
Long-eared myotis (<i>Myotis evotis</i>)	S1
Meadow jumping mouse (<i>Zapus hudsonius campestris</i>)	S3
Merriam's shrew (<i>Sorex merriami</i>)	S1
Mountain lion (<i>Felis concolor</i>)	S2
Northern flying squirrel (<i>Glaucomys sabrinus</i>)	S2
Northern myotis (<i>Myotis septentrionalis</i>)	S3
Plains spotted skunk (<i>Spilogale putorius interrupta</i>)	S3
Silver-haired bat (<i>Lasionycteris noctivagrans</i>)	S4
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	S2S3
<i>REPTILES AND AMPHIBIANS</i>	
Black hills redbelly snake (<i>Storeria occipitomaculata pahasapae</i>)	S3
Short-horned lizard (<i>Phrynosoma hernandesi</i>)	S2
Smooth green snake (<i>Liochlorophis vernalis</i>)	S4
<i>FISH</i>	
Finescale dace (<i>Phoxinus neogaeus</i>)	SE, S1
Lake chub (<i>Couesius plumbeus</i>)	S1
Longnose sucker (<i>Catostomus catostomus</i>)	ST, S1
Mountain sucker (<i>Catostomus platyrhynchus</i>)	S3
Plains topminnow (<i>Fundulus sciadicus</i>)	S3

[^] State Status: an endangered species in danger of extinction throughout all or a significant portion of its range statewide

SE State Endangered

ST State Threatened

[†] State Rank: Separate rank given for breeding (B) and non-breeding (N) seasons (if different).

S1 Critically imperiled because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extinction.

S2 Imperiled because of rarity (6 to 20 occurrences or few remaining individuals) or because of some factor(s) making it very vulnerable to extinction throughout its range.

S3 Either very rare and local throughout its range, or found locally (even abundantly at some of its locations in a restricted range, or vulnerable to extinction throughout its range because of other factors; in the range of 21 to 100 occurrences.

S4 Apparently secure, though it may be quite rare in parts of its range, especially at the periphery; cause for long term concern.

SX Believed extinct, historical records only.

SZ No definable occurrences for conservation purposes, usually assigned to migrants.

Christensen Ranch and Irigaray Mines 2012 Wildlife Monitoring

PREPARED FOR:

Uranium One Americas, Inc.
907 North Poplar Street, Suite 260
Casper, Wyoming 82601
Contact: Jon Winter
307/234-8235

PREPARED BY:

ICF International
405 West Boxelder Road, Suite A-5
Gillette, Wyoming 82718
Contact: William Vetter
307/687-4770

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Acronyms and Abbreviations

GPS	global positioning system
ICF	ICF International
Uranium One	Uranium One Americas, Inc.
WGFD	Wyoming Game and Fish Department

Introduction

Uranium One Americas, Inc. (Uranium One) has developed two in situ uranium recovery operations (Christensen Ranch and Irigaray) in eastern Johnson and western Campbell Counties, Wyoming. ICF International (ICF) conducted annual wildlife monitoring surveys at the Irigaray and Christensen Ranch operations from 1995 through 1999, but discontinued surveys in 2000 when operations at both sites were suspended. In preparation for renewed operations, Uranium One commissioned ICF to renew wildlife monitoring efforts at both properties in 2007, with full reinstatement of the annual wildlife monitoring program beginning in 2008.

Past wildlife surveys included voluntary aerial winter surveys for big game as well as those specified in Uranium One's Permit to Mine (No. 478-A2):

- Monitoring of known greater sage-grouse (*Centrocercus urophasianus*) leks and searches for new leks, and
- Surveys for known raptor nests and searches for new nesting raptors.

In 2012, ICF biologists again conducted surveys for nesting raptors and sage-grouse leks. Voluntary big game surveys were discontinued in 2009 and have not been conducted since then. This report summarizes specific information collected in 2012 and compiled for the Christensen Ranch and Irigaray Mine wildlife monitoring program, as well as population trend data spanning previous years. The wildlife survey area, survey methods, and results are described below.

Survey Area

The combined Christensen Ranch and Irigaray wildlife survey area has varied over time, ranging from roughly 53.0 to 64.0 square miles. Beginning in 2009, the boundary for the wildlife monitoring area was modified to include a perimeter that was approximately a uniform buffer of 1.0 mile around both permit boundaries, totaling 64.2 square miles. That boundary was still current as of 2012.

Christensen Ranch

The Christensen Ranch permit area (including a previous Amendment Area) encompasses approximately 22.1 square miles and includes portions of Sections 24, 25, 34, and 35, T45N:R77W; Sections 19 and 31-33, T45N:R76W; Sections 1-3 and 10-12, T44N:R77W; and Sections 3-10 and 16-21, T44N:R76W (Map 1). Although the Christensen Ranch survey area (permit area and surrounding 1.0-mile perimeter) is quite large, activities associated with uranium recovery have been limited to non-contiguous parcels that encompass a minor portion of the area.

Topography throughout most of the survey area is generally rugged, featuring many long prominent ridges, rocky outcrops, and deep eroded draws. Much of the Christensen Ranch survey area is divided by numerous drainages associated with the North Butte plateau, which exists in the extreme southeastern portion of the survey perimeter. Most of those drainages

include exposed soil and sandstone with some rock ledges and escarpments. In contrast, the far southwestern portion of the monitoring area consists of more open terrain, a few deep drainages, and several rolling hills.

Grasses are prevalent throughout the area and were generally shorter in the uplands and much taller and dense within the drainages. However, grass cover is generally sparse throughout the majority of the survey area, ranging from 25 to 35% bare ground in most places. Common species include junegrass (*Koeleria macrantha*), needle-and-thread (*Hesperostipa comata*), crested wheatgrass (*Agropyron cristatum*), cheatgrass (*Bromus tectorum*), native wheat grasses (*Pascopyrum* and *Elymus* spp.), bluegrasses (*Poa* spp.), Japanese brome (*Bromus japonicus*), Indian ricegrass (*Oryzopsis hymenoides*), blue grama (*Bouteloua gracilis*), and threadleaf sedge (*Carex filifolia*).

The most abundant shrub in the survey area is Wyoming big sagebrush (*Artemisia tridentata wyomingensis*). Sagebrush occurs in a patchy mosaic of sparse to moderately dense stands, with the greatest concentrations present along the drainages and on the gentler slopes. Less common shrubs within the survey area include currant (*Ribes* spp.), rabbitbrush (*Chrysothamnus viscidiflorus*), and Great Plains yucca (*Yucca glauca*). Small thickets of currant exist among the sandstone outcrops, with rabbitbrush and yucca present in most upland areas.

Relatively few trees exist within the survey area. Aside from the pine stands that occur on the North Butte plateau, trees are limited to cottonwoods (*Populus* spp.) along Willow Creek. However, small stands of mature cottonwoods and willows (*Salix* spp.) also exist within a few minor draws

The primary drainage in the survey area is Willow Creek, which flows northwest through the center of the permit area. Numerous unnamed drainages also flow north or west into Willow Creek. Most of these drainages are dry for the majority of the year, with ephemeral flow during heavier precipitation events.

Irigaray

The Irigaray permit area is limited to approximately 1.0 square mile that spans Sections 5, 8, 9, and 16, T45N:R77W (Map 1).

The Irigaray Mine survey area is similar in many ways to the previously described Christensen Ranch survey area. With the exception of the North Butte plateau and its associated woodland habitats (i.e., conifer), most topography and habitat components are the same. The terrain in the Irigaray portion of the survey area is rugged and heavily dissected by numerous steep drainages. Willow Creek bisects the area from southeast to northwest and flows to the Powder River, just west of the 1.0-mile survey perimeter. Sparse grasslands and moderately dense stands of sagebrush shrublands are generally present along the ridgelines and drainages, respectively. Individuals and small stands of cottonwood trees occur along Willow Creek, but few trees are found elsewhere.

Greater Sage-grouse

According to the Wyoming Game and Fish Department (WGFD), eight greater sage-grouse leks are known to exist within 1.0 mile of the Irigaray and Christensen Ranch permit areas (Wyoming Game and Fish Department, 2012). Although none of the leks are located within the Irigaray permit area, three (Christensen Ranch 1, 3, and 7) are located within the Christensen Ranch permit area. The five remaining leks (Irigaray and Irigaray II, and Christensen Ranch 2, 4, and 5) are located within the surrounding survey perimeter (Map 1).

Both aerial surveys and ground-based counts for sage-grouse leks were conducted during spring 2012. Aerial surveys were used primarily as a means to search for new leks, while ground surveys were used to confirm activity and obtain accurate counts at the known leks. Aerial surveys were conducted concurrently from two different airplanes on the morning of April 13, and ground counts were conducted on April 4, 5, 23, and 24.

The aerial surveys were completed between 30 minutes before and 1 hour after sunrise in a fixed wing Cessna 172 and 172XP. In each plane, two ICF biologists and a pilot flew north-south transects spaced at 0.62-mile (1.0 kilometer) intervals over both permit areas and the surrounding 1.0-mile perimeter at a speed and altitude of 80-100 mph and 100-300 feet above ground level, respectively. Ground-based counts were conducted between 30 minutes before and 30 minutes after sunrise. During the ground surveys, biologists also searched for displaying grouse while slowly driving through the area, concentrating efforts in likely lek habitat (level to rolling sagebrush-grassland). Frequent stops were also made at vantage points to scan and listen for strutting birds. Biologists also watched for and recorded grouse or their sign (droppings, fecal deposits, or feathers) during all other wildlife surveys.

Raptors

Raptor nest monitoring at known sites and searches for new nests were conducted from late April through mid-July, 2012. Guidelines recommended by Grier and Fyfe (1987) were followed to prevent nest abandonment and injury to eggs or young. Early in the breeding season, known nests were monitored from a distance with the aid of binoculars and a spotting scope. Nests were not approached on foot until after May. All nests previously identified within the survey area were checked at least once during the breeding season.

New nests were located by walking or slowly driving throughout the survey area and frequently stopping to examine typical nesting habitat. Rough breaks and tree groves were searched on foot. Personnel continually watched for adult raptors and noted behavior that could indicate a nearby nest. Areas where individuals or pairs were repeatedly seen were thoroughly searched for nests. Seven small prairie dog colonies, totaling 0.45 square miles and representing potential burrowing owl (*Athene cunicularia*) habitat, were also carefully searched (Map 1).

The substrate, condition, status, location, and other site-specific information were recorded for all raptor nests. Universal Transverse Mercator (UTM NAD83, Zone 13N) coordinates

(uncorrected, less than 10m accepted error) for new nests were determined using a hand-held global positioning system (GPS) receiver. The status (active, inactive, alternate, etc.) and condition of nests and the number of young successfully hatched and raised to fledglings were recorded for each nest.

Results

Greater Sage-grouse

Although suitable sage-grouse habitat exists throughout much of the survey area, neither the permit areas nor the surrounding survey area are situated within the sage-grouse core population areas or defined connectivity corridors identified by the state of Wyoming (Executive Order No. 2011-5, 2011).

Eight greater sage-grouse leks have been documented in the Irigaray and Christensen Ranch survey area. Three leks (Christensen Ranch 1, 3, and 7) are located within the Christensen Ranch permit area. The five remaining leks (Irigaray and Irigaray II, and Christensen Ranch 2, 4, and 5) are located within the surrounding survey perimeter (Map 1). Seven of the leks are currently designated as occupied, and one (Christensen Ranch 3) is designated as undetermined status. However, with the inclusion of the 2012 results, sufficient data exists to designate the Christensen Ranch 3 lek as unoccupied (Wyoming Sage-grouse Definitions, 2011).

Five leks were active and three leks were inactive in spring 2012 (Table 1). The Christensen Ranch 1 lek was active with a peak male count of 21 seen on April 23. One female was also seen attending the lek on this date, and seven females were observed on April 5. The Christensen Ranch 4 lek was reported active with a peak male count of 17 and 7 females reported on April 5 (Bureau of Land Management, 2012). The Christensen Ranch 5 lek was active with a peak count of one male and two females documented on April 24. However, those birds were actually seen 0.44 mile southeast (UTM NAD 83 – 418627E, 4853218N) of the original lek coordinates. The Christensen Ranch 7 lek was active with one male observed on April 8 (Bureau of Land Management, 2012). As in previous years, displaying males were again seen at the alternate location for the Irigaray II lek (UTMs listed in Table 1) on April 5 and April 23, with three males seen on both occasions. One female was also recorded attending the lek site on April 5. The Christensen Ranch 2, Christensen Ranch 3, and the Irigaray leks were inactive in 2012.

Four of the leks (Irigaray and Christensen Ranch 1-3) were discovered in 1989. The Christensen Ranch 4 and 5 leks were discovered in 1998 and 1999, respectively, and the Irigaray II and Christensen Ranch 7 leks were discovered in 2005. Most sage-grouse leks were monitored nearly every year since their respective discoveries, whether by agency (WGFD) or consulting biologists. As a result, long-term data are available for each site (Table 2 and Figure 1). The grouse population in the Irigaray and Christensen Ranch area, as measured by male attendance at the monitored leks, has been cyclic over the years (Figure 1).

Table 1. Locations and 2012 observations at greater sage-grouse leks in the Irigaray and Christensen Ranch survey area.

Lek Name	Lek Status	UTM X	UTM Y	¼ ¼ Section, T(N):R(W)	Date	Type of Survey	Number of Displaying Males
		(UTM NAD83, Zone 13N)					
Christensen Ranch 1	Occupied	416484	4846657	SW SW 19, 44:76	4/5/2012	Ground	19*
					4/16/2012	Ground†	20*
					4/23/2012	Ground	21*
Christensen Ranch 2	Occupied	415500	4847700	NE NE 24, 44:77	4/5/2012	Ground	0
					4/13/2012	Aerial	0
					4/23/2012	Ground	0
Christensen Ranch 3	Undetermined	415500	4850600	NE NE 12, 44:77	4/5/2012	Ground	0
					4/13/2012	Aerial	0
					4/23/2012	Ground	0
Christensen Ranch 4	Occupied	416981	4856764	SE NE 19, 45:76	4/4/2012	Ground	13
					4/5/2012	Ground†	17*
					4/24/2012	Ground	14*
Christensen Ranch 5	Occupied	418106	4853705	NE NW 32, 45:76	4/4/2012	Ground	0
					4/13/2012	Aerial	0
					4/24/2012	Ground‡	1*
Christensen Ranch 7	Occupied	412682	4850520	SW NW 11, 44:77	4/5/2012	Ground	0
					4/8/2012	Ground†	1
					4/13/2012	Aerial	0
Irigaray	Occupied	409300	4854500	NE SE 29, 45:77	4/23/2012	Ground	0
					4/5/2012	Ground	0
					4/13/2012	Aerial	0
Irigaray II [^]	Occupied	410646	4854324	SE SE 28, 45:77	4/5/2012	Ground	3*
					4/23/2012	Ground	3

[^] Alternate lek location and data reported

* One or more female sage-grouse were also observed

† Data obtained from the Bureau of Land Management lek coordination database (2012)

‡ Observation made 0.44 mile southwest of the lek site (UTM NAD 83, 418627, 4853218)

Cumulative peak attendance declined from 1989 through 1995 and remained quite low through 1997 (Figure 1). However, populations began to increase in 1998, rising to a cumulative high of 69 males in 2006. It should be noted that leks were only monitored sporadically in 2000 and 2001, and according to the WGF database records, only the Irigaray lek was monitored in 2002. Between 2006 and 2011, the peak male counts declined again; however, the numbers began to increase again in 2012, suggesting that sage-grouse population in the survey area may be on the rise.

Table 2. Peak male counts at greater sage-grouse leks in the Irigaray and Christensen Ranch survey area from 1989 through 2012.

Year	CR 1	CR 2	CR 3	CR 4	CR 5	CR 7	Irigaray	Irigaray II
1989	23	--	9	--	--	---	10	---
1990	16	--	4	--	--	---	6	---
1991	21	3	0	--	--	---	2	---
1992	13	6	0	--	--	---	6	---
1993	8	10	0	--	--	---	5	---
1994	4	3	0	--	--	---	5	---
1995	3	1	1	--	--	---	2	---
1996	7	0	0	--	--	---	1	---
1997	7	0	0	--	--	---	1	---
1998	10	0	0	7	--	---	5	---
1999	7	0	0	43	11	---	0	---
2000 ^a	---	---	---	22	10	---	---	---
2001 ^a	16	---	---	11	4	---	---	---
2002 ^a	---	---	---	---	---	---	0	---
2003 ^a	12	0	0	15	0	---	0	---
2004 ^a	12	0	0	14	0	---	0	---
2005 ^a	25	0	0	24	0	2	0	14
2006 ^a	28	2	0	23	5	0	1	10
2007	28	0	0	19	0	1	0	7
2008	19	0	0	17	1	0	10	12
2009	11	0	0	12	0	0	0	5
2010	6	0	0	17	0 ^b	1	0	2
2011	10	0	0	12	3	0	0	4
2012	21	0	0	17	1	1	0	3

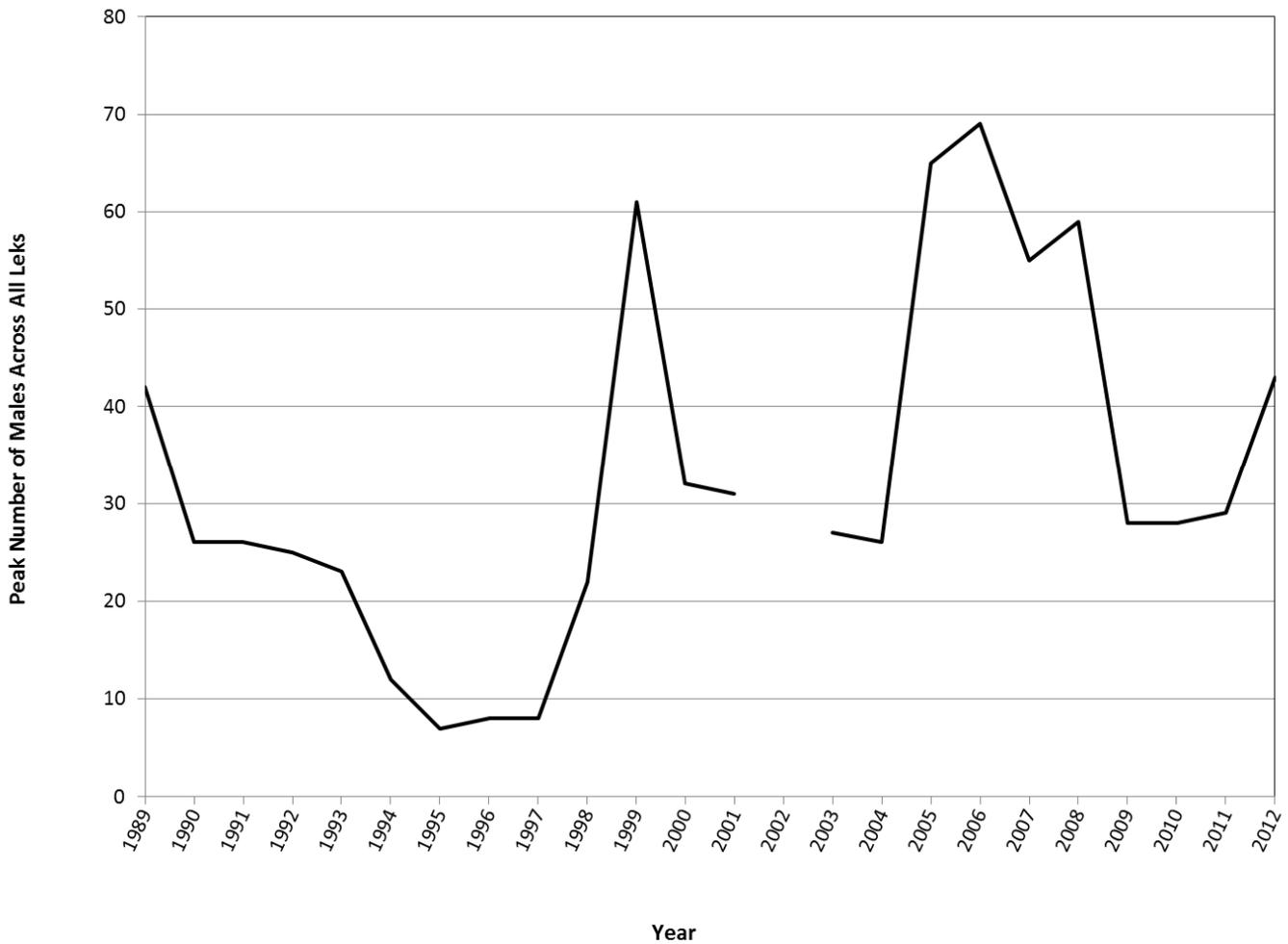
CR = Christensen Ranch

--- = Lek was not discovered or monitored in the given year.

^a Peak male counts from the WGFD database; not all leks were monitored in all years.

^b Four males were observed at this lek by other individuals in 2010 (WGFD 2011).

Figure 1. Cumulative peak male sage-grouse lek attendance in the Irigaray and Christensen Ranch survey areas during spring surveys from 1989 through 2012¹.



¹Not all leks were monitored between 2000 and 2002.

Sage-grouse habitat is relatively abundant within the survey area and observations beyond the known lek sites typically occur in appropriate habitats. A few potential lek sites have been identified in past years, but no additional leks have been officially designated by the WGFD. No new leks were documented in 2012. Outside of the active leks, sage-grouse were observed on one occasion in 2012. On July 17, a hen and approximately nine full-grown poults flushed from a drainage in SW SE Section 29 T45N:R76W. Sage-grouse droppings were also observed in the survey area in 2012. On July 17, a single relatively fresh roost pile was observed in sagebrush habitat in NE SE Section 29 T45N:R76W.

Other Upland Game Birds

In addition to sightings of greater sage-grouse, wild turkeys (*Meleagris gallopavo*) and gray partridge (*Perdix perdix*) have been documented in the survey area in past years. However, neither of those species was documented in 2012.

