

SECTION 16

FISH AND WILDLIFE

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16.1-1	Baseline Wildlife Surveys
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Field Code Changed

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16.A	Wildlife Baseline Report November 2004
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LIST OF REVISIONS DURING PERMIT TERM

REV. NUMBER	REVISION DESCRIPTION	DATE APPROVED
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SECTION 16 FISH AND WILDLIFE

Baseline surveys for wildlife have been conducted on and around the Navajo Mine mining lease since 1973 (BNCC 2009). Historical wildlife studies conducted on the mining lease and surrounding area include the following: Westinghouse Electric Corporation (Westinghouse 1975); Battelle (1975); Hinton (1980); Mariah (1983, 1984, 1985, 1986, 1987, and 1989); Woyewodzic (1987), and Dixon Extension (Ecosphere 2001). These surveys were reviewed and compiled as part of the existing ~~BHP Navajo Coal Navajo Transitional Energy~~ Company (~~BNCCNTEC~~) Navajo Mine SMCRA permit (OSM Permit No. NM-0003F). ~~Results of recent surveys conducted in Area 4 North in 2004; Areas 4 South and 5 in 2005 and 2007; and surveys specifically for federally threatened and endangered species and Navajo Nation Species of Concern in the Pinabete Permit Mine Plan permit area (permit area) in 2012 have been reviewed and compiled herein to describe more current conditions and summarize species-specific data for the permit area of BNCCNTEC's mining lease. Results of recent surveys conducted in Area 4 North in 2004 and Areas 4 South and 5 in 2005 and 2007 have been reviewed and compiled herein to describe more current conditions and summarize species specific data for the Pinabete Mine Plan permit area (permit area) of BNCC's mining lease.~~

Ecosphere Environmental Services (Ecosphere) completed baseline surveys in Area 4 North (2004). The baseline surveys characterized the general habitats, regionally common wildlife, and species with special protection or conservation status according to Federal, State, and Navajo Nation management agencies. The survey procedures and methodologies for both general wildlife and sensitive species were developed by qualified biologists using standardized protocols in coordination with species-specific Navajo Natural Heritage Program (NNHP), Navajo Nation Department of Fish and Wildlife (NNDFW) guidelines, or in accordance with scientific standards. A detailed report describing the baseline surveys for wildlife and threatened, endangered, and sensitive (TES) species in Area 4 North is provided in [Appendix 16.A](#).

In 2005 and 2007, Ecosphere ~~also~~ completed baseline surveys in Area 4 South and Area 5 for general wildlife species and TES species, including species of concern (Ecosphere 2008a and Ecosphere 2008b). Results of the 2005 surveys were not submitted to ~~BNCCNTEC~~ in a comprehensive report, but the 2005 data was used to supplement the 2007 baseline wildlife surveys. Procedures and methodologies for the 2007 baseline general wildlife and TES species surveys were reviewed and approved by the NNDFW and the Office of Surface Mining Reclamation and Enforcement (OSM) prior to commencing fieldwork. The procedures and methodologies utilized in the 2005 surveys were similar to those approved for the 2007 surveys. Detailed reports describing the baseline wildlife and TES species surveys in Area 4 South and Area 5 are provided in [Appendix 16.B](#) and [Appendix 16.C](#), respectively. ~~The following subsections provide a summary of key wildlife resource information for the permit area.~~

~~In 2012, Ecosphere completed surveys for TES species, including species of concern, in the permit area. The surveys focused on species listed by the United States Fish and Wildlife Service (USFWS) and NNHP~~

of the NNDFW as documented or having potential to occur in the permit area. Surveys followed established methodologies previously approved by NNHP and OSM. A detailed report including survey methodologies and results for TES species with potential to occur in the permit area are provided in Appendix 15.D.— The following subsections provide a summary of key wildlife resource information for the permit area.

16.1 Fish and Wildlife Survey Methods

The following sections discuss the survey methods utilized for wildlife baseline surveys in the permit area. Section 16.1.1 provides details on general wildlife surveys while survey methods for federally listed TES species and Navajo Nation sensitive species are discussed in Section 16.1.2.

16.1.1 General Wildlife

General wildlife surveys were conducted in Areas 4 North, 4 South, and 5 following standard scientific protocols and NNDFW guidelines. A detailed discussion of methodologies used for general wildlife baseline surveys is presented in [Appendix 16.A](#) and [Appendix 16.B](#).

16.1.1.1 Raptors

In accordance with the current Surface Mining Control and Reclamation Act (SMCRA) permit, annual raptor surveys of suitable cliff habitat and historic nests are required by OSM for the entire ~~BNCNTEC~~ mining lease boundary plus a 1-mile buffer. On May 7, 2004, a raptor nest survey was conducted in Area 4 North using a fixed-wing aircraft (Cessna 206 airplane). All pinnacles and cliffs identified as potential habitat for raptors were visited by flying systematically across the mining lease boundary and identified nests were checked to determine if they were occupied. Any nests found within a 1-mile radius of Area 4 North were then surveyed with high-powered binoculars and spotting scopes from the ground.

In 2005 and 2007, systematic ground surveys were conducted in Area 4 South and Area 5 plus a 1-mile buffer for all raptor species identified by NNDFW as potentially occurring or known to occur in the area. The surveys were initiated by identifying potential habitat according to U.S. Geologic Survey (USGS) topographic maps and aerial photographs of Areas 4 South and 5, as well as reviewing historic nest locations from previous surveys. All field surveys were conducted using high-powered binoculars and spotting scopes to identify nests or breeding individuals. Additional information on methods used for raptor surveys is provided in ~~Appendices~~ [Appendix 16.A](#), [Appendix 16.B](#), and [Appendix 16.C](#).