Raptors

A compilation of all known datasets, including the current BLM database (February 2012), lists greater than 160 raptor nest sites within the Irigaray and Christensen Ranch survey area. However, duplicate agency records exist for some nests, and ICF biologists have confirmed (through several years of monitoring) that numerous others are characteristic of black-billed magpie (*Pica hudsonia*) nests. Although some species of raptors may use intact magpie nests (e.g., the long-eared owl [*Asio otus*] and merlin [*Falco columbarius*]), the construction and orientation of magpie nests do not typically provide adequate support or access for most raptor species. Therefore, only the nest sites that constitute valid raptor characteristics, or were documented to have these characteristics in the past, are included in the totals below. As magpie nests become dilapidated over time, they may provide better access and serve as an initial base for raptors to add additional nesting material; therefore, ICF biologists will continue to monitor these sites as well as all confirmed raptor nests in future years.

Consequently, 153 valid raptor nest records existed within the current Irigaray and Christensen Ranch survey area in 2012. All records are listed in Table 3 and displayed in Map 1. Over time, several of those nests were destroyed by natural or other causes, including eight that were destroyed naturally between the 2011 and 2012 nesting seasons. As a result, 92 nests were confirmed intact at the end of the 2012 breeding season. Those nests included:

- 20 red-tailed hawk (*Buteo jamaicensis*) nests,
- 7 ferruginous hawk (*Buteo regalis*) nests,
- 4 great horned owl (*Bubo virginianus*) nests,
- 4 golden eagle (*Aquila chrysaetos*) nests,
- 2 long-eared owl nests,
- 1 American kestrel (*Falco sparverius*) nest,
- 40 unknown raptor species nests,
- 5 red-tailed hawk/great horned owl nests,
- 2 unknown raptor species/red-tailed hawk nests,
- 2 unknown raptor species/golden eagle nests,
- 2 unknown raptor species/great horned owl nests,
- 1 unknown raptor species/long-eared owl nest,
- 1 red-tailed hawk/long-eared owl nest, and
- 1 red-tailed hawk/great horned owl/Swainson's hawk (*Buteo swainsoni*) nest.

Seventeen raptor nests were active within the Irigaray and Christensen Ranch survey area during 2012. Those included eight red-tailed hawk nests, three great-horned owl nests, two golden eagle nests, two long-eared owl nests, one ferruginous hawk nest, and one nest that was tended by an unknown species (Table 3).

Fluctuations in raptor nesting attempts and success rates are often linked to variations in prey availability. Large raptor species such as golden eagles, ferruginous hawks, red-tailed hawks, and great horned owls prey predominantly on lagomorphs. Lagomorph surveys are not required for in situ uranium operations in Wyoming. However, surveys for lagomorphs in other parts of the Powder River Basin indicate that populations were severely reduced from 1993 through 1996 and fall 2008 through 2011 (ICF, unpublished data).

Over time, raptor productivity (total number of fledged young) has fluctuated from as few as 0 (2009) to at least 28 (1998) total fledged young throughout the survey area (Table 4). Productivity was relatively low from 1991 through 1996, but increased in subsequent survey years. Raptor production was the greatest in 1998, with relatively high fledgling counts in the following year (1999) and again in 2007. The high productivity in 1998 was primarily attributable to the enlargement of the survey area that year, though high prey populations (e.g., lagomorphs/hares and rabbits) throughout the region from 1993 to 1996 and 2005 to 2007 (ICF, unpublished data) likely contributed to greater raptor production during those periods. In contrast, lagomorph counts declined considerably in 2008 and continued to remain low through 2011. Reduced lagomorph indices in those 4 years were primarily due to one factor. The extremely high density of lagomorphs in 2006 and 2007 triggered an outbreak of tularemia, which was documented in Campbell County the following year. That disease has been known to contribute to the cyclic nature of lagomorph populations in the region, and possibly impacted the population through 2011 as well. Consequently, raptor productivity was extremely low from 2008 through 2011. Raptor productivity in the Irigaray and Christensen Ranch survey area in 2012 was markedly increased from 2011, and was at the highest level recorded since 2007.

Red-tailed hawks are common nesters in the survey area, and were more abundant than other raptor species in most survey years (Table 4). Although the number of nesting pairs of red-tailed hawks within the overall survey area has fluctuated in recent years, at least one pair successfully nested in 9 of the 15 years that surveys were conducted (1991 through 1999 and 2007 through 2012). At the end of the 2012 breeding season, 29 intact red-tailed hawk nests (including multiple species nests) were present in the survey area. Of those, nine were active in 2012 and collectively fledged at least 6 young. One of those (RTH4b) was tended by an unknown raptor species in 2012; several mutes and feathers were observed in and around the nest, but no raptors were observed.

Golden eagles have also regularly nested in the Irigaray and Christensen Ranch survey area. From 1991 through 1997, four known territories were present within or immediately adjacent to the Irigaray and Christensen Ranch survey area. By 2007, nine golden eagle territories had been recorded within the overall survey area. At least one pair of golden eagles fledged young during 10 of the 15 years surveys were conducted (1991 through 1999 and 2007 through 2012). In 2012, six intact golden eagle nests (including multiple species nests) were present within the survey area. Two of those were active in 2012: the UNK45/GE9b nest was active and fledged one young, and a pair also nested in a previously unknown species nest (UNK19/GE8c), but that nest was not successful.

One golden eagle pair (GE1a-c, Map 1) nests near the Christensen Ranch facilities and has been monitored with some regularity since 1987. Over the years, the pair has had a history of failed nesting attempts due to their repeated use of a friable cliff bank along Willow Creek as a nest site. From 1987 through 1995, three separate nesting attempts were unsuccessful due to structural failures in the cliff wall either above or below the occupied nest. Chicks perished during two of the incidents, and eggs were destroyed during the third. In 1996, the pair again built a nest on the cliff bank; the nest remained intact and one eaglet fledged. Young also fledged from that nest in two of the subsequent 3 years. In more recent years, the pair was successful in fledging two young in 2006, but only tended an alternate nest in the territory the next year and did not lay eggs. In 2008, the cliff nest site used by the pair once again failed, and no activity has been recorded in the territory since then (i.e., 2009 through 2012).

Multiple ferruginous hawk territories were first identified in the survey area in 1996. A single adult ferruginous hawk was observed bringing sticks to the FH1a nest (Map 1) in both 1996 and 1997, but no eggs or young were seen in either year. In the following 2 years (1998 and 1999) the FH1 pair nested and fledged a total of five young. In more recent years, the FH1 pair successfully nested in 2006 and 2008, and attempted to nest but failed to fledge any young in 2007 (Table 3). Seven intact ferruginous hawk nests were recorded within the survey area in 2012. The FH1 pair successfully nested again in 2012 at the FH1a nest, fledging 3 young.

Great horned owls were found nesting in the area in 1991 and 1994, but their productivity during those years was not determined. No active nests were located in 1995 or 1996, although adult owls were observed roosting during each of those years. From 1997 through 1999 and again in 2007 through 2009 and in 2011, great horned owls were recorded actively nesting each year. In 2012, 12 intact great horned owl nests were confirmed (including multiple species nests) present within the survey area. Three nests were confirmed active in 2012 and collectively fledged a total of five young.

Long-eared owls have occasionally been documented in the Irigaray and Christensen Ranch survey area. The first active nest was recorded in 2006, but productivity at the nest was unknown that year. In 2010, the LEO2 nest fledged one young. In 2012, two nests were active with long-eared owls. The RTH4c/LEO3 nest fledged one young, and the UNK46/LEO4 nest fledged at least one young.

Table 3. Raptor nest locations, status, and productivity in the Irigaray and Christensen Ranch survey area from 2007 through 2012.

Nest No.	Code	¼ ¼	Sec	T-R	2007	2008	2009	2010	2011	2012
FH1a	CB	NW SW	34	45-77	A,0+,0	A,2+,2	I	I	I	A,3,3
FH1b	CB	SE SW	34	45-77	I	I	I	I	I	ALT
FH2a	SS	NE NE	28	45-77	D-N in 1998	---	---	---	---	---
FH2b	ROC	SW SE	21	45-77	I	I	D-N	---	---	---
FH2c	SS	NE NE	28	45-77	U	U	I	D-N	---	---
FH2d	CB	NW SE	28	45-77	I	I	I	I	I	I
FH3a	G	SE SW	19	45-76	U	U	I	I	I	I
FH3b	CB	NE SW	19	45-76	U	U	D-N	---	---	---
FH4a	ROC	SW SE	11	44-77	I	I	I	D-N	---	---
FH4b	CB	NE NE	14	44-77	---	I	I	I	I	I
FH4c	CB	NE NE	14	44-77	---	I	I	I	I	I
FH6	W	NE NE	30	44-76	A-T	D-N	---	---	---	---
FH7a	ROC	SE NE	20	45-76	I	U	I	I	D-N	---
FH7b	ROC	SE NE	20	45-76	I	U	I	D-N	---	---
FH7c	ROC	NW SW	21	45-76	I	U	I	I	I	I
FH7d	CB	SE SE	20	45-76	I	I	I	D-N	---	---
FH8	CB	SE NE	2	44-77	---	I	I	I	D-N	---
Ferruginous Hawk Subtotals					2,0+,0	1,2+2	0	0	0	1,3,3
GE1a	CB	NW SW	8	44-76	U	A,1+,0	I	I	D-N	---
GE1b	CLF	NW SW	8	44-76	A-T	ALT	I	D-N	---	---
GE1c	CLF	SW SW	8	44-76	ALT	ALT	I	D-N	---	---
GE4a	CW	NE SW	27	44-76	U	I	D-N	Rebuilt; A, ?, ?	I	I
GE4b	CW	NE SW	27	44-76	U	I	I	I	I	I
GE4c	CW	NW SE	27	44-76	D in 2006	---	---	---	---	---
GE4d	CW	SW SE	27	44-76	U	D-N	---	---	---	---
GE5	CLF	NE SE	36	45-77	U	I	I	I	D-N	---
GE6a	CW	NE NE	23	45-77	U	I	D-N	---	---	---
GE6b	CW	SW SW	24	45-77	D-N in 2005	---	---	---	---	---
GE7	CW	SE NE	26	45-77	U	I	D-N	---	---	---
GE8a	POL	NW SW	10	44-76	U	I	I	I	D-N	---

Table 3. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
GE8b	PP	NW NW	15	44-76	---	---	I	I	I	ALT
GE9a	CW	NE NE	29	44-76	I	I	I	I	ALT	ALT
Golden Eagle Subtotals					1,0,0	1,1+,0	0	1,?,?	0	0
GHO2b	CW	NW NE	8	45-77	---	I	I	I	D-N	---
GHO4b	ROC	SE NE	32	45-76	I	I	D-N	---	---	---
GHO7a	CW	SE NE	9	45-77	U	I	D-N	---	---	---
GHO8	CW	NW SE	22	45-77	U	U	I	I	D-N	---
GHO9b	CW	NW NW	27	45-77	A-T	U	D-N	---	---	---
GHO9c	CW	NW NW	27	45-77	I	U	D-N	---	---	---
GHO10a	BOX	NE NE	32	45-76	I	I	A,?,?	I	I	A,3,3
GHO11a	CW	SW NE	36	45-77	U	I	D-N	---	---	---
GHO12a	CW	SE SE	8	44-76	I	I	I	I	I	I
GHO13	CW	NW NW	19	44-76	A,1+,1	A,?,?	I	I	I	I
GHO14b	CW	SE SW	13	44-77	A,1+,1	I	I	I	D-N	---
GHO15b	CW	SE SE	25	44-77	I	I	I	I	I	D-N
GHO16	CW	SW NE	30	44-76	A,2+,2	I	I	I	D-N	---
GHO17a	CW	SW NE	6	45-77	---	---	I	I	I	ALT
Great Horned Owl Subtotals					4,4+,4	1,?,?	1,?,?	0	0	1,3,3
RTH1a	CW	SE SE	5	45-77	D-N in 1996	---	---	---	---	---
RTH1c	CW	NW NW	9	45-77	U	U	I	D-N	---	---
RTH1d	CW	SW SW	4	45-77	U	I	I	A,2,0; D-N	Rebuilt; A,?,?	A,1+,1
RTH2b	CW	SE SE	21	44-76	U	I	D-N	---	---	---
RTH2c	CW	SE SE	21	44-76	A,1+,1	I	D-N	Rebuilt; A,2,2	A-T	I
RTH3a	CW	SW NW	33	45-76	U	I	I	I	A,?,?	A,2,2
RTH3b	CW	SW NW	33	45-76	U	I	I	I	ALT	ALT
RTH4a	CW	SE SW	1	44-77	---	I	D-N	---	---	---
RTH4b	ROC	SW NW	1	44-77	U	I	I	I	A,?,?	A-T
RTH4d	CLF	SW NW	1	44-77	---	I	I	I	I	ALT
RTH5b	CW	NW SE	33	45-77	D-N in 1997	---	---	---	---	---
RTH8a	CW	NE SE	21	45-77	D-N in 1995	---	---	---	---	---

Table 3. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
RTH8b	CW	SW SE	21	45-77	---	U	I	D-N	---	---
RTH8d	CW	SW NW	21	45-77	A,?,?	I	I	I	I	I
RTH11	CW	NW NW	13	44-77	U	U	I	I	I	I
RTH12	CW	NW NW	35	45-76	U	U	I	I	D-N	---
RTH13b	CW	NW SE	25	44-77	A,2+,2	I	I	I	I	ALT
RTH13c	CW	NW SE	25	44-77	A-T	I	I	I	I	ALT
RTH14a	CW	SE NE	9	45-77	U	U	I	I	I	D-N
RTH18	CW	SW SW	18	44-76	A,3+,3	I	I	I	I	I
RTH20a	CW	SW NE	30	44-76	A,2+,2	I	I	I	I	ALT
RTH20b	CW	NW SE	30	44-76	---	---	---	---	---	A-T
RTH21a	CW	NW SE	27	44-76	A,0,0	I	I	I	I	I
RTH21b	CW	NW SE	27	44-76	U	I	I	I	I	I
RTH22a	CW	SW NE	6	45-77	---	I	I	I	I	I
RTH22b	CW	SW NE	6	45-77	---	I	I	I	I	I
RTH23	CW	NE SE	17	45-77	---	U	I	I	I	A,1,1
RTH24	CW	NE SW	29	44-76	---	---	I	I	I	I
RTH25	CW	NE SE	28	45-76	---	I	I	I	I	A-T
RTH26	CW	SW SE	32	45-76	A-T	U	A,?,?	D-N	---	---
Red-tailed Hawk Subtotals					8,8+,8	0	1,?,?	2,4,2	4,?,?	6,4+,4
AMK1	CLF	SE NW	5	45-77	---	---	A-T	I	I	D-N
AMK2	ROC	SE SE	4	44-76	I	I	I	I	I	D-N
AMK3	CW	NE SW	29	44-76	---	---	---	---	A,?,?	I
American Kestrel Subtotals					0	0	1,0,0	0	1,?,?	0
H1	G	NE NE	18	44-76	D-N in 1999	---	---	---	---	---
Northern Harrier Subtotals					0	0	0	0	0	0
LEO1	CW	SE NW	19	45-76	U	I	I	I	I	I
LEO2	JU	SE NW	22	44-76	---	---	A,1,1	I	U	I
Long-eared Owl Subtotals					0	0	1,1,1	0	0	0
UNK1	CW	NE SW	16	45-77	U	I	I	D-N	---	---
UNK2	CW	NW SE	9	45-77	I	U	I	I	D-N	---
UNK3	CW	NE NE	15	45-77	U	I	I	I	I	I
UNK5	CW	NW SE	22	45-77	I	D	---	---	---	---
UNK6	CW	NE NE	23	45-77	U	I	D-N	---	---	---

Table 3. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
UNK7	CW	NW NE	23	45-77	U	D-N	---	---	---	---
UNK8	CW	SE SE	24	45-77	U					
UNK9	CW	NE SW	26	45-77	U		D-N	---	---	---
UNK11	CW	SW SW	36	45-77	U					D-N
UNK14	CW	NE NE	1	44-77						
UNK16	CW	SW NW	8	44-77						BBMA
UNK17	WIL	NW NE	16	44-76						
UNK18	PP	SE NW	10	44-76						BBMA
UNK20	POL	NE NW	15	44-76						
UNK21	CW	SW SW	33	46-77						
UNK23	CW	NE NE	20	45-76		U				
UNK26	JU	SE SW	32	45-76	U	U				BBMA
UNK27	JU	SE SW	32	45-76	A-T	U				
UNK28	JU	SE SW	32	45-76	U	U				
UNK29	CW	SE SE	17	45-76	U	BBMA				
UNK31	CW	SE SW	33	46-77						
UNK32	CW	NE SE	27	44-76	U					
UNK33	CW	NW SW	5	45-77	---				D-N	---
UNK35	CW	NW SW	5	45-77	---					BBMA
UNK36	CW	NE SW	5	45-77	---				D-N	---
UNK37	CW	NE SW	5	45-77	---					
UNK38	CW	NE SW	5	45-77	---					
UNK39	CW	NE SW	5	45-77	---					D-N
UNK40	CW	NE SW	5	45-77	---				D-N	---
UNK41	CW	NE NE	23	45-77	---	---				
UNK42	JU	SE NE	2	44-77	---					
UNK43	CW	SE NW	1	44-77	---					D-N
UNK47	CW	NE SE	36	45-77	---	---	---			
UNK48	CLF	NE NE	14	44-77	---	---	---			
UNK49	CW	SE SW	29	44-77	---	---	---			D-N
UNK50	CW	NW NE	17	44-76	---		D-N	---	---	---
UNK51	CW	NE NE	4	44-76	---	---				
UNK52	CW	SW NW	9	44-76	---	---	---			

Table 3. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>¼ ¼</u>	<u>Sec</u>	<u>T-R</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
UNK53	CW	SW NW	9	44-76	---	---	---			
UNK54	CW	SE SE	8	44-76	---	---				
UNK55	JU	NE NW	16	44-76	---	---				
UNK56	CW	NW NW	19	44-76	---	---	---			
UNK57	CW	NE NE	1	44-77	---	---				
UNK58	CW	NWSW	9	44-76	---	---	---	---	---	
UNK59	WIL	NENW	21	44-76	---	---	---	---	---	
UNK60	CW	SESW	16	44-76	---	---	---	---		
UNK61	CW	NENE	5	44-76	---	---	---	---		
UNK62	CW	SWSW	16	44-76	---	---	---	---		
UNK63	CW	SESE	17	44-76	---	---	---	---		
UNK64	JU	SESW	15	44-76	---	---	---	---		
UNK65	CW	NENE	29	44-76	---	---	---			
UNK66	CW	NENW	27	45-77	---	---	---	---		
UNK67	JU	NENW	3	44-76	---	---	---	---	---	
UNK68	JU	NW SW	28	45-76	---	---	---	---	---	
Unknown Species Subtotals					2,0,0	0	0	0	0	0
RTH1b/GHO2a	CW	NW NW	9	45-77	U	U	D-N	---	---	---
RTH2a/GHO3	CW	SW SE	21	44-76	U		D-N	---	Rebuilt ^{RTH} ; A,?,? ^{GHO}	
RTH8c/GHO5	CW	SE NE	21	45-77	ALT				D-N	---
RTH10a/GHO4a	CW	SE SW	16	44-76	A,?,? ^{GHO}					
RTH10b/GHO4b	CW	NW NE	21	44-76	A,?,? ^{GHO}					
RTH13a/GHO15a/ SH1	CW	NW SE	25	44-77	A,2+,2 ^{GHO}				A,?,? ^{SH}	A,1+,1 ^{RTH}
RTH16/GHO9a	CW	SW NW	27	45-77	A,?,? ^{GHO}	A,1+,1 ^{GHO}				A,1+,1 ^{RTH}
RTH17a/GHO12b	CW	SW NW	9	44-76	A,2+,2 ^{GHO}	A,?,? ^{RTH}	A,?,? ^{RTH}		A,2,2 ^{RTH}	
RTH19/GHO14a	CW	SE SW	13	44-77		D-N	---	---	---	---
GE11/RTH27a	CW	NE NW	20	45-76	A,1+,0 ^{GE}		A,?,? ^{RTH}	D-N	---	---
UNK44/RTH28	CW	NW SW	6	44-76	---	---			A,?,? ^{RTH}	
UNK45/GE9b	CW	NW NW	20	44-76	---			A,0,0 ^{GE}	A,1,1 ^{GE}	A,1,1 ^{GE}
RTH4c/LEO3	CW	SW SW	2	44-77	U					A,1+,1 ^{LEO}
UNK10/GHO11b	CW	SE SW	25	45-77	U					A,1,1 ^{GHO}

Table 3. Continued.

UNK19/GE8c	CLF	NW NE	15	44-76	I	I	I	I	I	A,1+,0 ^{GE}
UNK24/RTH27b	CW	SW SE	20	45-76	A-T ^{UNK}	U	I	I	I	A,?,? ^{RTH}
UNK34/GHO17b	CW	NW SW	5	45-77	---	---	I	I	I	A,1,1 ^{GHO}
UNK46/LEO4	JU	NW NW	28	45-76	---	U	I	I	BBMA	A,1+,1 ^{LEO}
Multiple Species Subtotals					6,5+,4	2,1+,1	2,?,?	1,0,0	5,3+,3	9,8+,7
Grand Totals					26,19+,18	6,4+,3	5,1+,1	3,4,2	9,3+,3	17,18+,17

X,#,# = Status, number of young hatched, number of young fledged.

? = Unknown number of young hatched or fledged.

#+ = Minimum estimate of young.

Species Codes

AMK = American kestrel
 BBMA = Black-billed magpie
 FH = Ferruginous hawk
 GE = Golden eagle
 GHO = Great horned owl
 H = Northern harrier
 LEO = Long-eared owl
 RTH = Red-tailed hawk
 SH = Swainson's hawk
 UNK = Unknown species

Nest Substrate Codes

BOX = Boxelder
 CLF = Cliff
 CB = Creek bank
 CW = Cottonwood
 G = Ground
 JU = Juniper
 POL = Power pole
 PP = Ponderosa pine
 ROC = Rock
 SS = Sandstone pillar
 W = Windmill
 WIL = Willow

Nest Status Codes

A = Active
 ALT = Alternate nest
 A-T = Active-tended/no eggs laid
 BBMA = Nest is characteristic of a black-billed magpie nest, and is not currently suitable for most raptor species.
 D = Destroyed by other means, including manmade causes
 D-N = Destroyed, natural causes
 I = Inactive
 U = Unknown
 --- = Undiscovered or nonexistent

Table 4. Annual productivity for nesting raptors in the Irigaray and Christensen Ranch survey area during surveys conducted for those properties from 1991 through 1999 and 2007 through 2012.

Year	Number of young fledged/species						Total
	RTH	GE	GHO	FH	SH	LEO	
1991	---	1+	?	---	---	---	1+
1992	---	3+	0	---	---	---	3+
1993	---	0	0	---	---	---	0
1994	---	1+	?	---	---	---	1+
1995	1	1	0	---	---	---	2
1996	4	4	0	0	---	---	8
1997	7+	3	2+	0	---	---	12+
1998 ^a	17+	4	4	3+	---	---	28+
1999	11	6	2	2	---	---	21
2000 to 2006: No surveys conducted							
2007	8+	0	8+	0	---	---	18+
2008	?	0	1+	2+	---	---	3+
2009*	?	---	?	---	---	1	1+
2010*	2+	0	---	---	---	---	2+
2011	2	1	?	---	?	---	3+
2012	6+	1	5	3	---	2+	17+
Annual Means ^b	6.5	2.5	3.7	2.5	---	1.5	9.2

+ Indicates minimum estimate.

? Indicates final productivity was unknown.

--- Indicates that the species was not known to nest in area.

^a Survey area was increased by 40 mi² in 1998.

^b Means calculated within species by dividing total minimum number fledged by the number of years (not including unknown productivity years) the species nested within survey area.

* Productivity numbers likely influenced by limited access to some nests during key productivity times.

Species Codes

FH = Ferruginous hawk

GHO = Great horned owl

RTH = Red-tailed hawk

GE = Golden eagle

LEO = Long-eared owl

SH = Swainson's hawk

References

Bureau of Land Management. (2012). Lek survey coordination. [Online database]. Retrieved from http://www.blm.gov/wy/st/en/field_offices/Buffalo/wildlife/coordination.html

Executive Order No. 2011-5 Greater Sage-grouse core area protection (2011). Retrieved from <http://will.state.wy.us/sis/wydocs/execorders.html>

Grier, J. W., & Fyfe, R. W. (1987). Preventing research and management disturbance. In B. A. Pendleton, B. A. Milsap, K. W. Cline, & D. M. Bird (Eds.), *Raptor Management Techniques Manual* (pp. 173–182). Washington, D.C.: National Wildlife Federation.

Wyoming Game and Fish Department (WGFD). (2012). SG lek locations & descriptors 2012. [MS Excel data file]. Buffalo, WY: Author.

Wyoming Sage-grouse definitions. (2011). In S.A. Tessmann (Ed.), *Handbook of biological techniques* (Rev. ch 12, 3rd ed., pp. 12-1 – 12-36). Cheyenne, WY: Wyoming Game and Fish Department.

ANTELOPE MINE
2012 WILDLIFE MONITORING



Prepared for:

Cloud Peak Energy Resources LLC
Antelope Mine
Caller Box 3008
Gillette, WY 82717-3008

Prepared by:

Thunderbird Wildlife Consulting, Inc.
5303 Van Ripper St.
Gillette, WY 82718

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VIII. Monitoring Results

VIIIB. Wildlife Section

1. Introduction

The original baseline inventories for the Antelope Mine were conducted in 1978 and 1979 (Commonwealth Associates, Inc. 1980). Annual wildlife monitoring began at the mine in 1982. The mine's staff biologist conducted all surveys from 1982 through 1993. From 1994 to the present, biologists with Thunderbird Wildlife Consulting, Inc. (TWC, formerly Jones & Stokes Associates and Powder River Eagle Studies [PRES]) have conducted all annual wildlife monitoring surveys for the property.

The mine's wildlife monitoring program complies with Appendix B (Wildlife Monitoring Requirements for Surface Coal Mining Operations) of the Wyoming Department of Environmental Quality-Land Quality Division (WDEQ-LQD) Coal Rules and Regulations. Appendix B outlines survey requirements and methods, and describes general data presentation procedures. In 2000, the WDEQ-LQD approved revisions to the Antelope Mine permit (#525) that eliminated surveys for big game and upland game bird broods from the wildlife monitoring program. That revision to the annual monitoring program was based on recommendations made by the Wyoming Game and Fish Department (WGFD). The Antelope Mine voluntarily continued annual winter big game surveys through 2003, and transitioned to alternate year surveys in 2006 (2008, 2010, 2012, etc.).

The permit area, survey methods, and results of wildlife monitoring conducted during the current report period and in previous years are described below. The period covered by this annual report is February 1, 2012 through January 31, 2013.

2. Permit Area Description

The Antelope Mine is located approximately 22 miles southeast of Wright, Wyoming. The current permit area encompasses 14,320.63 acres spanning Townships (T) 40 and 41 North (N) and Ranges (R) 70 and 71 West (W), and straddles the Campbell and Converse county line. The principal drainages within the survey area are Antelope Creek, Spring Creek, and Horse Creek. Antelope Creek flows west to east in the southern half of the permit area. Spring Creek and Horse Creek are tributaries of Antelope Creek and flow northwest to southeast through the western and northern portions of the permit area, respectively.

Topography within the permit area primarily consists of gently sloping uplands, with relatively level terrain on the terraces along the primary creeks. Rough breaks, hills, and higher ridges are common in the northern portion of the area but are interspersed as isolated features throughout the remainder of the area. Extensive and steep porcelanite hills and ridges occur immediately east and southeast of the permit boundary.

The most prevalent native habitat type within the permit area is upland grassland. Sagebrush-grassland, primarily big sagebrush (*Artemisia tridentata*), is present in isolated pockets in the northern and western portions of the permit area. Bottomlands are found along the three primary creeks and their larger tributary draws.

Twenty black-tailed prairie dog (*Cynomys ludovicianus*) colonies, totaling approximately 669 acres, occur entirely within or overlap the 1.0-mile report perimeter (Plate AR12/13:VIII B-1). The colonies range in size from less than 1 to approximately 345 acres, and average 33.4 acres; two of the larger colonies along the eastern edge of the permit area are comprised of multiple smaller sites.

Trees, primarily cottonwoods (*Populus* spp.), occur in sparse stands along Antelope Creek and as isolated individuals along the other major drainages. Traditionally, this semi-arid rangeland has been used for year-round grazing. Four ranchers use portions of the permit area for livestock (cattle, sheep) grazing and occasional lambing. More recently, coal bed natural gas (CBNG) resources have been developed in the northwestern portion of the area.

Through January 31, 2013, mining had affected 9,532.2 acres within the permit area; 451.1 of those acres were disturbed during the current report period (February 1, 2012 through January 31, 2013). The acreage reclaimed with permanent seed mixtures to date is 3,362.0.

3. Methods

A. BIG GAME

Winter Aerial Survey-Historical

From 1987 through 1993, a staff biologist with the Antelope Mine conducted winter big game counts using a variety of methods. TWC standardized those survey techniques beginning in 1994, and those same methods were used in all subsequent survey years.

TWC conducted winter aerial surveys at the Antelope Mine annually from 1994 through 2003, and biannually from 2006 through 2012.

To gather area-wide data on big game numbers and distribution, annual surveys of a multi-mine area occurred from 1993 through 2003, with a transition to biannual surveys beginning in 2006. The size of the multi-mine survey area generally increased from 1993 through 2012 as mines incorporated approved and proposed amendment areas. Exceptions were in 2001, 2003, and 2012, when the Black Thunder Mine was not included, and in 2004, when surveys were conducted only for certain mines.

Winter Aerial Survey-2012 Report Period

One voluntary aerial survey for winter big game, primarily pronghorn (*Antilocapra americana*), was conducted on February 13, 2012. The Antelope Mine, pending West Antelope II amendment, and a 2.0-mile perimeter cover approximately 101 square miles (mi²) (Plate AR12/13:VIII B-1) in the southwestern part of the multi-mine survey area. The multi-mine survey area that year covered approximately 383.3 mi², and encompassed the Antelope Mine survey area plus the permit areas, pending permit amendments, and respective 2.0-mile perimeters around two nearby mines: North Antelope Rochelle and School Creek. In 2012, the winter aerial survey was conducted jointly by biologists from TWC and ICF International.

A high wing, light plane (Cessna) was used for the aerial survey. The area was covered by flying north-south oriented transects spaced at 1.0-mile intervals. Flight speed and altitude were approximately 85 miles per hour (mph) and 300 feet above ground level, respectively. Two observers counted big game within a 0.5-mile wide strip on either side of the flight path; incidental sightings of other wildlife also were noted. A navigator/recorder plotted all observations on a 1:55,000 topographic map. Data recorded included the number and species of animals seen, location to quarter-section, and habitat association.

Ground Surveys

The Antelope Mine conducted four seasonal ground surveys for both pronghorn and mule deer (*Odocoileus hemionus*) each year from 1993 through 1999, per WDEQ-LQD's Appendix B. Although such surveys were no longer required after 1999, the mine voluntarily conducted winter big game ground surveys annually from 2001 through 2003, in 2006, and in

2010. In 2012, the voluntary ground survey was suspended due to persistent snow and impassable road conditions during February of that year.

Range Conversion

Big game range delineation information from the WGFD has been used to calculate the disturbance to these range types in each survey year. The extent of mine-related disturbance to big game ranges, both recent and cumulative, was determined by using AutoCAD® Map 3D 2010 software to overlay the Antelope Mine disturbance area map and current WGFD big game seasonal range maps. The acreage of affected range types was calculated where overlap occurred between the big game and affected area boundaries.

Mortalities and Concentration Buildups

During all wildlife surveys, biologists watched for any concentrations of dead or live animals along fence lines and other barriers to movement. Mortalities along roadways and right-of-way fences in and near the permit area also were noted throughout the year.

B. UPLAND GAME BIRDS

Grouse Lek Attendance Monitoring

No greater sage-grouse leks exist in or within 1.0 mile of the Antelope Mine permit area. The nearest lek with recent activity (“Steckley Road”) is approximately 2.7 miles southeast of the permit area in NE NW Section 29, T40N:R70W.

Grouse Lek Searches

The Antelope Mine has conducted annual searches for greater sage-grouse leks within the permit area and 1.0-mile perimeter as part of its wildlife monitoring program since 1982. Those efforts exceed annual monitoring requirements outlined in WDEQ-LQD’s Appendix B, which call for surveys to include only the term of permit and 1.0-mile perimeter each year with the entire permit area and 1.0-mile perimeter surveyed every third year.

In 2012, ground and aerial searches for new leks were conducted on April 14 and 25, respectively. Searches began at dawn and continued until 1 hour after sunrise, and were conducted only under favorable weather conditions (i.e., low or light winds, no precipitation). During the ground search, a biologist searched for displaying grouse by slowly driving through the area, making frequent stops at vantage points to scan and listen for strutting

birds. A high wing, light plane (Cessna 182) was used for the aerial survey. The area was covered by flying north-south oriented transects spaced at approximately 0.25-mile intervals in appropriate habitats. Flight speed and altitude were approximately 85 mph and 150 feet above ground level, respectively. A biologist and experienced pilot watched for displaying grouse on either side of the flight path. Observations were plotted on a 1:24,000 topographic map. Data recorded included the number of animals seen, location to quarter-section, and habitat association. Personnel searched the entire survey area during each effort, but concentrated their efforts in likely lek habitat (level to rolling sagebrush-grassland).

Measures of Disturbance

Current and cumulative habitat alterations were calculated by delineating the acreage of each vegetation type affected during the current report period. This was accomplished by overlaying digital layers (AutoCAD[®] Map 3D 2010) showing vegetation cover types and disturbance boundaries for that timeframe.

Other Upland Game Bird Surveys and Sightings

The Antelope Mine conducted surveys for sage-grouse broods annually from 1994 through 1999 under WDEQ-LQD's Appendix B, after which surveys were no longer required. The same route was followed each survey year, and covered approximately 5.0 miles along native reaches of Antelope and Horse creeks. During each survey, a biologist walked along the routes and watched for grouse and sign (feathers, scat, etc.). Searches began no sooner than 0900 hours each day to maximize opportunities to observe grouse in the drainages.

Specific surveys for nesting and wintering grouse are not part of the WDEQ-LQD's Appendix B annual monitoring requirements for surface coal mines in Wyoming. However, ground surveys (including walking surveys in sagebrush habitats) targeting other wildlife species have been conducted in potential grouse nesting habitats each spring since 1982.

Surveys for winter grouse use were conducted as part of the required baseline inventories for proposed permit amendments over the years. During the winter, biologists conducted the surveys by driving and walking through sagebrush habitats while watching for grouse and their sign (snow tracks, droppings, feathers).

In addition to these specific surveys, all incidental game bird observations within 1.0 mile of the permit area were recorded throughout the year. Data collected included the species, number of birds, location, habitat, and activity.

C. RAPTORS

Nesting Surveys

Initial surveys for nesting raptors in and near the Antelope Mine permit area were conducted during baseline studies in 1978 and 1979. Each year from 1982 through 1993, the mine's staff biologist monitored raptor nests in the area. Since 1994, TWC biologists have conducted annual surveys for nesting raptors within the permit area and accessible portions of its 1.0-mile perimeter. In 2012, the raptor survey area encompassed approximately 55 mi² (Plate AR12/13:VIII B-1).

During all field work, guidelines recommended by Grier and Fyfe (1987) were followed to prevent nest abandonment and injury to eggs or young. Nest monitoring for early breeding raptors, such as golden eagles (*Aquila chrysaetos*) and great horned owls (*Bubo virginianus*), began in February; monitoring for other nesting raptor species began in late March. Early in the breeding season, nests were observed from a distance with the aid of binoculars and a spotting scope. Eagle and owl nests were not approached until late April; other species' nests were not approached until June. All previously identified nests were checked at least once during the breeding season. Searches for new nests and productivity checks of active nests were conducted over several days through early August.

New nests were located by slowly driving through the survey area and stopping frequently to examine typical nesting habitat. Rough breaks and tree groves were searched on foot during appropriate months. Biologists also watched for adult raptors while conducting other surveys. Areas where individuals or pairs were repeatedly seen, or where defensive behavior was observed, were thoroughly searched for nests. All active nests were monitored until the pair's breeding attempt failed or young fledged.

All nests were plotted on 1:24,000 topographic maps using a combination of hand-held Global Positioning Receiver (GPS) technology and visual verification. The status (i.e., active, inactive, or alternate) of nests and production of young at active nests were recorded.

Measures of Disturbance

The distance from each intact raptor nest to the nearest occurrence of regular human activity was measured in the field. Disturbances were measured to the nearest 0.1 mile. The type of activity and whether it was visible from the nest also were noted.

Prey Abundance Indices: Lagomorphs

Lagomorph (hares and rabbits) abundance is known to influence the nesting attempts and success of large raptors such as golden eagles, ferruginous hawks (*Buteo regalis*), red-tailed hawks (*Buteo jamaicensis*), and great horned owls (Johnsgard 1990). For this reason, the WDEQ-LQD's Appendix B has required surveys for lagomorphs at the Antelope Mine since 1994.

The same basic route was surveyed between late summer and early fall each year, although some modifications have been made to avoid pit advance, accommodate mine expansions, and include additional areas of reclamation. During 2012, the approximately 10.6-mile route (Plate AR12/13:VIII B-1) was surveyed on August 13 and 14; the route passed through all major native and reclaimed habitats within the permit area. Each night, two biologists began driving the route no earlier than 30 minutes after sunset. One observer drove approximately 5 mph while the other continuously swept a spotlight back and forth along and across the path. Data collected included the species, number of animals, route segment, and habitat.

D. MIGRATORY BIRD SPECIES OF MANAGEMENT CONCERN

General Surveys

In 2012, general surveys targeting the 40 migratory bird species of management concern for coal mines in Wyoming (U.S. Fish and Wildlife Service [USWS] 2002) were conducted in conjunction with other wildlife surveys over several days from mid-March through early August. The survey area consisted of the permit area and 0.5-mile perimeter for most species, but extended out to 1.0 mile for bald eagles (*Haliaeetus leucocephalus*). Similar surveys have been conducted in the spring and summer annually since 1994, and usually occurred within the same habitats along the same route each year.

During these general surveys, biologists drove and walked through the area scanning and listening for avian species of concern. In addition to searches of common upland vegetative communities, specific habitat features such as creek channels, cottonwood corridors, and black-tailed prairie dog colonies were examined. Personnel also watched for avian species of concern while conducting all other field studies. All sightings recorded included notes on the species, location, habitat, and activity.

No known bald eagle winter roost sites occur in or within 1.0 mile of the Antelope Mine permit area. Nevertheless, surveys for such roost sites were conducted according to WDEQ-

LQD's Appendix B protocols. Ground surveys specifically targeting roosting bald eagles were conducted on February 3 and December 28, 2012. An aerial survey was completed on January 23, 2012. All surveys encompassed the permit area and 1.0-mile perimeter, and were conducted from 30 minutes before sunrise to 1 hour after sunrise, or 1 hour before sunset to 30 minutes after sunset.

Surveys were conducted by slowly driving through or flying over the survey area. A high-wing, light plane (Cessna 172) was used for the aerial survey. Flight speed and altitude were approximately 85 mph, and 300 to 350 feet above ground level, respectively. During each survey, a biologist scanned all areas with mature trees using binoculars and/or a spotting scope to search for perched bald eagles, concentrated prey, or large carcasses that might attract eagles. All sightings of perched and flying bald eagles were recorded throughout the winter, including notes on location to quarter-quarter section, habitat, and activity.

Breeding Bird Belt Transect Surveys

In accordance with requirements of the USFWS Ecological Services Office (ESO) in Cheyenne, Wyoming, the Antelope Mine supplemented general surveys for migratory birds with point counts from 2005 through 2011. Starting in 2012, the ESO allowed a transition to belt transect surveys, which are more appropriate for open prairie habitats. Transects were to be surveyed on two consecutive mornings from mid-May through mid-June.

One transect was established across each of six habitat types. All transects were approximately 100 meters wide (50 meters on each side) and 1.0 kilometer long. Precise coordinates of transect locations were determined using a hand-held GPS receiver (Plate AR12/13:VIII B-1). Native habitats included one transect each in grassland, a prairie dog colony, and along a cottonwood-riparian reach of Antelope Creek. One transect in reclaimed grassland also was surveyed.

All transects were surveyed on June 9 and June 12, 2012. Surveys were not completed on consecutive days due to strong winds. All surveys began no sooner than 30 minutes before sunrise and were completed within 4 hours after sunrise, and were conducted only under favorable weather conditions (i.e., calm to light winds and no precipitation).

During the surveys, one observer walked the centerline of each transect and recorded all birds seen and heard within the belt (50 meters on each side). Binoculars and pre-survey reviews of bird songs were used to aid with identification by sight and sound, respectively.

Each individual was recorded by species, and family groups and flocks also were noted. Birds that were merely flying over transects, and those seen or heard beyond the survey boundaries, were noted as incidentals but were not included in the data analysis. Exceptions were made for species such as swallows, turkey vultures (*Carthartes aura*), and other primarily aerial species.

Mountain Plovers

a. Annual Monitoring

Mountain plovers (*Charadrius montanus*) were first documented in the vicinity of the Antelope Mine during baseline studies conducted in 1978 and 1979. Annual monitoring for this species began in 1982 and continued through 2012.

Every year since 1982, numerous surveys were conducted throughout the entire breeding season in all areas where mountain plovers had been seen historically, as well as in other areas with suitable habitat conditions. In 2012, periodic surveys were conducted between March 15 and August 18, and consisted of specific searches as well as observations made in conjunction with other field studies; this approach is in keeping with the USFWS approved monitoring plan for this species. During surveys, biologists drove through known historic and potential mountain plover habitat, stopping often to scan for birds using binoculars and spotting scopes. All mountain plover sightings were recorded, including notes on location, number of individuals, habitat, and activity.

b. Mitigation for Habitat Loss

On May 23, 2002, the USFWS agreed that the Antelope Mine would restore 160 acres of mountain plover habitat to mitigate losses to mine operations that occurred from 1982 through 2003. Rigorous observations over the last 31 years (1982 through 2012) have revealed that mountain plovers in the vicinity of the mine are most common in black-tailed prairie dog colonies. In 2000, the mine initiated an innovative program to create mountain plover habitat in reclamation through the translocation of prairie dogs. The project included various site preparation methods, ranging from drilling pilot holes for prairie dogs to enhance on their own to the construction of artificial burrows and chambers. Due to new state and federal permitting requirements and restrictions, no translocations occurred from 2004 through 2008, though the existing colonies were monitored for activity and production during that period. In September 2008, the Wyoming Game and Fish Commission gave its approval

to resume the translocation project. Those efforts were renewed in fall 2009 and each subsequent year through 2011; no prairie dogs were translocated in 2012 due to the severe drought. All trapping and release activities occurred on lands owned by the Antelope Mine and within the existing permit area.

Since 2009, translocation efforts have had two main purposes: supplementing prairie dogs in a previous release site that was impacted by the plague in 2004; and creating a colony at a new site in recently completed reclamation within the permit boundary. These two release sites are located in Section 11, T40N:R71W and mid-NE Section 34, T41N:R71W, respectively. Each colony site was chosen based on topography, vegetative structure and composition, proximity to historic mountain plover sightings, proximity to other release sites, and future potential to attract mountain plovers. Five to 10 burrow chambers refurbished in 2009 were used in 2010 and 2011, with minor maintenance prior to use. A full description of this release site, including preparatory efforts and the dimensions of underground box chambers and above-ground retention cages, was provided in the 2009 annual report. Initial preparation (mowing, etc.) of a new release site located in reclamation in occurred in late summer 2010; that location is approximately 0.75 mile north of the original source colony for the translocation efforts. No prairie dogs were released at the new site in 2010 to allow the vegetation to have another growing season. In 2011, prairie dogs were released into five burrow chambers in Section 34 reclamation.

Trapping was conducted from early July through November in 2010 and 2011; again, no trapping occurred in 2012. Approximately 30 Havahart[®] live-traps measuring 7.5 x 7.5 x 24 inches were distributed in a natural prairie dog colony overlapping the permit area in SW Section 4, SE Section 5, NE Section 8, and NW Section 9, T40N:R71W (Plate AR12/13:VIII B-1). Traps were grouped in clusters of two to four per burrow. Traps were baited with rolled oats and tied open for one or two days to allow the animals to acclimate to their presence in the colony. Traps were set and baited at dawn and left open only until mid-morning to prevent the animals from becoming overheated. At the end of each session, traps were either tied open or tripped shut to prevent accidental captures and mortalities.

Captured prairie dogs were distributed among the chamber boxes in reclamation based on their age, sex, and estimated family relationship to other translocated animals. Animals were kept in the retention cages for 3 to 7 days at the Section 34 release site, depending on their age. Individuals released at the Section 11 site were kept in cages for 1 to 3 days because prairie dogs were already present at that location. Caged prairie dogs

were fed and provided with fresh grass daily during their respective retention periods. To release the animals, a door was opened along the bottom edge of all four sides of each cage to allow for easy exit and reentry of released prairie dogs; doors were hinged at the bottom of the cage and laid flat on the ground so animals could not be accidentally prevented from exiting or entering the cages. Additional oats were provided upon release and periodically throughout the fall and winter to encourage the prairie dogs to remain in the area and to maximize survival rates. Biologists observed the colony prior to each feeding to document the presence and number of visible prairie dogs at each release site.

E. FEDERALLY LISTED SPECIES

During the current report period, two species in Converse and Campbell counties (including the Antelope Mine) were listed or involved in the listing process under the Endangered Species Act (ESA): the Ute ladies'-tresses (*Spiranthes diluvialis*) (threatened); and greater sage-grouse (candidate) (USFWS 2012). The remaining vertebrate species currently listed for Converse County are associated with downstream riverine habitats of the Platte River system (USFWS 2012), or heavily vegetated streamside areas and adjacent grassland cover in southeastern Wyoming (<http://www.fws.gov/mountain-prairie/species/mammals/preble>). Therefore, these species do not occur in the Antelope Mine's wildlife monitoring area or immediately surrounding region.

Surveys for federally listed plants and their potential habitats are not included in the annual wildlife monitoring program. Information on surveys conducted for such plants can be found in Volumes 16 and 17, Appendix D8 (Vegetation baseline) of Permit 525. Surveys for greater sage-grouse were described in the preceding *Upland Game Birds* section. Mountain plover surveys were detailed in the *Migratory Bird Species of Management Concern* section above.

The black-footed ferret (*Mustela nigripes*) is no longer considered a federally listed species for Converse and Campbell counties, Wyoming (USFWS 2012). Additionally, the USFWS issued a block clearance for this species in all black-tailed prairie dog colonies throughout Wyoming in early 2004 (USFWS 2004). Consequently, ferret surveys are no longer required in such colonies statewide. Furthermore, the mine area is not within the region currently identified for black-footed ferret reintroductions in Wyoming (U.S. Forest Service 2002, Grenier 2004).

Although the black-footed ferret is not a listed species for the Antelope Mine, it remains on the federal list under the ESA. As a result, the USFWS encourages project proponents to protect all prairie dog colonies or complexes for their value to the prairie ecosystem and the many species that rely on them. The agency further encourages project applicants to analyze potentially disturbed prairie dog colonies for their value to future black-footed ferret reintroductions.

In addition to targeted survey efforts, biologists watched for all federally listed vertebrate species (including endangered, threatened, candidate, proposed, and petitioned species) in habitats that could support them while conducting other surveys. Any sightings recorded included notes on the species, number of individuals, age and sex (if possible), location, habitat, and activity.

F. OTHER ANIMALS

Incidental sightings of animals not targeted by systematic searches conducted during the 2012 report period were recorded during all wildlife surveys.

4. Results and Discussion

A. BIG GAME

Winter Aerial Survey

The majority of the survey area was free of snow during the big game aerial count conducted on February 13, 2012. However, patchy snow occurred in the southwestern portion (i.e., Antelope Mine area). The sky was partly cloudy, with high, thin clouds and the winds were calm (5 to 10 mph). Overall, the survey conditions were rated as good.

Multi-mine Area

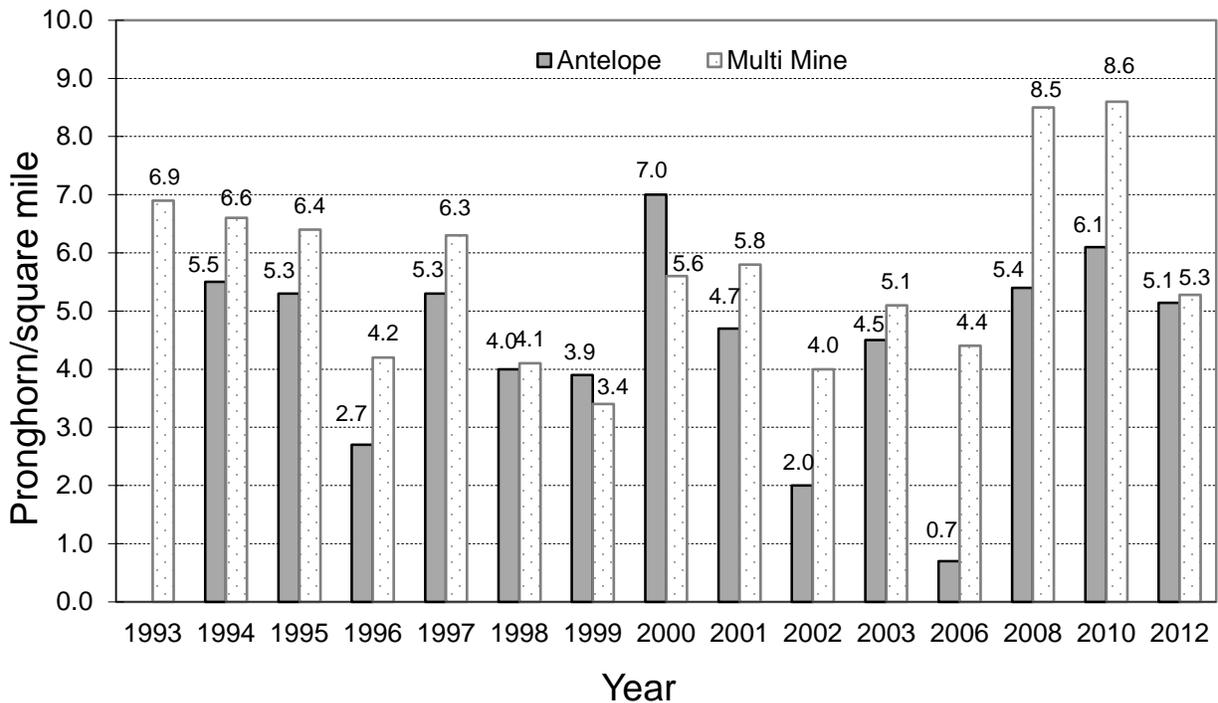
A total of 1,230 pronghorn (averaging 5.3 animals/mi²) was observed in the three-mine area during the 2012 winter aerial survey. Pronghorn herd size ranged from 2 to 65 animals and averaged 19.5; approximately 33% of the herds consisted of 25 or more animals. Pronghorn were widely distributed over most of the area, with fewer observations in the northeastern, eastern, and southeastern portions of the survey area. Those regions consist primarily of habitats that are not particularly attractive to wintering pronghorn, such as rough breaks, ponderosa pine, and grasslands.

Fifty percent (50%) of the pronghorn observations made during the 2012 aerial survey were in grassland habitat, followed closely by approximately 43% in sagebrush-grassland habitat. During most of the 14 previous multi-mine aerial surveys (1993 - 2003, 2006, 2008, 2010) conducted in the area, more pronghorn were found in sagebrush-grassland than in any other single habitat. Those records are not surprising, as sagebrush-grassland is the most common habitat type in the multi-mine area and is preferred by wintering pronghorn (Sundstrom et al. 1973, Fitzgerald et al. 1994). Other habitats where pronghorn were observed during the 2012 aerial survey included reclaimed grassland (6.7%) and bottomland (0.2%).

With the exception of 1997, pronghorn density in the multi-mine area declined steadily from 1993 through 1999 (Figure 1). Much of that decline was probably attributed to natural factors such as disease and inclement weather. For example, the sharp (35%) drop in pronghorn density that occurred between the 1995 and 1996 surveys was likely the result of a disease outbreak in fall 1995. WGFD personnel estimated that pronghorn numbers throughout northeast Wyoming were reduced by 15 to 25% that fall; in some areas losses were estimated to be nearly 60%. Moderately harsh weather during the winter of 1996/1997 may have prompted pronghorn from other localities to immigrate into the survey area, resulting in an increased count in 1997 despite challenging conditions. Conversely, negative effects from blizzards in April 1997 and February 1998 may have influenced the low count in 1998. Despite the mild winter of 1998/1999, pronghorn density had dropped again in 1999.

Milder winters after 1998 probably contributed to higher pronghorn counts in 2000 and 2001. The next several years of persistent drought may have played a role in the lower numbers recorded through 2006. The marked increase in pronghorn numbers in 2008 and 2010 may have been influenced by a combination of multiple factors, including above average precipitation during that period (resulting in increased foraging habitat) and relatively mild winter conditions in southern Campbell County compared to the northern portion of the county. Continued above average precipitation and excellent forage production through 2011 and mild winter conditions through February 2012 could have allowed pronghorn to remain well distributed throughout the region, which may have contributed to the lower numbers recorded during the 2012 aerial survey.

Figure 1. Observed pronghorn densities recorded in the multi-mine and Antelope Mine survey areas during winter aerial surveys conducted from 1993 through 2010*.



Multi-mine Survey Area: 184.5 mi² (1993); 232.0 mi² (1994-1996); 238.5 mi² (1997-1998); 250.8 mi² (1999); 256.9 mi² (2000); 227.3 mi² (2001); 288.4 mi² (2002); 229.4 mi² (2003); 331.3 mi² (2006); 383.3 mi² (2008, 2010); 233.1 mi² (2012).

Antelope Mine Survey Area: 66.8 mi² (1994-2001); 81.6 mi² (2002-2003, 2006), 97.7 mi² (2008); 101.0 mi² (2010, 2012).

Aerial surveys were conducted annually through 2003, and biannually beginning in 2006.

Seventy-eight (78) mule deer in 16 herds were observed in the multi-mine area during the 2012 aerial survey. More (43%) deer were seen in grassland than in any other habitat. Other habitats where mule deer were recorded included reclaimed grassland (38%), bottomland (15%), and sagebrush-grassland (4%).

Thirteen (13) elk (*Cervus elaphus*) in three herds were seen during the February 2012 flight. Most (62%) of elk were observed in grassland habitat. The remaining animals were recorded in rough breaks (23%) and reclaimed grassland (15%) habitats. Elk were also documented during most of the previous 14 winter aerial surveys.

Antelope Mine and Two-Mile Perimeter

Thirty big game herds were observed in the Antelope Mine survey area in February 2012: 29 pronghorn (519 animals) and 1 mule deer (3 animals). Pronghorn herds ranged in

size from 2 to 51 animals, with an average of 17.9. Pronghorn density (5.1 animals/mi²) within the mine survey area was only slightly lower than that of the multi-mine area (Figure 1).

Ten pronghorn herds (175 animals) were observed within the Antelope Mine permit area; no mule deer were seen in the permit area. As in previous years, few pronghorn were recorded in the rough breaks along the eastern edge of the survey area.

Approximately twice as many pronghorn were recorded in grassland habitats than in sagebrush-grassland habitats. Two herds were seen in reclaimed grassland (Table 1).

As described in the *Methods* section, winter big game counts in the Antelope Mine area were conducted using a variety of methods prior to 1994. During that period, staff biologists reported that the pronghorn population in the area increased from 1986 through 1991, remained steady in 1992, and declined by January 1993. Some individuals undoubtedly perished during the harsh winter of 1992-1993. Others probably moved from the Antelope Mine survey area into surrounding lands where sagebrush-grassland is more prevalent.

Beginning in 1994, standardized annual winter aerial big game surveys were conducted at Antelope Mine. Since then, fluctuations in pronghorn density in the mine's survey area have been similar to those for the multi-mine area (Figure 1). As in the larger area, natural factors appear to have the greatest influence on pronghorn density in the vicinity of the mine. In most years since 1994, pronghorn density in that survey area was lower than that of the multi-mine area, with the density in 2006 being the lowest recorded since surveys began (Figure 1). However, by 2008 pronghorn density at the mine had rebounded, and then increased to near-record levels in 2010. Numbers were down again in 2012. These fluctuations in population cannot be attributed to a single cause.

Few pronghorn herds were observed within the Antelope permit area itself during the last 14 aerial surveys (spanning 1994-2012). That area is dominated by mining activities, reclaimed lands, and the bottomlands and flood plain along Antelope Creek. The southern part of the survey area is dominated by gently rolling grassland interspersed with limited sagebrush-grassland habitats. The northern region contains some clay rough breaks and steep drainages that have not historically yielded large numbers of wintering pronghorn. Over time, few pronghorn were observed in the eastern third of the survey area. Although areas with suitable winter habitats are present in the east, much of that area also is comprised of clay and scoria rough breaks.

Table 1. Habitat associations of big game observed at the Antelope Mine during the February 2012 winter aerial survey.

PRONGHORN		
HABITAT	No.	%
Grassland	321	62
Sagebrush-grassland	164	31
Reclaimed grassland	34	7
TOTAL	519	100

During 10 of the last 14 aerial surveys (1994-2012), more pronghorn were seen in native grassland than any other habitat. Grassland is the dominant native habitat type in the vicinity of the mine. Generally, nearly all of the remaining animals were in sagebrush-grassland. That relationship held true for 2012.

The number of mule deer observed during winter aerial surveys has ranged from 3 to 182. Annual variations in mule deer abundance recorded during flights are difficult to interpret because those surveys are designed primarily to census pronghorn and, thus, may not yield accurate counts for deer.

Range Conversion

The current Antelope Mine permit area encompasses 14,320.6 acres. Roughly 12,545 acres will be disturbed over the life of the mine. Approximately 11,526 acres of the permit area are classified as yearlong pronghorn range; the remaining acres are classified as summer/winter range. Through January 2013, activities at the mine had disturbed approximately 9,532 acres: 7,610 acres of yearlong range and 1,922 acres of summer/winter range.

The eastern portion of the permit area (about 4,479 acres) has been classified as winter/yearlong mule deer range, with the western part (9,370 acres) considered yearlong range. A small (472 acres) portion of the northeastern permit area is classified as mule deer “out” range; that range type is considered inadequate to support mule deer. Through the current report period, approximately 3,829 acres of winter/yearlong, 5,703 acres of yearlong

mule deer range, and <1 acre of “out” range had been disturbed by operations at the Antelope Mine.

Mortalities and Concentration Buildups

During 2012, no concentrations of dead or live big game animals were encountered along fence lines or other barriers to movement. No individual pronghorn or mule deer mortalities were documented during the current reporting period.

B. UPLAND GAME BIRDS

Grouse Lek Searches

No new sage-grouse leks were discovered in or within 1.0 mile of the Antelope Mine permit area during 2012.

Although sage-grouse do not generally inhabit the survey area, they are a species of significant concern in the region. Potential year-round habitat (level to rolling sagebrush-grassland) is present only in limited quantities in the vicinity of the mine. No grouse leks have ever been documented in or within 1.0 mile of the permit area during baseline inventories (Commonwealth Associates 1980, PRES 1999, TWC 2004) or annual monitoring conducted at the mine since 1982 (PRES 1994-1999, TWC 2000-2011; refer to annual reports on file with the WDEQ-LQD in Cheyenne, Wyoming). The nearest known lek (“Steckley Road”) is approximately 2.7 miles southeast of the mine.

Measures of Disturbance

Approximately 9,532 acres have been affected at the Antelope Mine, with approximately 451 acres disturbed during the current report period (February 1, 2012 through January 31, 2013). Habitat alterations over the entire permit area through January 2013 are presented in Table 2. To date, reclamation has been completed on 3,362.0 acres: 3,240.9 acres were seeded with an upland range mix and 121.1 acres with a channel (bottomland) mix.

Despite the absence of regular grouse use, the Antelope Mine makes every effort to schedule disturbance activities during the non-breeding season in areas where grouse could potentially occur. Should the sage-grouse be listed under the ESA in the future, all appropriate precautions and current USFWS species-specific protective measures (if applicable) will be implemented to guard against the loss of individuals, nests, or young.

Table 2. Cumulative habitat disturbance at the Antelope Mine through January 2013 (rounded to nearest acre).

Habitat	Pre-2013	2013	Total
Blue Grama Roughlands	3,534	176	3,710
Blue Grama Uplands	2,794	139	2,933
Birdsfoot Sagebrush Uplands	1,593	79	1,672
Bluebunch Wheatgrass Roughland	279	14	293
Silver Sagebrush Lowlands	376	19	395
Greasewood Lowlands	199	10	209
Big Sagebrush Draws	85	4	89
Grassy Bottom	108	5	113
Sagebrush Uplands	98	5	103
Water	11	1	12
Trees	2	0	2
Antelope Creek	2	0	2
TOTAL ACRES	9,081*	451	9,532

* Pre-2013 acreage was proportionally adjusted during previous report periods to remove acreage disturbed by approximately 158.6 acres of impoundments not typically included in this category and to account for approximately 16.7 acres of previous calculation errors.

The Antelope Mine also incorporates methods to enhance reclaimed areas for sage-grouse, where appropriate. For example, as required by the WDEQ-LQD permit, both shrubs and forbs are planted in the permanent seed mixes. Stream-side areas are planted to a lowland mix that could provide brood-rearing and summer habitat for grouse. Such efforts could enhance post-mining habitat for sage-grouse by providing important sources of food and cover. As documented in the 2010 annual report, two sage-grouse nests were discovered in reclamation that year; as noted, the nearest occupied lek is approximately 3.0 miles southeast of the mine. These reclamation practices are strictly monitored by the

WDEQ-LQD and will continue as additional sagebrush habitats are impacted by mine operations. Annual vegetation sampling and wildlife monitoring of reclaimed sagebrush habitats has been occurring since they were established and will continue through the life of the mine to document their vegetative characteristics and use by grouse and other wildlife species.

The mine's efforts to enhance sagebrush habitats in reclamation are also consistent with the BLM's recent Instruction Memorandum No. WY-2010-012 on sage-grouse habitat management. Although the BLM policy does not apply to leased coal resources, the establishment of reclaimed shrubland habitats at the Antelope Mine and other local coal mines will contribute to multi-agency efforts to improve overall habitat conditions for sage-grouse and other sagebrush-obligate species in the region. Should the sage-grouse ever become listed under the ESA, Antelope will re-evaluate its monitoring and mitigation plan in coordination with the USFWS. In the meantime, the mine is voluntarily participating in the development of a landscape-scale Candidate Conservation Agreement (CCA) and CCA with Assurances (CCAA) that will benefit the sage-grouse and other sagebrush-obligate species in the region.

Other Upland Game Bird Surveys and Sightings

Isolated and sporadic observations of sage-grouse both with and without broods were made in the northwestern part of the permit area during the early 1980s. However, no grouse or their sign (droppings, feathers, etc.) were observed in the Antelope Mine survey area from 1991 through 2009. That period encompassed many years before mine-related disturbance began to encroach on the northern sagebrush areas.

For the first time since the 1980s, sage-grouse were reported within the mine permit area during the 2010 report period. In April of that year, a grouse hen was observed in SE Section 25, T41N:R71W. A nest with six eggs was subsequently discovered. In August, an adult sage-grouse with five chicks was documented in the general vicinity of the nest area. In 2011, grouse lek searches included the 2010 nest site in reclamation, but no sage-grouse were observed there or elsewhere in the survey area. No sage-grouse were observed during the 2012 surveys.

The mourning dove (*Zenaida macroura*) was the only upland game bird species observed in the permit area during the 2012 report period. A mourning dove was seen flying over the Section 11, T40N:R71W prairie dog colony on two days in June. A mourning dove

was recorded perched and flying in riparian habitat in SESE Section 6, T40N:R71W in early July. Two doves were seen in riparian habitat along Antelope Creek in SWSE Section 32, T41N:R70W in late July. Mourning doves have been confirmed nesting in the permit area near Antelope Creek in some previous years.

C. RAPTORS

Nesting Surveys

Through the 2011 report period, 148 raptor nest sites had been identified in or within 1.0 mile of the Antelope Mine permit area. Over time, many of those nests were destroyed by natural causes, removed by mining activities, or relocated as mitigation measures. Consequently, 58 known nests remained intact within the raptor survey area as of January 31, 2012.

Two new nests were discovered during the 2012 report period and three previously destroyed nests were rebuilt. Prior to the 2012 breeding season, five nests were destroyed by natural causes or mine operations. Consequently, 58 known intact nests were present in the survey area at the end of the 2012 report period. Twenty-one of the intact nests were within the permit area, and the rest were in the 1.0-mile perimeter. Existing nests included:

- 15 ferruginous hawk nests,
- 11 burrowing owl (*Athene cunicularia*) nest sites,
- 8 golden eagle nests,
- 8 red-tailed hawk nests,
- 5 great horned owl nest sites,
- 2 Swainson's hawk (*Buteo swainsoni*) nests,
- 2 red-tailed hawk/great horned owl nests,
- 1 red-tailed hawk/golden eagle nest,
- 2 golden eagle/great horned owl nests,
- 1 ferruginous hawk/red-tailed hawk nest,
- 1 Swainson's hawk/red-tailed hawk nest,
- 1 red-tailed hawk/golden eagle/great-horned owl nest, and
- 1 golden eagle/buteo/red-tailed hawk nest.

Table 3 provides the locations of all nests and their histories from 2008 through 2012. Nest locations are illustrated on Plate AR12/13:VIII B-1.

Table 3. Raptor nest locations, status, and productivity at the Antelope Mine from 2008 through 2012.

<u>Nest No.</u>	<u>Code</u>	<u>1/4</u>	<u>¼</u>	<u>Sec</u>	<u>TWP</u>	<u>RNG</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
GE1a*	CW	SW	SE	31	41	70	R-GE1d in 1983	---	---	---	---
GE1b	G ^m	SE	NW	7	40	70	D-N in 1995	---	---	---	---
GE1c	G ^m	NE	NW	7	40	70	D-N in 1998	---	---	---	---
GE1d	SN ^m	NW	NW	7	40	70	D-N in 1990	---	---	---	---
GE1e	P ^m	NW	NW	7	40	70	I	ALT	I	ALT	ALT
GE1f*	CW	NE	SW	31	41	70	D-H in 1984	---	---	---	---
GE1g*	CW	NE	NE	1	40	71	D-N in 2006	---	---	Rebuilt, A-T	A,2,2
GE1h*	CW	NE	NE	1	40	71	A-T	A-T	I	D-N	---
GE2a*	CW	NW	NE	34	41	71	R-GE2b in 1981	---	---	---	---
GE2c*	CW	NW	NE	34	41	71	D-H in 1982	---	---	---	---
GE2d*	CW	NW	NE	34	41	71	D-H in 1984	---	---	---	---
GE2e*	SC	NW	NE	34	41	71	D-N in 2006	---	---	---	---
GE2f*	CW	NW	NE	34	41	71	D-N in 2004	---	---	---	---
GE2g*	CW	SE	SE	32	41	71	A,2,2	A,2,2	A,2,2	A-T	A,2,2
GE3b	CW	SW	SE	13	40	71	D-N in 1984	---	---	---	---
GE3d*	CW	SE	SE	14	40	71	ALT	A-T	I	A-T	ALT
GE3e	HF	SE	NW	24	40	71	A-T	ALT	I	A-T/ALT	A,2,2
GE3f	HF	NW	SE	24	40	71	ALT	ALT	I	ALT	ALT
GE4e ^a	CW	SE	SE	32	41	70	A,1,1	I	D-N	---	---
GE5a	CW	NW	SW	5	40	70	D-N in 1997	---	---	---	---
GE5b*	CW	SE	SW	5	40	70	A,0,0	I	A,1+,0	A,0,0	A-T
GE9	CW	NW	SW	7	40	70	A,0,0	A,2,2	I	D-N; A-T	I
Golden Eagle Subtotals:							6,3,3	4,4,4	2,3+,2	5,0,0	4,6,6
FH1b*	G	SW	SW	11	40	71	R-FH1g in 1988	---	---	---	---
FH1c*	G	NW	SW	11	40	71	R-FH1h in 1988	---	---	---	---
FH1d*	G	SW	SW	11	40	71	R-FH1i in 1988	---	---	---	---
FH1f	EP	SE	SE	9	40	71	I	I	ALT	I	I
FH1g*	P ^m	SE	SW	10	40	71	R-FH1j in 2004	---	---	---	---
FH1h*	G ^m	NE	NW	10	40	71	D-N in 1992	---	---	---	---
FH1i*	P ^m	NE	SW	10	40	71	D-N in 1992	---	---	---	---

Table 3. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>1/4</u>	<u>1/4</u>	<u>Sec</u>	<u>TWP</u>	<u>RNG</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
FH1j	P ^m	SW	SW	10	40	71	R-FH1k in 2004	---	---	---	---
FH1k	P ^m	SE	SE	9	40	71	I	I	A-T	I	I
FH1l	RK	SW	NW	15	40	71	I	I	ALT	I	I
FH2a*	CB	SE	NW	25	41	71	R-FH2f in 2001	---	---	---	---
FH2b	EP	NW	SW	24	41	71	I	I	I	I	I
FH2c	CB	NE	SW	24	41	71	D-N in 2000	---	---	---	---
FH2d	CB	SE	NE	23	41	71	I	I	I	I	I
FH2e*	CB	NW	NE	26	41	71	R-FH2f in 2001	---	---	---	---
FH2f	CB ^m	SE	NE	23	41	71	I	I	D-N	---	---
FH3a ^a	SB	SE	SW	24	40	71	I	I	I	I	I
FH3c ^a	G	SE	SW	24	40	71	I	I	I	I	I
FH4a ^a	OC	SE	SE	16	40	71	D-N in 1998	---	---	---	---
FH5a	CB	NE	NE	22	40	71	I	I	I	A,0,0	ALT
FH5b	G	NE	NE	22	40	71	I	I	I	ALT	ALT
FH5c	G	NE	NE	22	40	71	I	I	I	ALT	A,2,2
FH5d	CB	SW	NE	22	40	71	I	I	I	ALT	ALT
FH5e	G	SE	NW	22	40	71	I	D-N	---	---	---
FH5f*	CW	SE	SW	14	40	71	I	I	I	D-N	---
FH7a	CB	SW	NE	13	41	71	D-N in 2003	---	---	---	---
FH7b	G	SE	NE	13	41	71	D-N in 1990	---	---	---	---
FH8d ^a	G	SE	SW	16	41	71	I	I	I	ALT	D-N
FH8e	G	NW	NE	20	41	71	---	I	I	ALT	I
FH9a*	G	NW	SW	27	41	71	R-M in 2006	---	---	---	---
FH9b*	G	NW	SW	27	41	71	D-N in 2005	---	---	---	---
FH10	G	NW	SE	9	41	71	D-N in 1999	---	---	---	---
FH11b	HF	NW	NW	11	41	71	D-N in 1999	---	---	---	---
FH12b ^a	G	NW	NE	12	41	71	I	I	I	I	I
FH13b ^a	G	SW	SE	17	40	71	ALT	I	D-N	---	---
FH15	CB	SE	NE	9	41	71	I	I	I	I	D-N
FH18b	CW	SW	SE	31	41	71	ALT	I	I	I	ALT
FH18c	CW	SE	SE	31	41	71	A,0,0	I	I	I	ALT
FHi-1	CB	NE	NW	19	41	71	I	I	I	I	D-N
FHi-2	CB	SW	NW	19	41	71	I	I	I	D-N	---
Ferruginous Hawk Subtotals:							1,0,0	0	1,0,0	1,0,0	1,2,2

Table 3. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>1/4</u>	<u>1/4</u>	<u>Sec</u>	<u>TWP</u>	<u>RNG</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
RTH1a*	CW	SE	SE	11	40	71	R-RTH1b in 1991	---	---	---	---
RTH1b*	SN ^m	SW	SW	2	40	71	D-N in 1998	---	---	---	---
RTH1c*	CW	NW	NE	12	40	71	D-N in 2000	---	---	---	---
RTH3a*	SN	SE	NE	35	41	71	D-N in 1979	---	---	---	---
RTH3b*	CW	SW	SE	26	41	71	D-N in 1991	---	---	---	---
RTH3d*	CW	SW	SE	26	41	71	D-N in 1992	---	---	---	---
RTH3e*	CW	SE	SW	26	41	71	D-N in 1995	---	---	---	---
RTH3h*	CW	NE	NW	35	41	71	I	A-T	D-N	---	---
RTH3i*	CW	NE	NE	35	41	71	---	---	A-T	I	I
RTH6*	CW	SE	SE	14	40	71	I	I	I	I	I
RTH7a	CW	NW	NW	32	41	70	D-N in 1982	---	---	---	---
RTH7b*	CW	NE	SE	31	41	70	D-N in 2002	---	---	---	---
RTH7d	CW	NW	SW	32	41	70	ALT	ALT	ALT	ALT	ALT
RTH8	WI	NE	SW	23	40	71	A,0,0	D-N	---	---	Rebuilt A,2,2
RTH9a	HF	NE	NW	30	41	70	D-N in 1995	---	---	---	---
RTH9c	HF	SW	NE	24	41	71	D-N in 1998	---	---	---	---
RTH13a*	CW	NE	SE	33	41	71	D-N in 1997	---	---	---	---
RTH13c*	SN	SE	SE	33	41	71	ALT	ALT	ALT	ALT	ALT
RTH14a	CW	NE	NE	7	40	71	A-T; D-N	---	---	---	---
RTH14b	CW	NE	SE	6	40	71	ALT	I	I	ALT	ALT
RTH14c	CW	NE	SW	6	40	71	A,1+,1	I	I	A,?,0	A,1,1
RTH16a	CW	SW	NE	13	41	71	D-N in 2003	---	---	---	---
RTH18*	CW	SW	SW	35	41	71	A,2,2	A,1+,1	A,2,2	A-T	A,1+,0
Red-tailed Hawk Subtotals:							3,3+,3	2,1+,1	2,2,2	2,0,0	3,4+,3
GHO2a*	CW	SE	SE	14	40	71	D-N in 1983	---	---	---	---
GHO2b*	PH	NE	NW	14	40	71	R-M in 1992	---	---	---	---
GHO3a*	CW	SW	SW	35	41	71	D-N in 1988	---	---	---	---
GHO3b*	MF	NE	NW	2	40	71	R-M in 2000	---	---	---	---
GHO3c*	MF	NW	SW	11	40	71	R-M in 2000	---	---	---	---
GHO5a*	CW	SW	SW	31	41	70	ALT	ALT	I	I	ALT
GHO5b ^{ad}	MF	SE	SE	36	41	71	A,2,1	A,1+,1	I	I	A,3,3
GHO6b*	CW	SE	SW	26	41	71	D-N in 2005	---	---	---	---
GHO8*	CB	NW	NE	6	40	70	I	I	I	I	I
GHO9	CB	NW	NE	13	40	71	I	I	I	I	I
GHO10a	T	NW	SW	32	41	70	D-N in 1992	---	---	---	---
GHO10b	CW	NW	SW	32	41	70	D-N in 1991	---	---	---	---

Table 3. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>1/4</u>	<u>1/4</u>	<u>Sec</u>	<u>TWP</u>	<u>RNG</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
GHO10d	CW	SE	SE	32	41	70	D-N in 2004	---	---	---	---
GHO10g	RR	SE	SE	31	41	70	---	---	---	---	A,1+,1
GHO11a*	CW	NW	NE	33	41	71	R-M	---	---	---	---
Great Horned Owl Subtotals:							1,2,1	1,1+,1	0	0	2,4+,4
BO1*	PB	NW	SE	36	41	71	R-M in 1996	---	---	---	---
BO2a	PB	NE	NW	9	40	71					D-M
BO2b*	PB	NW	NW	9	40	71					
BO2c	PB	SE	NW	9	40	71					
BO2d	PB	NE	NE	8	40	71					
BO3*	RG ^m	SW	SW	2	40	71					
BO4*	RG ^m	SE	NE	10	40	71					
BO5	PB	SW	NE	15	40	71	A,1+,1				
BO6*	PB	NE	NW	3	40	71	R-M in 2000	---	---	---	---
BO7*	PB	NW	NE	3	40	71	R-M in 2000	---	---	---	---
BO8	PB	NW	NW	28	41	71					
BO9	PB	NE	NW	28	41	71					
BO10*	RG ^m	NW	NE	11	40	71					
BO11*	RG ^m	NE	SW	14	40	71					
BO12*	PB	SW	NW	27	41	71					
Burrowing Owl Subtotals:							1,1+,1	0	0	0	0
B1*	CW	SW	SW	35	41	71	D-N in 1989	---	---	---	---
Unknown Buteo Subtotals:							0	0	0	0	0
SH3c ^b	CW	SE	SE	22	41	71	R-SH3c-1 in 2007	---	---	---	---
SH3c-1 ^m	P	NW	SE	22	41	71	R-SH3c-2	---	---	---	---
SH3c-2 ^m	P	SE	SW	22	41	71	A,2,2	A,2,2	R-SH3c-3	---	---
SH3c-3 ^m	P	NE	NW	27	41	71	---	---	C-M, I	A,1+,0	
SH5	SN	SE	SW	24	41	71	D-N in 2005	---	---	---	---
SH7	CW	SW	SW	31	41	71	---	---	---	---	A,1,1
Swainson's Hawk Subtotals:							1,2,2	1,2,2	0	1,1+,0	1,1,1
H1	G	NW	SW	9	41	71	---	---	---	A,3,3	D-N
Northern Harrier Subtotals:							0	0	0	1	0
GE2b/GE5c/ GHO2c	CW ^m	SW	SW	33	41	71	D-N in 2001	---	---	---	---
GE3a/GHO2d	CW	NE	SW	13	40	71	ALT	ALT		D-N	Rebuilt ^{GE} A,2,2 ^{GHO}
GE3c/GHO2c	CW	SW	SE	13	40	71	D-N	---	---	---	---

Table 3. Continued.

<u>Nest No.</u>	<u>Code</u>	<u>1/4</u>	<u>1/4</u>	<u>Sec</u>	<u>TWP</u>	<u>RNG</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
GE4a ^a / GHO10e	CW	SW	SE	32	41	70	ALT	I	A-T ^{GE}	A-T ^{GE}	A,1,1 ^{GE}
GE4d ^a / GHO10c/ RTH7c	CW	SW	SW	32	41	70	D-N in 2001	---	---	---	---
GE8a/B2/ RTH16c	CW	NE	NE	14	41	71	A,1,1 ^{RTH}	A,?,0 ^{RTH}	D-N	---	Rebuilt, A-T ^B
FH1a/RTH2a/ GHO1a*	CW	NE	NE	10	40	71	R-FH1e in 1987	---	---	---	---
FH1e/RTH2b/ GHO1b*	CW	SE	NE	35	41	71	D-N in 1990	---	---	---	---
FH18a ^c / RTH22	CW	SE	SW	31	41	71	A,1+,1 ^{RTH}	I	I	I	A,1+,1 ^{FH}
RTH3c/ GHO6a*	CW	NW	NE	35	41	71	D-N in 1989	---	---	---	---
RTH3f/ GHO6d*	CW	NW	NE	35	41	71	D-N in 2005	---	---	---	---
RTH3g/ GHO6c*	CW	NW	NW	35	41	71	D-N in 2000	---	---	---	---
RTH4/ GHO4a*	CW	NE	NW	36	41	71	D-N in 1991	---	---	---	---
RTH5a/ GHO7b*	CW	NE	NE	31	41	70	R-RTH5c in 1993	---	---	---	---
RTH5b/ GHO7a*	CW	NE	NE	31	41	70	R-RTH5d in 1993	---	---	---	---
RTH5c/ GHO7c	T ^m	NW	NW	32	41	70	D-N in 1994	---	---	---	---
RTH5d/ GHO7d	T ^m	NE	SE	30	41	70	D-N in 1994	---	---	---	---
RTH7e/ GHO10f	CW	SW	SW	32	41	70	A,0,0 ^{RTH}	A,2,2 ^{RTH}	A,2,2 ^{RTH}	A,2,2 ^{RTH}	A,3,3 ^{RTH}
RTH9b/ GHO12	CW	NE	NE	25	41	71	D-N in 2002	---	---	---	---
RTH13b/ GHO11d*	CW	NE	SE	33	41	71	ALT	ALT	D-N	---	---
RTH15/GE6/ GHO18*	CW	SW	NW	29	41	71	A-T ^{RTH}	A-T ^{RTH}	A,2,2 ^{GHO}	A,1,1 ^{GE}	A-T ^{GE}
RTH16b/GE8b	CW	SW	NE	13	41	71	A,2,2 ^{GE}	ALT	I	A-T ^{GE}	I
GHO4b/ RTH20*	CW	NW	SW	36	41	71	D-N in 2007	---	---	---	---
GHO11b/ RTH13d*	CW	SE	SE	33	41	71	A,2,2 ^{RTH}	A-T ^{RTH}	A,2,1 ^{RTH}	A,1+,0 ^{RTH}	A,1+,1 ^{RTH}
SH3a/FH9c*	CW	NE	NE	22	41	71	R-M	---	---	---	---
SH3b/RTH21*	CW	NE	NW	22	41	71	A,1,0 ^{RTH}	A-T ^{RTH}	I	A-T ^{RTH}	I
Multi-species Subtotals:							7,7+,6	5,2,2	4,6,5	6,4+,3	7,8+,8
GRAND TOTALS:							20,18+,16	13,10,10	9,11,9	16,8+,6	18,25+,24

Table 3. Continued.

* Denotes nests within the Antelope Mine permit area.

^m Nests created as mitigation measures.

^a Additional nests within territory are beyond the 1.0-mile survey perimeter.

^b Original nest was relocated to a platform (SH3c1) during the 2007 breeding season.

^c Formerly Nest #FH-G from the West Antelope baseline.

^d Great horned owls used remnant crusher frame for nest after bulk of structure was removed prior to 2010 breeding season.

X,#,# = Status, number of young hatched, number of young fledged.

In TOTALS rows #,#,# = total active territories, total young hatched, total young fledged.

<u>Species Codes</u>	<u>Nest Substrate Codes</u>	
B = Unknown Buteo	CB = Creek bank	PH = Pit highwall
BO = Burrowing owl	CW = Cottonwood	RG = Reclamation
FH = Ferruginous hawk	EP = Earth pillar	RK = Rocky knob
GE = Golden eagle	G = Ground	RR = Railroad trestle
GHO = Great horned owl	HF = H-frame power pole	SB = Scoria boulder
H = Northern harrier	MF = Mine facilities	SC = Scoria cliff
RTH = Red-tailed hawk	OC = Outcrop	SN = Snag
SH = Swainson's hawk	P = Platform	T = Tree
	PB = Prairie dog burrow	WI = Willow

<u>Nest Status</u>	
A = Active	D-N = Destroyed, natural causes
ALT = Alternate nest	I = Inactive
A-T = Active-tended/no eggs laid	R-M = Removed, mine related
C-M = Created for mitigation	R-# = Relocated to site #
D-H = Destroyed by humans	? = Status unknown
to discourage nesting	--- = Undiscovered/non-existent
D-M = Destroyed by mining	#+ = Minimum estimate

Nineteen pairs of raptors were active at 18 nest sites within the survey area during 2012; two species used one site at different times. Fourteen of the 19 pairs fledged a total of 24 young. Raptors that successfully nested in the area included four pairs each of golden eagles and red-tailed hawks, three pairs of great horned owls, two pairs of ferruginous hawks, and one pair of Swainson's hawks. One pair of red-tailed hawks hatched at least one chick, but no young fledged. Three pairs of golden eagles and one unknown Buteo (likely red-tailed hawk) tended nests but did not lay eggs.

Raptor reproductive effort can be measured in many ways; e.g., percentage of occupied territories, percentage of successful pairs, average clutch size, etc. The number of offspring successfully reared to fledging (i.e., capable of flight but not necessarily independence), is a useful index of raptor productivity. Although annual production has

varied, young have fledged during each of the last 30 years (Table 4). The observed fluctuations in raptor nesting attempts and fledging success have been influenced by natural factors such as weather conditions and prey abundance. Because different species utilize different food resources (e.g., mice vs. rabbits), long-term trends in productivity are best considered on a species by species basis.

Four species of large raptors were consistently active in the area from 1982 through 2012: golden eagles, ferruginous hawks, red-tailed hawks, and great horned owls. Annual productivity fluctuated, but young fledged from at least one of these four species during each of the last 30 years (Figure 2). Large raptor productivity was lowest in 1985 and 1986, from 1993 through 1995, and in 2011. Although late spring snow storms affected raptor nesting success in some years (1984, 2005, 2009 through 2011), prey availability, especially lagomorph abundance, undoubtedly had the greatest influence on the reproductive success of large raptors through time (see *Prey Abundance Indices: Lagomorphs*, below).

Four pairs of golden eagles have occupied territories in the vicinity of the Antelope Mine during each of the last 31 years (1982 through 2012). Two more pairs occasionally nest in the survey area, but not with the same regularity. At least one pair of eagles fledged young in 29 of the last 31 years (Table 4); three or more pairs fledged young in 17 of those years. In 2012, four pairs of eagles actively nested (laid eggs); all fledged young (seven young total). Three additional pairs tended nests, but did not lay eggs (Table 3).

One (GE2) of the active territories has persisted since the early 1980s despite encroachment by mine operations. These birds adjusted to disturbance over the years by either nesting near continuous and ongoing mining activities, or by moving among alternate nest sites along a 2.0-mile reach of Antelope Creek as mining progressed through their territory. In 2011, the USFWS ESO in Cheyenne, Wyoming, and Migratory Bird Permit Office in Denver, Colorado, determined that mine operations were not likely to result in a take situation for this territory due to the pair's proven acclimation to mine disturbance over the years and their willingness to move among nest sites within the territory; that determination remained in effect in 2012. The GE2 pair fledged 2 young in 2012; it is expected that the pair will continue its pattern of adjusting to changing operations as additional reclamation is completed in the eastern portion of the territory and active mining moves to the north.

Table 4. Annual productivity (total number of young fledged) of nesting raptors in the Antelope Mine survey area from 1982 through 2012.

Year	Golden Eagles	Red-tailed Hawks	Ferruginous Hawks	Great Horned Owls	Burrowing Owls	Swainson's Hawks	Northern Harriers	Total
1982	4	3	3	4	--	--	--	14
1983	6	2	0	10	--	--	--	18
1984	5	0	0	6	--	--	--	11
1985	0	2	0	0	--	--	--	2
1986	2 ¹	0	2	0	--	--	--	4
1987	2 ¹	2	0	9	--	--	--	13
1988	5 ²	4	6	6	--	--	--	21
1989	5 ²	4	1	3	--	--	--	13
1990	5 ²	7	5	9	--	--	--	26
1991	3	7	4	3	4	--	--	21
1992	5 ¹	6	5	9	--	--	--	25
1993	5	0	0	0	--	--	--	5
1994	0	1	1	?	8	--	--	10
1995	2	0	1	0	4	--	--	7
1996	5	3	3	2	14	--	--	27
1997	4	2	2	1	5	--	--	14
1998*	4	3	7	4	2	1	--	21
1999	5	7	8	1	22	1	--	44
2000	2	3	3	7	9	--	--	24
2001	8	5	2	3	4	3	--	25
2002*	6	4	2	6	4	--	--	22
2003	2	5	1	6	3	--	--	17
2004	1	10	0	9	6	--	--	26
2005	1	10	0	4	8	2	--	25
2006*	6	16	7	4	13	--	--	46
2007	9	17	5	2	4	2	--	39
2008	5	9	0	1	1	2	--	18
2009	4	3	--	1	--	2	--	10
2010	2	5	0	2	--	--	--	9
2011	1	2	0	--	--	0	3	6
2012	7	7	3	6	--	1	--	24
Total	121	149	71	118	111	14	3	587

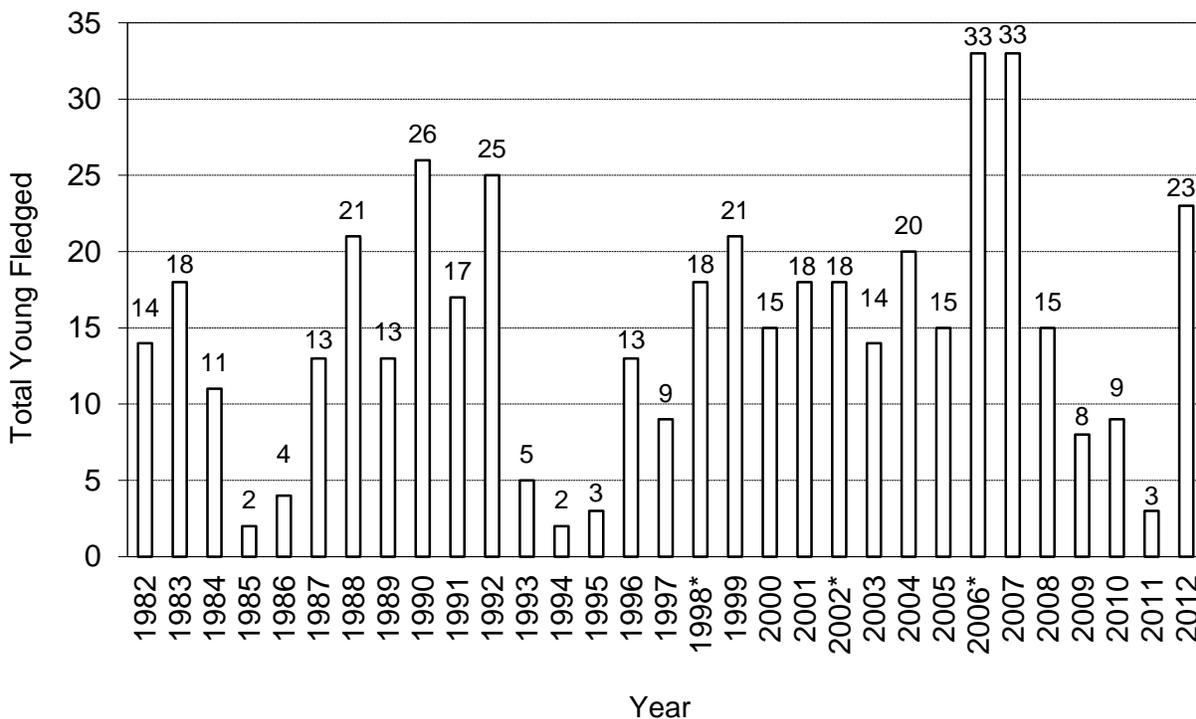
-- No active nests identified for given species

¹ One additional eaglet near fledging age was taken each year by the Georgia Dept. of Natural Resources for a golden eagle reintroduction project.

² Two additional eaglets near fledging age were taken each year by the Georgia Dept. of Natural Resources for a golden eagle reintroduction project.

* Survey area was expanded in 1998, 2002, and 2006 (nests from 2006 expansion reflected in 2007).

Figure 2. Annual productivity (total young fledged) of large raptors (golden eagles, ferruginous hawks, red-tailed hawks, and great horned owls) at the Antelope Mine from 1982 through 2012.



* The raptor survey area was expanded in 1998, 2002, and 2006.

Two additional eagle territories were added to the survey area as a result of the recent West Antelope permit amendment. The GE5 pair has consistently nested in the general vicinity since 1997, with additional historical nesting efforts dating back to the late 1970s. While the pair has a long history of production, the last 5 years were less successful (Table 3). The GE9 territory is located west of Wyoming Highway 59, beyond the pre-amendment wildlife monitoring area for the Antelope Mine. Nevertheless, the pair has been monitored with some regularity since the early 1980s, with annual checks beginning in 2003. The GE9 pair has actively nested (laid eggs) in 3 of the last 6 years, with young fledged in 2 years. In 2012, the GE9 nest was inactive.

Red-tailed hawks have regularly nested in the survey area since 1982. Generally, three to five pairs exhibited some level of activity each year. At least one pair fledged young in 27 of the last 31 years (Table 4). Five pairs of red-tailed hawks were active at some level in 2012, and a total of seven young fledged that year. One red-tailed nest (RTH18) was first discovered along Antelope Creek inside the permit area in 2003; the pair fledged young each

year through 2010 despite the presence of mining activities proximate to and within view of the nest site. Although the RTH18 pair hatched at least one egg in 2012, no young fledged (Table 3).

Ferruginous hawks nested in the vicinity of the Antelope Mine during 28 of the last 31 years, and fledged young in 20 years (Table 4). Three to five pairs nested in the survey area in many years, though nesting efforts were lower from 2008 through 2012 (Table 3). That decline was likely related to a reduction in lagomorph populations and to persistent severe spring weather from 2009 through 2011. For example, the Antelope Mine experienced multiple episodes of heavy rainfall in 2010, with precipitation exceeding 2 inches in a 50-hour period more than once; the mine received 6 inches of hail in early June 2011 (K. Wendtland, Antelope Mine, personal communication). In 2012, two pairs of ferruginous hawks incubated eggs; both fledged young (three total).

Great horned owls have regularly nested in the raptor survey area since 1982. In contrast to the diurnal raptors, the number of active pairs of great horned owls declined over the last decade. Prior to 1993, up to six pairs nested in a given year. In most subsequent years, no more than two pairs were active, and one or fewer pairs nested from 2008 through 2011 (Table 3). The reduction in nesting pairs after 1992 was likely related to multiple factors, including diminished prey numbers in some years and the loss of numerous nests to natural causes in the early 1990s. Great horned owls do not build their own nests and, thus, are dependent on other species for the construction and maintenance of nest sites. Additionally, the secretive nature of owls may cause searchers to overlook some nesting pairs, which could result in undercounting. In 2012, great horned owl nesting efforts increased again; three active pairs each fledged young (six total).

Burrowing owls were first recorded nesting in the raptor survey area in 1991, with active pairs confirmed during 15 of the following 17 years (1992 through 2008). Only one pair nested each year from 1991 through 1995. However, two or more pairs were active in most years from 1996 through 2008. At least one pair fledged young during all active years. No burrowing owls were observed in the survey area from 2009 through 2012.

Swainson's hawks nested beyond the Antelope Mine monitoring area for several years. However, no active nests were present within the raptor survey area until 1998. One pair (SH3) has nested in the area in 8 of the last 15 years (1998 through 2012). In 2007, the pair built a new nest (SH3c) in a lone tree within 360 feet of active mining operations after returning to find other nests within its territory occupied by different raptor species. Following

the acquisition of appropriate permits, the nest and chicks were transferred to a mobile platform nest structure placed beside the nest tree, which was then incrementally relocated approximately 2,050 feet northwest of the original nest site to SH3c-1 (Plate AR12/13:VIII B-1) over the subsequent 9 days. The platform was relocated approximately 990 feet to the southwest prior to the 2008 breeding season. The pair fledged young from the new platform location (SH3c-2, Plate AR12/13:VIII B-1) in both 2008 and 2009. In 2010, the platform was moved to the next drainage to the west during the non-breeding season. The nest was inactive during that year. A pair of Swainson's hawks hatched at least one chick on the platform nest in 2011, but the young did not survive. The platform nest was not active in 2012. However, a new Swainson's hawk nest (SH7, Plate AR12/13:VIII B-1) was discovered just inside the western edge of the permit area in 2012; the pair hatched and fledged one young.

Northern harriers (*Circus cyaneus*) were regularly observed in the survey area during several recent breeding seasons. Although actual nest sites were not found, newly fledged young have occasionally been observed within the permit area. In 2011, a northern harrier nest (H1) was documented in the survey area for the first time, but it was destroyed by natural causes prior to the 2012 nesting season. It is not surprising that active nests are not commonly found, as this ground-nesting species builds inconspicuous nests among tall vegetation, and ranges over a relatively large area when hunting. Consequently, locating nest sites often depends on chance sightings of adults taking prey to the nest. One northern harrier was seen incidentally during surveys conducted in 2012. A female was observed flying within the permit area in NW SW Section 11, T40N:R71W in August.

Measures of Disturbance

Fifty-eight intact raptor nests were present in the Antelope Mine raptor survey area during the 2012 breeding season. Mine-related facilities and associated road and rail traffic were the most common disturbances proximate to 32 (55%) of the 58 intact nests (Table 5). Twenty (34%) intact nests were near traffic on two-tracks, paved county roads, or scoria roads not directly associated with operations at the Antelope Mine. Three (5%) nests were near a CBNG well and two (3%) were near the same ranch house; the residence is no longer occupied. The remaining nest (2%) was near a conventional gas well.

In 2012, active nests (including tended sites) throughout the survey area were slightly closer (average of 0.19 mile) to regular human disturbance than inactive/alternate nests

Table 5. Nearest disturbance to, and status of, intact raptor nests at the Antelope Mine in 2012.

Nest	Disturbance	Distance ¹ from Nest (mi)	Line-of-Sight	Status
GE1e	Railroad	0.2	Yes	ALT
GE1g*	Coal Crusher	0.2	Yes	S
GE2g*	Mine Activities	<0.1	Yes	S
<u>GE3a/GHO2d</u>	Railroad Construction	<0.1	Yes	S
GE3d*	Railroad	0.1	Yes	ALT
GE3e	Railroad	0.5	Yes	S
GE3f	Railroad	0.8	Yes	ALT
<u>GE4a/GHO10e</u>	Scoria Road	0.1	Yes	S
GE5b*	Mine Activities	0.3	Yes	A-T
<u>GE8a/B2/RTH16c</u>	Railroad	0.4	Yes	A-T
GE9	Paved County Road	0.2	Yes	I
FH1f	Two-track Road	<0.1	Yes	I
FH1k	Two-track Road	0.1	Yes	I
FH1l	Two-track Road	<0.1	Yes	I
FH2b	Paved County Road	0.2	No	I
FH2d	Paved County Road	0.3	No	I
FH3a	Railroad	1.0	No	I
FH3c	Railroad	1.0	No	I
FH5a	Paved County Road	0.2	Yes	ALT
FH5b	Paved County Road	0.3	Yes	ALT
FH5c	Paved County Road	0.3	Yes	S
FH5d	Paved County Road	0.1	Yes	ALT
FH8e	Two-track Road (CBNG)	0.4	No	I
FH12b	Gas Well	0.4	No	I
<u>FH18a/RTH22</u>	CBNG Well	0.3	Yes	S
FH18b	CBNG Well	0.1	Yes	ALT
FH18c	CBNG Well	0.2	No	ALT
RTH3i	Mine Activities	<0.1	Yes	I
RTH6*	Railroad	0.1	Yes	I
RTH7d	Scoria Road	0.1	Yes	ALT
<u>RTH7e/GHO10f</u>	Railroad	0.1	Yes	S
RTH8	Railroad	<0.1	Yes	S
RTH13c*	Mine Activities	0.2	Yes	ALT
RTH14b	Ranch House	0.7	No	ALT
RTH14c	Ranch House	0.5	Yes	S
<u>RTH15/GE6/GHO18*</u>	Scoria Road (CBNG)	<0.1	Yes	A-T
RTH16b/GE8b	Paved County Road	0.2	No	I

Table 5. Continued.

Nest	Disturbance	Distance ¹ from Nest (mi)	Line-of- Sight	Status
RTH18*	Mine Road	0.1	Yes	U
GHO5a*	Coal Crusher	0.2	No	ALT
GHO5b*	Coal Crusher Frame	0	Yes	S
GHO8*	Railroad	0.1	Yes	I
GHO9	Railroad	0.2	Yes	I
GHO10g	Railroad	0	Yes	S
GHO11b/ <u>RTH13d</u> *	Mine Activities	0.2	Yes	S
BO2b*	Mine Activities	0.1	Yes	I
BO2c	Two-track Road	0.1	Yes	I
BO2d	Two-track Road	<0.1	Yes	I
BO3*	Mine Road	0.1	Yes	I
BO4*	Mine Road	0.1	Yes	I
BO5	Mine Activities	0.2	Yes	I
BO8	Two-track Road	<0.1	Yes	I
BO9	Two-track Road	<0.1	Yes	I
BO10*	Mine Road	0.4	No	I
BO11*	Mine Road	0.2	No	I
BO12*	Mine Activities	<0.1	Yes	I
SH3b/ <u>RTH21</u> *	Mine Activities	0	Yes	I
SH3c3*	Mine Activities	<0.1	Yes	I
SH7	Paved County Road	<0.1	Yes	S

¹ Maximum reported distance is 1.0 mile, which is the maximum buffer recommended by the USFWS (2009).

* Located within the Antelope Mine permit area.

___ Underline denotes species using nest in 2012. One nest was used by two species that year.

Status Codes

ALT = Alternate to active nest	I = Inactive
A-T = Active-tended	S = Successful
	U = Unsuccessful

(average of 0.24 mile). Successful nests also were closer (average of 0.19 mile) to a disturbance source than unsuccessful/tended nests (average of 0.23 mile). Disturbance activities were visible from all (100%) of the 18 active nests (successful and unsuccessful) within the survey area, and from 28 (70%) of the 40 inactive or alternate nests.

Long-term data demonstrate that many raptors nesting in the Antelope Mine survey area have developed a high tolerance for mine-related disturbances. Several raptor pairs from at least four different species have illustrated this acceptance by repeatedly nesting in

the permit area despite ongoing and encroaching mine operations. Photographs documenting several of these successful raptor nest sites have been presented in recent annual wildlife reports, on file with the WDEQ-LQD in Cheyenne, Wyoming.

As described in the above *Raptors: Nesting Surveys* section, golden eagles have maintained four territories within or near the permit area for more than 25 years. One (GE1) of those pairs nested in the same tree (GE1g, Plate AR12/13:VIII B-1) during 17 of the 29 years from 1984 through 2012, despite the construction and/or operation of two coal crushing structures within 0.1 to 0.25 mile of the nest site since 1995. Eagles incubated at that site during 10 of the 18 years since 1995, and fledged young in 7 years. The GE1g nest was destroyed by natural causes in early 2006. The pair used a nest (GE1h) constructed in a nearby tree from 2006 through 2009. That nest was built in 2005, and was also located 0.25 mile from an active coal crusher. The GE1 pair successfully fledged young from the new site in 2006 and 2007, and tended the nest in the subsequent 2 years. The GE1h nest was inactive in 2010, and was destroyed by natural causes in 2011. The GE1g nest was rebuilt in 2011 and, although the pair did not lay eggs that year, two young were fledged in 2012.

The previous *Raptors: Nesting Surveys* section also describes examples of red-tailed hawks (RTH3, RTH13, and RTH18) regularly fledging young from nests near active mining over the years. All three hawk territories overlap the same 2.0-mile stretch of Antelope Creek as it courses through the center of the active area. The nests within those territories are quite near, and in view of, numerous mining operations, yet the three pairs fledged young during most recent years. The RTH18 pair has successfully nested near active mining during 7 of the previous 8 years (unsuccessful in 2012), as has the RTH3 pair during 11 of the past 16 years. The RTH13 pair has successfully nested in 7 of the last 9 years since mine operations advanced toward the nest area. These long-term annual monitoring results indicate that raptor productivity in the vicinity of the mine appears to be primarily influenced by prey availability, as described in the following section.

As mining progresses through the permit area, numerous trees will be removed from terraces along, but not within, Antelope Creek. Several trees were removed in advance of mining in fall 2010. The Antelope Mine voluntarily placed many of them in reclamation to provide nesting and perching snags for various avian species. All trees impacted by mining will be replaced upon final reclamation.

Prey Abundance Indices: Lagomorphs

Two lagomorph species were observed during spotlight surveys conducted in 2012: the cottontail (*Sylvilagus* spp.) and white-tailed jackrabbit (*Lepus townsendi*). Total lagomorph abundance was 0.3 animal/survey mile, which, along with counts from the previous 3 years, was the lowest since 1996 (Table 6). Jackrabbit observations were among the lowest since before 2003, with only one animal recorded. Lagomorphs were seen in reclaimed and sagebrush habitats in 2012 (Table 6).

Long-term incidental observations, and survey data from the Antelope Mine and other local mines, have documented dramatic changes in regional lagomorph populations since 1987. Numbers increased through 1992, but experienced an extraordinary decline in late winter 1992-1993 (TWC, unpublished data). That reduction was due primarily to the disease Tularemia, which was documented in Campbell County that year. The lagomorph population remained depressed region-wide through 1997. By 1998, rabbit abundance had increased substantially at some local sites, including the Antelope Mine (Table 6), but was still quite low at others. Numbers at the mine showed even greater improvement after 1998, and the population growth appeared to be more widespread throughout the region. The regional lagomorph index was extremely high from 2004 through 2006, with record high counts at the Antelope Mine and other local mines. However, lagomorph populations declined considerably throughout the region in 2007, with especially low numbers in the following 5 years (Table 6). As in the early 1990s, recent reductions in local lagomorph populations were most likely associated with the return of Tularemia, which was documented in Campbell and Natrona Counties in recent years.

As noted in the *Raptors: Nesting Surveys* section above, lagomorph abundance influences the occurrence and breeding success of large raptor species. Although quantitative lagomorph data were not available at the Antelope Mine prior to 1994, fluctuations in large raptor production and lagomorph abundance since then appear to follow similar, though not identical, trends (Figure 3). As expected, the graph indicates a slight delay between changes in lagomorph abundance and apparent responses in raptor productivity. Additionally, numerous lagomorphs were seen incidental to other wildlife surveys in 2012, so the survey results from that year do not appear to reflect actual populations. While these survey results have not been subjected to statistical analyses, their apparent relationship is quite clear. Data from long-term lagomorph surveys at other mines in the vicinity lend further support to this relationship (TWC, unpublished data).

Table 6. Total lagomorphs observed during spotlight surveys conducted at the Antelope Mine in 2012, and abundance indices from 1994 through 2012.

Species	2012 Lagomorph Survey Data		
	Reclaimed Grassland	Sagebrush-grassland	Total Observed ^a
Cottontail	2	0	2
White-tailed jackrabbit	0	1	1
Total No. Observed	2	1	3

^a Number given is highest count for each species from two survey nights.

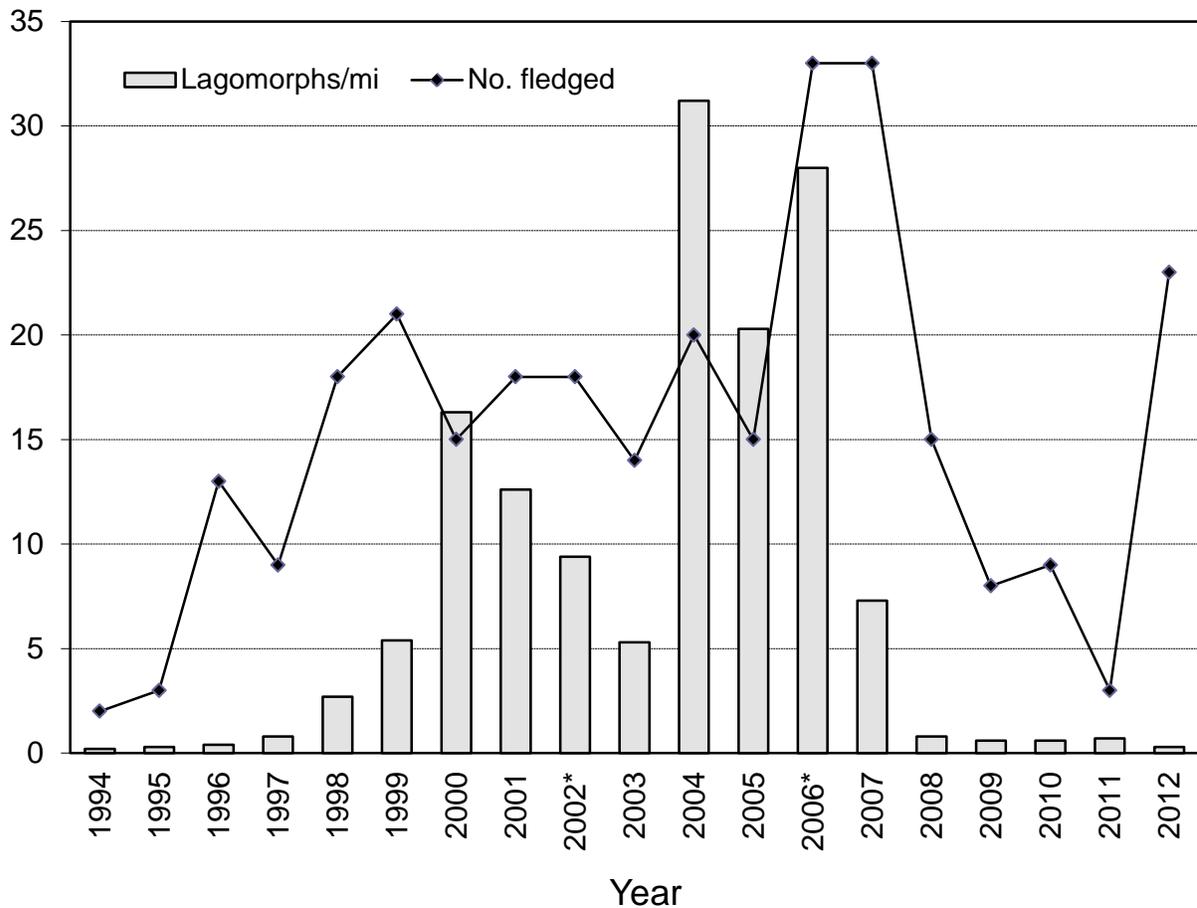
Year	Annual Abundance Indices (Lagomorphs/Survey Mile ^a)			Large Raptor Production
	Cottontail	White-tailed Jackrabbit	Total	
1994	0.0	0.2	0.2	2
1995	0.2	0.1	0.3	3
1996	0.3	0.1	0.4	13
1997	0.5	0.3	0.8	9
1998	1.9	0.8	2.7	18
1999	4.7	0.7	5.4	21
2000	15.7	0.6	16.3	15
2001	12.2	0.4	12.6	18
2002*	9.1	0.3	9.4	18
2003	4.3	1.0	5.3	14
2004	29.3	1.9	31.2	20
2005	14.5	5.8	20.3	15
2006	11.1	16.8	28.0	33
2007	0.4	6.9	7.3	33
2008	0.1	0.7	0.8	15
2009	0.3	0.3	0.6	8
2010	0.1	0.5	0.6	9
2011	0.2	0.5	0.7	3
2012	0.2	0.1	0.3	23

^a Survey route length varied in some years but averaged approximately 10 miles.

* The raptor survey area was expanded beginning in 2002, but the lagomorph

route already included portions of the enlarged area.

Figure 3. Reproductive success of large raptors (golden eagles, ferruginous hawks, red-tailed hawks, and great horned owls) and lagomorph abundance indices at the Antelope Mine from 1994 through 2012.



* The Antelope Mine permit area was expanded in 1998, 2002, and 2006; nests from the 2006 expansion are reflected in the 2007 data.

Historical Raptor Electrocutions and Recent Mortalities

In response to a USFWS request, the Antelope Mine has been providing a summary of raptor electrocutions and other raptor mortalities that have occurred since 2000, the period for which TWC has access to complete records of such incidents. Five raptor electrocutions have been reported at the mine since 2000 (Table 7); all five involved sub-adult golden eagles. Injuries on all birds were consistent with ground-to-phase contact, likely associated with insufficient clearances between energized wires and a pole ground, including a junction pole (March 2002), deadend pole (November 2002), or horizontal post insulators on three-phase 69 kilovolt transmission poles (2010, 2011, and 2012). Full details of all incidents were promptly reported to the USFWS.

Table 7. Documented Raptor Electrocutions and Mitigation Responses at the Antelope Mine from 2000 through 2012^a.

Species	Discovery Date	Pole Configuration	Mitigation Response	Disposition of Bird
Sub-adult Golden Eagle	March 23, 2002	Three-phase distribution junction pole, double crossarms	Retrofitted with perch guards, insulated jumpers, and alternate perch	Transferred carcass to USFWS-Casper, WY
Sub-adult Golden Eagle	November 22, 2002	Deadend single-phase transformer pole	Retrofitted with a perch guard and insulated jumper	Transferred carcass to USFWS-Casper, WY
Sub-adult Golden Eagle	November 15, 2010 ^b	Three-phase 69kV transmission pole	Surveyed all power lines in permit area for additional mortalities, initiated voluntary Avian Protection Plan to analyze and address all potential problem electrical infrastructure	Collected by USFWS-Casper, WY
Sub-adult Golden Eagle	September 20, 2011	Three-phase 69kV transmission pole	Independent contractor inventoried and assessed applicable electrical infrastructure	Collected by USFWS-Buffalo, WY
Sub-adult Golden Eagle	October 22, 2012 ^c	Three-phase 69kV transmission pole	Independent contractor inventoried and assessed applicable electrical infrastructure	Collected by USFWS-Buffalo, WY

^a Time period for which TWC has access to records.

^b The mine experienced a brief power flux in September 2010 but not a full outage; the eagle may have been electrocuted at that time but not discovered until November.

^c The mine experienced a brief power outage in October 2012; the fresh eagle carcass indicated the electrocution caused the outage.

A TWC biologist collected both electrocutions found in 2002 under USFWS Special Purpose Salvage permit MB057823; both birds were eventually transferred to USFWS personnel in Casper, Wyoming for appropriate disposition. Personnel with the USFWS collected the electrocuted birds found in all subsequent years.

Immediately following all incidents, the mine commissioned a local electrical contractor to modify the problem poles to minimize the risk of future injuries or mortalities (refer to

photographs in previous annual reports). Prey remains found at the base of the Section 2 junction pole in 2002 suggested that raptors regularly perched there. Consequently, the decision was made to accommodate perching raptors rather than try to discourage them from using the site. The contractor placed numerous perch guards on all four crossarms to prevent raptors from landing among the electrical hardware, and erected a perch above the crossarms. The contractor also covered all exposed jumper wires and placed a perch guard on the crossarm of the Section 11 pole that year to prevent raptors from landing among the electrical hardware in the future.

In addition to these efforts, the mine voluntarily worked with the USFWS Enforcement Office in Casper, Wyoming to develop a plan to inventory power poles in the permit area and retrofit those that presented an electrocution danger to perching migratory birds, especially raptors. The plan was completed by retrofitting 93 power poles with raptor protection, and no further electrocutions occurred at the Antelope Mine from fall 2002 through fall 2010.

Following the discovery of the eagle carcass in November 2010, the Antelope Mine voluntarily began working with EDM International, Inc. an independent firm considered to be a world-wide expert in raptor electrocutions, to develop an Avian Protection Plan for the mine. In 2011, EDM personnel conducted a thorough inventory and assessment of the electrical infrastructure within the permit area. That information is being used to prioritize retrofitting efforts, modify pole designs, and make other recommendations for the Antelope Mine's Avian Protection Plan. The mine submitted the final plan to the USFWS for review and approval in 2012.

Two other raptor mortalities have been reported in the Antelope Mine permit area over the years. On August 31, 2007, mine personnel contacted TWC to report an injured hawk walking around in a machinery storage yard near the main facilities. The bird was captured easily and placed in a large cardboard box in a cool, dark location until it could be transferred to a local raptor rehabilitation center; it was later identified as a young Cooper's hawk (*Accipiter cooperii*). The bird expired within an hour of capture and was determined to have starved to death based on the lack of obvious injuries and its emaciated state. On April 21, 2011, an adult red-tailed hawk carcass was found under a coal conveyor belt. The region had experienced some extremely high winds during that period, and it was presumed that the bird had accidentally struck the conveyor in flight, perhaps while pursuing prey. No power lines were present at either of those mortality sites. In both instances, the hawks were buried near their discovery sites per USFWS authorization.

D. MIGRATORY BIRD SPECIES OF MANAGEMENT CONCERN

General Surveys

The 40 migratory bird species considered by the USFWS to be of current management concern for surface coal mines in Wyoming are listed in Table 8. The table provides a record of their occurrence and status in the vicinity of the Antelope Mine, both historically and during the current reporting period. Suitable nesting habitat exists in the Antelope area for only 17 of the 40 listed species. Those same 17 species (noted with an asterisk in Table 8) also nest regularly throughout the Powder River Basin of Wyoming (Orabona et al. 2012, TWC unpublished data).

Ten avian species of concern were documented in or within 0.5 mile of the Antelope permit area during the current reporting period. Five of the 10 species are classified as Level I, which indicates a need for conservation action such as a monitoring and mitigation plan: McCown's longspur (*Rhynchophanes mccownii*), ferruginous hawk, Swainson's hawk, mountain plover, and Brewer's sparrow (*Spizella breweri*). The remaining five species are considered Level II, for which continued monitoring is recommended: lark bunting (*Calamospiza melanocorys*), grasshopper sparrow (*Ammodramus savannarum*), loggerhead shrike (*Lanius ludovicianus*), vesper sparrow (*Pooecetes gramineus*), and lark sparrow (*Chondestes grammacus*).

a. Level I

Historically, 11 of the 14 Level I species have been recorded at least once in the vicinity of the Antelope Mine (Table 8). Four of the five Level I species documented during general avian surveys conducted in 2012 occur in the area with some regularity: the mountain plover, McCown's longspur, ferruginous hawk, and, recently, the Swainson's hawk. The Brewer's sparrow is less frequently observed. The mountain plover will be discussed in greater detail in the *Mountain Plovers* section, below. Discussion of the two hawk species was included in the previous *Raptors: Nesting Surveys* section.

Breeding bird survey data from surveys conducted for the Antelope Mine and incidental observations at the mine have shown that the Brewer's sparrow is an occasional breeder in the area (PRES 1999, TWC 2004, TWC, unpublished data). This species has been recorded in the vicinity of the mine in some previous years. Brewer's sparrows were

Table 8. Nesting habitat and occurrence of the 40 Migratory Bird Species of Management Concern for Wyoming Coal Mines in or within 0.5 mile of the Antelope Mine permit area.

Species ^a	Primary Nesting Habitat(s)	Historical Occurrence (1978-2007) ^b	2008	2009	2010	2011	2012
LEVEL 1 (Conservation Action Required)							
Mountain plover* <i>Charadrius montanus</i>	Short-grass prairie, shrub-steppe	Common Breeder	Su-B	Su-B	Su-B	Su-B	Su-B
Greater sage-grouse* <i>Centrocercus urophasianus</i>	Shrub-steppe	Rarely Observed	---	---	Su-B	---	---
McCown's longspur* <i>Rhynchophanes mccownii</i>	Short-grass prairie, shrub-steppe	Common Breeder	Su-B	Su-B	Su-B	Su-B	Su-B
Baird's sparrow <i>Ammodramus bairdii</i>	Short-grass prairie	Never Recorded	---	---	---	---	---
Ferruginous hawk* <i>Buteo regalis</i>	Shrub-steppe, grasslands	Common Breeder	Su-B	Su-B	Su-R	Su-B	Su-B
Brewer's sparrow* <i>Spizella breweri</i>	Shrub-steppe, montane shrublands	Occasional Breeder	---	---	---	Su-B	Su-B
Sage sparrow <i>Amphispiza belli</i>	Shrub-steppe, montane shrublands	Never Recorded	---	---	---	---	---
Swainson's hawk* <i>Buteo swainsoni</i>	Grasslands	Likely Breeder	Su-B	Su-B	Su-R	Su-B	Su-B
Long-billed curlew <i>Numenius americanus</i>	Grasslands	Infrequently Observed	Su-R	---	---	---	---
Short-eared owl* <i>Asio flammeus</i>	Grasslands	Infrequently Observed	---	---	---	---	---
Peregrine falcon <i>Falco peregrinus</i>	Cliffs	Never Recorded	---	---	---	---	---
Burrowing owl* <i>Athene cunicularia</i>	Grasslands, shrub-steppe	Occasional Breeder	Su-B	---	---	---	---
Bald eagle <i>Haliaeetus leucocephalus</i>	Riparian	Winter Resident	---	Wi-R	Wi-R	Wi-R	---
Upland sandpiper* <i>Bartramia longicauda</i>	Grasslands, shrub-steppe	Potential Breeder	---	Su-R	---	---	---

Table 8. Continued.

Species ^a	Primary Nesting Habitat(s)	Historical Occurrence (1978-2007) ^b	2008	2009	2010	2011	2012
LEVEL 2 (Monitoring)							
Cassin's kingbird <i>Tyrannus vociferans</i>	Juniper woodland, riparian	Never Recorded	---	---	---	--	--
Lark bunting* <i>Calamospiza melanocorys</i>	Grasslands, shrub-steppe	Common Breeder	Su-B	Su-B	Su-B	Su-B	Su-B
Dickcissel <i>Spiza americana</i>	Grasslands	Never Recorded	---	---	---	---	---
Chestnut-collared longspur* <i>Calcarius ornatus</i>	Grasslands	Likely Breeder	---	---	---	---	---
Black-chinned hummingbird <i>Archilochus alexandri</i>	Riparian, shrub-steppe	Never Recorded	---	---	---	---	---
Pygmy nuthatch <i>Sitta pygmaea</i>	Low elevation conifer	Never Recorded	---	---	---	---	---
Marsh wren <i>Troglodytes troglodytes</i>	Wetlands	Never Recorded	---	---	---	---	---
Western bluebird <i>Sialia mexicana</i>	Juniper woodland, low elevation conifer	Never Recorded	---	---	---	---	---
Sage thrasher* <i>Oreoscoptes montanus</i>	Shrub-steppe	Never Recorded	---	---	---	---	---
Grasshopper sparrow* <i>Ammodramus savannarum</i>	Grassland	Likely Breeder	Su-B	Su-B	Su-B	---	Su-B
Bobolink <i>Dolichonyx oryzivorus</i>	Grassland	Never Recorded	---	---	---	---	---
Common loon <i>Gavia immer</i>	Lakes and ponds	Never Recorded	---	---	---	---	---
Black-billed cuckoo <i>Coccyzus erythrophthalmus</i>	Riparian	Never Recorded	---	---	---	---	---
Red-headed woodpecker <i>Melanerpes erthrocephalus</i>	Riparian, low elevation conifer	Occasionally Observed	Su-R	---	Su-R	---	---
Yellow-billed cuckoo <i>Coccyzus americanus</i>	Riparian	Never Recorded	---	---	---	---	---

Table 8. Continued.

Species ^a	Primary Nesting Habitat(s)	Historical Occurrence (1978-2007) ^b	2008	2009	2010	2011	2012
Eastern screech owl <i>Otus asio</i>	Riparian	Never Recorded	---	---	---	---	---
Western screech owl <i>Otus kennicottii</i>	Riparian	Never Recorded	---	---	---	---	---
Western scrub jay <i>Aphelocoma coerulescens</i>	Juniper woodland	Never Recorded	---	---	---	---	---
Loggerhead shrike* <i>Lanius ludovicianus</i>	Shrub-steppe	Breeder	Su-B	---	Su-B	Su-B	Su-B
Vesper sparrow* <i>Poocetes gramineus</i>	Shrub-steppe	Common Breeder	Su-B	Su-B	Su-B	Su-B	Su-B
Lark sparrow* <i>Chondestes grammacresus</i>	Shrub-steppe	Common Breeder	Su-B	---	Su-B	Su-B	Su-B
Ash-throated flycatcher <i>Myiarchus cinerascens</i>	Juniper woodland	Never Recorded	---	---	---	---	---
Bushtit <i>Psaltiriparus minimus</i>	Juniper woodland	Never Recorded	---	---	---	---	---
Merlin* <i>Falco columbarius</i>	Low elevation conifer	Never Recorded	---	---	---	---	---
Sprague's pipit <i>Anthus spragueii</i>	Grasslands, riparian	Never Recorded	---	---	---	---	---
Barn owl <i>Tyto alba</i>	Short-grass prairie	One Sighting	---	---	---	---	---

^a Species are arranged in descending priority within each level as assigned in the Wyoming Bird Conservation Plan (Cerovski et al. 2001). Level I indicates a clear need for conservation action. Level II indicates a need for continued monitoring.

^b Historical Occurrence is based on records from baseline and annual monitoring surveys conducted at the Antelope Mine from 1978 through 2007.

* Species regularly nests in the Powder River Basin.

Su-R = Summer Resident; observed June through August but no evidence of breeding

Su-B = Summer Breeder; observed May through August with evidence of breeding (nest or young observed, territorial males observed, pair carrying nesting material)

Wi-R = Winter Resident; observed December through February

most often seen in a relatively small stand of big sagebrush, their preferred habitat (Rotenberry et al. 1999), in the permit area just north of the county line in NW Section 27 and NE Section 28, T41N:R71W. Although nests have rarely been encountered, the presence and behavior (singing) of birds throughout spring and summer in some years suggest that Brewer's sparrows occasionally nest in the area.

No McCown's longspur nests or young have been encountered in the Antelope Mine survey area over time. However, this species has regularly been documented in the survey area since at least 1994. McCown's longspurs have most often been observed in an area comprised of upland grasslands (short-growth form) and an active black-tailed prairie dog colony just beyond the southwestern portion of the permit area, in N Section 15, T40N:R71W. In all years, this species exhibited breeding behavior (i.e., display flights and singing) throughout the nesting season, and therefore is a presumed breeder at the mine. In 2012, McCown's longspurs were recorded during the June breeding bird surveys in grassland and prairie dog colony habitats, and in a prairie dog colony in late July.

b. Level II

Only 8 of the 26 Level II species have been recorded in the Antelope Mine survey area over the years. Five of those eight species have been seen with some regularity in recent years: the lark bunting, grasshopper sparrow, loggerhead shrike, vesper sparrow, and lark sparrow (Table 8). Those same species were observed in 2012 and are known or presumed to nest in the area. Although some of the remaining Level II species could migrate through the area, no habitats exist that might attract large concentrations of those birds. Range and habitat considerations such as the lack of coniferous woodlands, lush wetlands and riparian corridors, and large persistent bodies of water make it unlikely that most of these species would occur in the immediate vicinity of the mine.

Historically, lark buntings and vesper sparrows were recorded in the vicinity of the Antelope Mine during each of the last 19 years (1994 through 2012). Lark buntings generally return to the area from migration in early May, while vesper sparrows are typically present in April. Both species were observed during breeding bird surveys conducted at the mine in 2012. Lark buntings were also seen incidentally in grassland and prairie dog colony habitats in and near the permit area throughout the spring and summer. Results from previous breeding bird surveys indicate that the lark bunting is often the most abundant breeding bird of management concern in the area, though vesper sparrows also regularly occur.

Loggerhead shrikes have been observed incidentally in both native and reclaimed habitats in and near the permit area in recent years. One loggerhead shrike was seen incidentally perched on a rock in rough breaks and sagebrush habitat in SW NE Section 9, T40N:R71W in 2012. Shrikes were also recorded during the breeding bird transects that year.

In 2012, a lark sparrow was observed singing in reclaimed grassland in NE NW Section 11, T40N:R71W during breeding bird surveys conducted in early June. This species inhabits a wide variety of habitats (Rising 1997), but was most often observed in relatively rugged terrain in and near the Antelope Mine permit area over the years. It may be that some features associated with this species' breeding habitat, such as open areas of low scrub or scattered trees (Harrison 1984, Peterson 1990), are more prevalent in the breaks, thus the higher number of sightings there.

Breeding Bird Belt Transect Surveys

Data from belt transect surveys were used to calculate species richness and abundance for each of the four major native and reclaimed habitats in the Antelope Mine permit area (Table 9). In 2012, fewer than 1,000 meters of habitat was available to establish transects in the sagebrush and scoria rough break habitats; therefore, those two habitat types were not surveyed. Species richness represents the number of species recorded in each habitat over the sampling period. Abundance is defined as the average number of birds observed over all transects in each habitat each day. Total abundance for each species is the average of total observations over all transects surveyed per day.

Weather conditions during the surveys consisted of clear to partly cloudy skies and calm to light winds. Twenty-six avian species were observed among the four surveyed habitats during point counts conducted in 2012. Overall breeding bird abundance for all species observed was 27.63 birds over all transects per day.

Species abundance and richness were highest in the cottonwood-riparian habitat in 2012 (Table 9). That habitat type has typically yielded the highest number of species and relative abundance for breeding birds since breeding bird surveys began in 2005, even though different survey methods were used prior to 2012. These results are not surprising, as habitats with greater structural diversity often support more species and individuals than more homogenous habitat types such as grasslands (Hurlbert 2004). The greater availability

Table 9. Relative abundance^a, species richness, and habitat associations of species observed during breeding bird surveys conducted at the Antelope Mine in spring 2012.

Species	G	RG	CR	PDC	Total ^b
Horned lark (<i>Eremophila alpestris</i>)	10.0	5.5	--	13.5	7.25
Western meadowlark (<i>Sturnella neglecta</i>)	3.5	6.5	3.0	3.5	4.13
Red-winged blackbird (<i>Agelaius phoeniceus</i>)	--	--	15.5	--	3.88
Lark bunting ^{II} (<i>Calamospiza melanocorys</i>)	4.0	2.0	--	2.5	2.13
Western kingbird (<i>Tyrannus verticalis</i>)	--	--	7.5	--	1.88
McCown's longspur ^I (<i>Rhynchophanes mccownii</i>)	0.5	--	--	4.0	1.13
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)	1.0	--	--	3.0	1.00
Vesper sparrow ^{II} (<i>Pooecetes gramineus</i>)	1.5	1.5	--	0.5	0.88
Grasshopper sparrow ^{II} (<i>Ammodramus savannarum</i>)	--	2.0	--	0.5	0.63
Red-tailed hawk (<i>Buteo jamaicensis</i>)	--	--	2.0	--	0.50
Mourning dove (<i>Zenaida macroura</i>)	--	1.0	1.0	--	0.50
Eastern kingbird (<i>Tyrannus tyrannus</i>)	--	--	2.0	--	0.50
Brewer's sparrow ^I (<i>Spizella breweri</i>)	1.0	0.5	--	0.5	0.50
Brown-headed cowbird (<i>Molothrus ater</i>)	--	--	2.0	--	0.50
Bullock's oriole (<i>Icterus bullockii</i>)	--	--	1.5	--	0.38
Common nighthawk (<i>Chordeiles minor</i>)	--	--	1.0	--	0.25
Northern flicker (<i>Colaptes auratus</i>)	--	--	1.0	--	0.25
Say's phoebe (<i>Sayornis saya</i>)	--	--	1.0	--	0.25
Yellow warbler (<i>Setophaga petechia</i>)	--	--	1.0	--	0.25
Turkey vulture (<i>Cathartes aura</i>)	--	--	0.5	--	0.13
Loggerhead shrike ^{II} (<i>Lanius ludovicianus</i>)	--	--	0.5	--	0.13
Rock wren (<i>Salpinctes obsoletus</i>)	0.5	--	--	--	0.13
American robin (<i>Turdus migratorius</i>)	--	--	0.5	--	0.13

Table 9. Continued.

Species	G	RG	CR	PDC	Total ^b
European starling (<i>Sturnus vulgaris</i>)	--	--	0.5	--	0.13
Lark sparrow ^{II} (<i>Chondestes grammacus</i>)	0.5	--	--	--	0.13
Unidentified flycatcher	--	--	0.5	--	0.13
Total Abundance (per habitat type)	22.5	19.0	41.0	28.0	27.63
Total Species	9	7	17	8	26
Total Abundance Level I and II of Management Concern	7.5	6.0	0.5	8.0	5.50
Total Level I and II Species	5	4	1	5	7

^a Abundance = Average number observed over all transects in each habitat each day.

^b Total = Average of total observations over all transects per day.

^I Level I species: requires "conservation action".

^{II} Level II species: requires only monitoring.

--- = Species not observed.

Habitat Codes

CR = Cottonwood-riparian
G = Grassland

PDC = Prairie dog colony
RG = Reclaimed grassland

of water and the structural diversity added by trees in the cottonwood-riparian corridor further enhance this habitat type and may attract additional avian species. The reclaimed grassland plot yielded the lowest relative abundance and the fewest species of the habitats sampled.

The most abundant species recorded during transect surveys conducted in 2012 was the horned lark (*Eremophila alpestris*) (Table 9). The lark bunting and western meadowlark (*Sturnella neglecta*) were also among the most abundant species observed during point count surveys. Those three species have been common in all recent years. The addition of the cottonwood-riparian transect in 2012 resulted in numerous sightings of red-winged blackbirds (*Agelaius phoeniceus*) during the surveys.

Seventeen of the 26 total species were recorded in only habitat type each: 15 in cottonwood-riparian, and 2 in grassland. Species documented in only a single transect typically have more restricted habitat requirements or larger breeding territories than those observed in a variety of habitat types.

Seven of the 26 species recorded during belt transects conducted in 2012 are considered by the USFWS to be of current management concern for Wyoming coal mines: two Level I species and five Level II species (Table 9). All of these species were described

under the preceding *General Surveys* subheading. Despite their classification as species of management concern, all are regularly observed in northeast Wyoming, including at the Antelope Mine.

In 2012, overall abundance for avian species of management concern was 5.5 birds over all transects per day, with lark buntings accounting for most of the sightings. Three of the habitats surveyed that year yielded at least four species of management concern each (Table 9). Both relative abundance and species richness were slightly higher in grassland and prairie dog colony habitats for avian species of concern.

Mountain Plovers

a. Annual Monitoring

Mountain plovers were recorded in the Antelope Mine survey area with less frequency during 2012 than in most previous years. Only four adults and two juveniles were observed that year (Table 10). The juveniles were in two different broods of one young each. One brood occurred in MPA1 and the other brood was located in MPA 3. Also in MPA 3, an adult was observed on a nest with three eggs. However, a month later no eggshell fragments, young, or adults were seen, so it is unknown if the nest hatched.

The history of mountain plovers at the Antelope Mine is well documented. This species has been the subject of two intensive studies, as well as more than two decades of annual monitoring. Generally, two to five pairs of mountain plovers nest in the mine area each year. Over time, the number of observed mountain plover broods has fluctuated considerably, but young were known to have fledged in all but 3 years from 1982 through 2012 (Table 10).

Variations in annual production for mountain plovers can be attributed, in part, to disparities in survey effort and timing. Those efforts were greatest from 1985 through 1988, during intensive studies at the mine. Not surprisingly, more broods were recorded during that period than in most other years. Natural factors such as weather conditions also appeared to affect brood production in some years. When weather conditions were unfavorable (e.g., drought, cold, excessive precipitation) in spring or summer, the number of young observed declined (e.g., 1988-1989, 1993, 1995, 1997, 2003, 2005, 2007-2011).

Table 10. Locations and primary habitats in which mountain plovers were observed during surveys conducted at the Antelope Mine in 2012.

LOCATIONS ^a AND HABITAT	DATE ^b	Total # PLOVERS		TOTAL # BROODS	TOTAL # YOUNG
		ADULTS	YOUNG		
MPA 1: SW¼ NW¼ Section 27, T40N, R71W					
Prairie dog colony	June 25	2	1	1	1
MPA 3: SE¼ NW¼ Section 15, T40N, R71W					
Prairie dog colony	June 7	1	0	0	0
Prairie dog colony	June 14	2	1	1	1
Prairie dog colony	June 25	1	0	0	0
GRAND TOTALS				2	2

^a Legal descriptions refer to the location of most sightings per area. Plovers were seen both within and immediately adjacent to MPAs. Most (90%) sightings occurred in, or within 0.5 mile of, a prairie dog colony; all were within 1.0 mile.

^b Does not include additional survey dates when plovers were not observed.

In many years since 1982, one-half to three-quarters of the mountain plover sightings occurred within the survey perimeter rather than the permit area itself (Table 11). Although those results are changing somewhat as the mine expands its permit boundary, all four sightings in 2012 were outside of the permit area. Over time, mountain plovers were also observed both within and beyond areas mapped as MPAs in 1989 (Table 11, Plate AR12/13:VIII B-1). As indicated, many of the MPAs overlap, or are adjacent to, black-tailed prairie dog colonies. Broods have only been recorded with any regularity in three areas since 1994, when TWC assumed annual monitoring tasks. During the last 19 years, the majority of young were seen in a prairie dog colony that overlaps the southern end of MPA 8 (Plate AR12/13:VIII B-1), within the southwestern portion of the permit boundary. The other two sites were also prairie dog colonies associated with MPAs 3 and 4, just beyond the southwestern corner of the permit area, and MPAs 6 and 7 within the permit area. The latter colony was disturbed by mining after the 2000 breeding season, but remained partially intact for several years. Mine operations are expanding into the MPA8 area, which may affect mountain plover sightings; no mountain plovers were recorded in that colony in 2012.

Table 11. Summary of mountain plover observations^a at the Antelope Mine from 1982 through 2012.

Year	First Date Seen	Last Date Seen	Sites with Plovers				Number of Broods		
			MPA ^b		Non-MPA Sites	Total	In Permit	Outside Permit	Total
			In Permit	Outside Permit					
1982	6/16	6/20	4	0	0	4	1	--	1
1983	4/20	7/14	1	1	0	2	1	--	1
1984	5/11	7/11	3	1	0	4	4	--	4
1985	4/18	8/22	4	3	0	7	3	4	7
1986	4/22	8/06	4	3	0	7	4	1	5
1987	4/06	8/17	4	5	0	9	5	8	13
1988	4/11	6/27	6	6	0	12	1	3	4
1989	4/25	7/18	3	3	0	6	1	2	3
1990	5/08	7/16	2	3	0	5	3	4	7
1991	3/26	7/19	3	4	0	7	3	1	4
1992	4/01	6/22	2	4	0	6	3	4	7
1993	4/02	5/04	2	4	0	6	0	0	0
1994	5/13	8/05	0	1	1	2	0	1	1
1995	5/19	6/23	0	2	1	3	0	1	1
1996	4/10	8/01	0	3	1	4	0	2	2
1997	4/22	8/08	0	2	0	2	0	1	1
1998	4/15	7/21	0	1	3	4	2	3	5
1999	4/14	7/12	1	2	3	6	1	3	4
2000	3/31	7/21	1	4	1	6	0	3	3
2001	4/30	8/02	1	3	0	4	0	4	4
2002	4/12	8/13	0	3	0	3	0	7	7
2003	4/21	8/05	0	2	2	4	0	1	1
2004	4/17	7/21	2	3	5	8	2	3	5 ^c
2005	4/15	8/08	0	3	0	3	0	2	2
2006	4/28	8/02	0	4	0	4	0	5	5
2007 ^d	4/29	6/19	1	1	0	2	1	0	1
2008 ^d	4/27	6/9	1	1	1	3	0	0	0
2009 ^d	5/10	6/26	1	1	2	4	0	0	0
2010 ^d	4/26	8/10	3	0	0	3	2	0	2
2011 ^d	8/13	8/13	1	0	0	1	1	0	1
2012 ^d	6/7	6/25	0	2	0	2	0	2	2

^a Annual data derived from repeated surveys of each known MPA, and additional similar habitat, throughout the entire breeding season.

^b MPAs as mapped in 1989 (based on observations made from 1982-1988).

^c One brood was likely a duplicate between the two areas.

^d The permit area included the West Antelope expansion beginning in 2007.

Those three general areas were also the locations of regular brood sightings made by the Antelope Mine's staff biologist prior to 1994 (Antelope Mine annual reports 1982-1993). In fact, rigorous observations over the last 31 years have documented that mountain plovers

in the vicinity of the mine have consistently been most common in the black-tailed prairie dog colonies located in and near the permit area. Recent studies elsewhere in the Powder River Basin further support this species' strong affinity for prairie dog colonies in northeastern Wyoming. On the Thunder Basin National Grasslands, 86% of recently (since 1993) occupied mountain plover habitat occurred within prairie dog colonies (Byer 2001).

When the MPAs were originally delineated in 1989, they encompassed approximately 2,336 acres. However, on May 23, 2002, the USFWS agreed to revise that total to include no more than 1,988 acres. The reduction in MPA acreage reflected the removal of lands that were declared unsuitable for mountain plovers during the original mapping effort (Oelklaus 1989), but were erroneously included in the mapping process anyway. To date, disturbance (both mine and non-mine related) has occurred in all or portions of 13 of the 14 MPAs (Table 12).

Habitat availability does not appear to be a major factor affecting mountain plover nesting in the Antelope Mine area. The majority of the acreage mapped as MPAs in 1989 has not been disturbed, yet plovers have been absent from some of those areas for over 20 years (Table 12). Conversely, mountain plovers continued to be seen in some disturbed areas for at least 10 years after their initial disturbance. Additionally, birds were consistently seen in the same general areas within the original MPAs during annual surveys conducted from 1982 through 2012, despite the availability of apparently suitable habitat elsewhere in the vicinity (see annual reports from 1982 through 2010, Oelklaus 1989). As noted, mountain plovers were seen in reclamation near the former MPA6 area in August 2010; plovers were last recorded in that vicinity in 1993. That site was approximately 0.75 mile northwest of the nearest mitigation prairie dog colony constructed in reclamation (see *Mitigation for Habitat Loss*, below). Areas where plovers were seen since 1994 are depicted on Plate AR12/13:VIII B-1. Furthermore, the natural expansion of prairie dog colonies in and near the permit area over time had created nearly 100 new acres of potential mountain plover habitat in the vicinity of the mine by 2000, although some of the new acreage was disturbed after that breeding season.

Given the species' willingness to return to areas disturbed by mining, the long-term stability of the number of breeding pairs in the area, and the quantity of apparently suitable but unoccupied habitat in the area, it appears that operations associated with the Antelope Mine are not adversely impacting mountain plovers. Rather, it is likely that other unknown

Table 12. Observed mountain plover use of MPAs at the Antelope Mine (1982 through 2012) and timing of disturbance in those areas.

MPA #	Acreage from 1989 Baseline Study ¹	Total # Years Monitored	Total # Years Occupied ²	Total # Years of Confirmed Nesting	Total # Nests or Broods Observed	Year Last Observed	Year First Disturbed ³
1	286	31	15	3	3	2012	N/A
2	225	31	9	4	5	1996	1995 ⁴
3	211	31	21	11	15	2012	1997
4*	202	31	10	7	10	2011 ⁵	1989
5*	145	31	7	3	4	1988	1982
6*	85	31	8 ⁶	3	3	1993	1987
7*	192	31	11	6	9	2001	2000
8*	345	31	25	18	32	2010	2008
9*	111	31	7	4	4 ⁷	2010	2006
10*	38	31	3	1	1	1990	2006
11*	36	31	2	1	1 ⁷	1989	2001
12*	38	31	2	0	0	1984	1982
13*	35	31	2	2	2	1988	1993
14*	39	31	1	0	0	1982	1994 ⁸
Total	1,988						

¹ Adjusted to remove 348 total acres from MPAs # 1, 3, 4, and 8 that were declared unsuitable for mountain plovers in the 1989 baseline report (Oelklaus 1989). The USFWS approved this adjustment in a letter to AM dated May 23, 2002.

² Occupied is defined as one or more mountain plovers seen at least once during the year. Annual data is derived from repeated surveys of each known MPA throughout the entire breeding season.

³ The majority of acreage delineated as MPA in 1989 has not yet been disturbed.

⁴ Railroad activities disturbed approximately 5 acres in 1995.

⁵ Prior to 2011, the last sighting in MPA 4 occurred in 1991.

⁶ A group of two adults and two young was seen in reclamation approximately 350 south of MPA 6 in 2010.

⁷ Nest failed in 2004.

⁸ Disturbance (1 acre) caused prior to 1994 by construction on the county road bordering the permit area.

* MPAs with the Antelope Mine permit area.

factors, perhaps on wintering grounds outside Wyoming, are the primary forces affecting mountain plover numbers and use at the mine.

b. Mitigation for Habitat Loss

Since 2002, when the mountain plover habitat restoration program became fully operational, 138 prairie dogs (33 adult males, 33 adult females, and 72 juveniles) have been moved from three source colonies to four release sites in permanent reclamation at the Antelope Mine. All source and release colonies are currently within the Antelope Mine permit area. Due to permitting restrictions, no animals were relocated from 2004 through 2008. In

fall 2008, the Wyoming Game and Fish Commission renewed its authorization for the program. Thirty-five of the 138 prairie dogs were released into reclamation colonies from September 2009 through early August 2011. Thirty animals were released in the existing Section 11 colony to replenish the plague-stricken site and 5 were placed in the newer Section 34 colony; the latter colony was first used in 2011. As noted, prairie dogs were not translocated in 2012 due to severe drought conditions, to allow vegetation to be rested for another year and improve the chance of success.

Post-release retention in the man-made colonies from 2002 to 2003 ranged from approximately 25% to 47%. Actual retention rates were difficult to ascertain after 2003 due to the likely mixing of animals within and among the colonies. Retention rates reported in the literature for similar translocations range from 0 to 50% (Truett et al. 2001). Litters have been confirmed in both of the original colonies (Section 11 and "PR") over time, with breeding occurring in at least one location in each of the last 9 years (2003 through 2011). Through 2010, more than twice as many (48) prairie dogs were present in the smallest (PR) colony as were originally released (16). This number also represents an increase from 2007, when 31 individuals were recorded. Prior to the August 2011 release, four prairie dogs were documented in the largest (Section 11) colony several times throughout the spring and summer. As indicated, prairie dogs were not present in that colony from 2005 through early 2009 due to an outbreak of sylvatic plague that was confirmed in a colony approximately 1.0 mile to the east in 2004. For unknown reasons, the carriers bypassed the PR colony. Prairie dogs have only been recorded sporadically in the two colonies constructed in 2003, appearing to concentrate in the two original sites constructed the previous year.

As indicated by the increased number of prairie dogs recorded in 2011, the mitigation colonies have increased in size since they were constructed. The sites initially ranged from approximately 1 to 4 acres each, for a total of 10 non-contiguous acres (Plate AR12/13:VIII B-1). The prairie dogs that remained in the release area enlarged several artificial chambers early in the program, and have also dug numerous new chambers and escape burrows both within and beyond the original colony boundaries. By September 2011, the original colony boundaries had expanded to more than 40 non-contiguous acres. Burrow density at the release sites had increased dramatically by fall 2011, from an original total of 70 man-made holes to more than 800 (including the original 70).

Along with their tentative efforts to expand the colonies, the prairie dogs are also having an impact on the vegetation in the mitigation area. Numerous burrow entrances within

the mitigation colonies are ringed by bare ground from the animals clipping the grass down to the roots below the surface. That behavior will greatly contribute to the ultimate goal of creating viable mountain plover habitat (i.e., short, sparse vegetation) on reclaimed lands. Though plovers have not yet been confirmed there, the continued viability of the man-made prairie dog colonies is evidence that this endeavor can establish and maintain potential mountain plover habitat within mine reclamation. The Antelope Mine has received multiple state and national awards from various regulating agencies, as well as an award from a statewide sportsman/conservation organization for this innovative approach to habitat restoration for species of concern.

E. FEDERALLY LISTED SPECIES

No critical habitat for federally listed species (USFWS 2012), or core or connectivity areas for the greater sage-grouse, have been designated by the USFWS or the State of Wyoming (2011), respectively, in the Antelope Mine permit area or surrounding perimeter. As noted in the *Methods* section, the black-footed ferret is no longer considered a federally listed species for Converse and Campbell counties, Wyoming. Furthermore, the mine area is not within the region currently identified for black-footed ferret reintroductions in Wyoming (USFS 2002, Grenier 2004).

As also noted in the *Methods* section, surveys for the Ute ladies'-tresses are not conducted as part of the wildlife monitoring program at Antelope Mine. Such surveys are typically only performed prior to mine expansions in appropriate habitat. Information regarding past surveys for these species and potential habitat in the area is detailed in Volumes 16 and 17, Appendix D8 of permit 525. However, due to their status, a general summary for this species is provided below. The sage-grouse (candidate species) was thoroughly discussed in the *Upland Game Birds* section of this report.

Ute ladies'-tresses (threatened)

The Ute ladies'-tresses, a member of the orchid family, was listed as threatened in January 1992. This plant colonizes early-succession riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobble edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season.

Prior to 2005, four orchid populations had been documented within Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). Four additional sites were

located in 2005 and one site was found in 2006 (Heidel 2007). The new locations were in the same drainages or tributaries as the original four populations. No occurrences have been recorded at Antelope Mine. The nearest documented record of Ute ladies'-tresses is the Antelope Creek population, approximately 10 miles west of the permit area. Any potential habitat for this species will be surveyed prior to disturbance using current USFWS survey protocols.

F. OTHER ANIMALS

Incidental sightings of animals not targeted by systematic surveys were recorded during all wildlife monitoring conducted at Antelope Mine in 2012. Several avian species of interest were recorded during the breeding bird surveys conducted in June, as described in that section of the report. Incidental sightings of gadwall (*Anas strepera*), American wigeon (*Anas americana*), a double-crested cormorant (*Phalacrocorax auritus*), and killdeer (*Charadrius vociferus*) were made at the Horse Creek reservoir within the northern portion of the permit area. Both the gadwall and wigeon had young.

As in recent years, a lone swift fox (*Vulpes velox*) was seen in grassland in the northern portion of the permit area during both nocturnal lagomorph surveys conducted in mid-August. A striped skunk (*Mephitis mephitis*) was observed walking in reclaimed grassland by the access road during the June breeding bird surveys.

Few reptiles and amphibians have been recorded during wildlife surveys conducted at the Antelope Mine over time. As in most previous years, boreal chorus frogs (*Pseudacris maculata*) were often heard along Antelope Creek and in several ponds throughout the survey area in spring.

5. REFERENCES

Byer, T. 2001. Biological assessment and biological evaluation report for Devon Energy Production Company. USFS, Douglas Ranger District.

Cerovski, A., M. Gorges, T. Byer, K. Duffy, and D. Felley, editors. 2001. Wyoming Bird Conservation Plan, Version 1.0. Wyoming Partners in Flight. Wyoming Game and Fish Department, Lander, Wyoming.

Commonwealth Associates, Inc. 1980. Terrestrial wildlife environmental baseline study: Antelope Coal Field. Volume X, Appendix D-9: Wildlife. Surface Mining Permit 525. WDEQ-LQD.

- Fertig, W. and G. Beauvais. 1999. Wyoming Plant and Animal Species of Special Concern. Unpublished report. Wyoming Natural Diversity Database, Laramie, WY.
- Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History, Denver, Colorado.
- Grenier, M. 2004. An Evaluation of Black-footed Ferret Block Clearances in Wyoming: Completion Report. Wyoming Game and Fish Department. Lander, Wyoming. 16pp.
- Grier, J. W. and R. W. Fyfe. 1987. *Preventing Research And Management Disturbance. Raptor Management Techniques Manual*. B. A. Pendleton, B. A. Millsap, K. W. Cline, and D. M. Bird, editors. National Wildlife Federation, Washington, D.C. pp. 173-182.
- Harrison, C. 1984. A Field Guide To The Nests, Eggs, And Nestlings Of North American Birds. The Stephen Greene Press. Brattleboro, Vermont and Lexington, Massachusetts.
- Heidel, B. 2007. Survey of Ute ladies'-tresses (*Spiranthes diluvialis*) in eastern Wyoming, 2005–2006. Prepared for U.S. Bureau of Land Management and the Medicine Bow/Routt National Forest/Thunder Basin National Grassland. Wyoming Natural Diversity Database, Laramie, WY.
- Hurlbert, A. H. 2004. Species-energy relationships and habitat complexity in bird communities. *Ecology Letters*, 7, 714-720.
- Johnsgard, P. 1990. Hawks, eagles, and falcons of North America. Washington: Smithsonian Institution Press.
- Oelklaus, W. F. 1989. *Mountain Plover Status On Their Current Breeding Range*. Unpublished report to NERCO Coal Corporation, Antelope Mine. Douglas, Wyoming.
- Orabona, A., C. Rudd, M. Grenier, Z. Waller, S. Patla, and B. Oakleaf. (Eds.). 2012. Atlas of birds, mammals, amphibians, and reptiles in Wyoming. Lander, Wyoming: Wyoming Game and Fish Department Nongame Program.
- Peterson, R. T. 1990. A field guide to the western birds. Houghton Mifflin Co., Boston, Massachusetts.
- Powder River Eagle Studies (PRES). 1994-1999. Antelope Mine wildlife monitoring reports *in* Annual reports for Wyoming Mining Permit 525 to Wyoming Department of Environmental Quality-Land Quality Division. Cheyenne, Wyoming.
- Powder River Eagle Studies (PRES). 1999. *Baseline Report for Antelope Coal Mine's Horse Creek Extension*, Submitted to Wyoming Department of Environmental Quality-Land Quality Division. Cheyenne, Wyoming.
- Rising, J. D. 1997. A guide to the identification and natural history of the sparrows of the United States and Canada. Academic Press, San Diego, CA.

Rotenberry, J.T., M.A. Patten, and K.L. Preston. 1999. Brewer's sparrow (*Spizella breweri*). *In* The Birds of North America, No. 390 (A. Poole and F. Gill, Eds.) The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

State of Wyoming: Executive Department. 2011. Executive Order: 2011-5. Cheyenne, Wyoming. Issued June 2, 2011. Available: http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/Sage_Grouse_EO_2011_5.pdf.

Sundstrom, C., Hepworth, W. G., & Diem, K. L. 1973. Abundance, Distribution, And Food Habits Of Pronghorn. Wyoming Game and Fish Commission, Bulletin No. 12.

Thunderbird Wildlife Consulting, Inc. (TWC). 2000-2011. Antelope Mine wildlife monitoring reports *in* Annual reports for Wyoming Mining Permit 525 to Wyoming Department of Environmental Quality-Land Quality Division. Cheyenne, Wyoming.

_____. 2004. *Baseline Report for Antelope Coal Mine's West Antelope Amendment Area*. Submitted to Wyoming Department of Environmental Quality-Land Quality Division. Cheyenne, Wyoming.

Truett, J. C., J. L. D. Dullum, M. R. Matchett, E. Owens, and D. Seery. 2001. *Translocating Prairie Dogs: A Review*. Wildlife Society Bulletin. 29 (3): 863-872.

U.S. Forest Service. 2002. Updated Land and Resource Management Plan for the Thunder Basin National Grassland, Medicine Bow-Routt National Forest, Rocky Mountain Region. USDA Forest Service, Medicine Bow-Routt national Forest, Rocky Mountain Regional Office, Denver, Colorado.

U. S. Fish and Wildlife Service (USFWS). 2002. List of Migratory Bird Species of Management Concern in Wyoming, based on Wyoming Bird Conservation Plan, Version 1.0. Report Available from Wyoming Field Office, Cheyenne, Wyoming.

_____. 2004. Letter to Interested Parties Regarding Black-footed Ferret Surveys in Wyoming. File ES-61411/BFF/WY7746, dated February 2, 2004.

_____. 2012. Endangered, Threatened, Proposed, and Candidate Species and Their Designated and Proposed Critical Habitat that Occur In or May Be Affected By Actions in Converse County, Wyoming. May. Available: <http://www.fws.gov/wyominges/PDFs/CountySpeciesLists/Campbell.pdf>