16.1.1.2 Breeding Birds

A general breeding bird survey was conducted on June 6, 2004 along two miles of Chaco Wash between the confluence of Pinabete and Cottonwood Arroyos, the most suitable avian habitat in Area 4 North. Two individuals conducted pedestrian surveys using high-powered binoculars in the early morning hours.

In 2007 between mid-May and mid-June, random strip-transect surveys for breeding birds were conducted to determine avian species richness, diversity, and relative abundance in Areas 4 South and 5. Baseline vegetation communities were used to randomly establish transects in the various habitats. The vegetation communities sampled for breeding birds included Alkali Wash, Arroyo Shrub, Badlands, Thinbreaks, and Sands. The Dunes vegetation community was not sampled because it was patchily distributed and provided limited habitat for breeding birds. Geographic Information System (GIS) software was used to randomly distribute transects. Two transects, each 2-kilometers in length, were established in each of the five vegetation communities for a total of four kilometers of sample transects per vegetation community ([Exhibit 16.1-1](#)). Random transect bearings were selected using a random numbers table. The Thinbreaks vegetation community was patchily distributed in the permit area and was not large enough to accommodate multiple 2-kilometer transects. Therefore, one 2-kilometer transect and two 1-kilometer transects were established.

Field Code Changed

The following information was calculated for each vegetation community: (1) mean number of individuals detected per 1-kilometer transect, (2) species richness, (3) relative abundance, and (4) species diversity. Species richness refers to the total number of different species detected within a vegetation community. Relative abundance is calculated by dividing the number of individuals of each species by the total number of individuals detected – either by auditory or ocular methods. Species diversity considers both the number of species present and the relative abundance or distribution of each species. Species diversity was calculated using Simpson’s Index Diversity formula (Simpson 1949; [Appendix 16.B](#)).

16.1.1.3 Shorebirds and Waterfowl

During the summers of 2005 and 2007, temporary ponds in Areas 4 South and 5 were surveyed for waterfowl and shorebirds, as shown on [Exhibit 16.1-1](#). High-powered binoculars and spotting scopes were used to scan the shorelines and water surfaces of temporary ponds; every individual waterfowl and shorebird present on each day was recorded. No specific surveys for shorebirds or waterfowl were conducted in Area 4 North in 2004.

Field Code Changed

16.1.1.4 Small Mammals

In 2004, small mammal surveys were conducted to determine their presence in six vegetation communities in Area 4 North: Arroyo Shrub, Sands (specifically, saline sands), Thinbreaks, Alkali Wash, Dunes, and Badlands. Trapping webs were established and monitored in the more suitable habitat, such as Arroyo Shrub that has more cover and forage opportunities for small mammals, whereas trapping grids, a less intensive effort, were established in less suitable habitat. Each trapping web covered 3.1 hectares and consisted of twelve 100-meter transects spaced 30° from a central point, similar to the spokes of a wheel. Each web contained 148 Sherman live-traps at 12 trap stations along each radiating spoke. The first four trap stations were at 5-meter intervals, and the remaining eight at 10-meter intervals. Four Sherman traps were placed around the central point ([Appendix 16.A](#)). Each trap was baited and set in the evening and

closed again every morning. Each trapping web and grid was run for two consecutive nights. Additionally, two trapping grids were set up in the Arroyo Shrub vegetation community to increase the trapping effort in the most suitable habitat where small mammal burrows had been identified. The number and spacing interval of traps established in a trapping grid can be flexible; consequently, trapping grids are easier to set up than trapping webs and the trap effort can be adjusted based on the desired need. Therefore, a systematic trapping grid was used to sample Badlands because this vegetation community is typically poorly suited as habitat for small mammals (i.e., no vegetative cover or forage potential) and requires less intensive trapping efforts. Trapping grids consisted of four transects of 12 traps, each row ten meters apart and each trap spaced ten meters apart for a size of 0.3 hectares ([Appendix 16.A](#)). Captured animals were identified, sexed, and uniquely marked with a non-toxic permanent marker. Animals were handled by experienced field biologists according to standardized health procedures and immediately released into the same area they were captured. All mark-recapture data were collected for purposes of density estimation.

Small mammal trapping was also conducted from July through August 2005 and May through June 2007 in Areas 4 South and 5 to document species in the Geomyidae, Heteromyidae, and Muridae families ([Exhibit 16.1-1](#)). In 2005, systematic trapping grids of seven to 10 parallel transects with about 140 traps evenly spaced at 10-meter intervals were randomly located in the Arroyo Shrub and Sands vegetation communities. In 2007, trapping webs consisting of twelve 100-meter transects spaced at 30° from a central point were randomly established identical to methods used in 2004 in the Arroyo Shrub, Alkali Wash, and Sands vegetation communities. No trapping was conducted in Dunes, Thinbreaks, and Badlands communities due to the lack of suitable habitat, including forage and cover for small mammals.

Field Code Changed

16.1.1.5 Lagomorphs

Surveys for lagomorphs (i.e., black-tailed jack rabbits [*Lepus californicus*] and cottontails [*Sylvilagus audubonii*]) were conducted by visual observation concurrently with other surveys in Areas 4 North, 4 South, and 5 in 2004, 2005, and 2007. Any incidental sightings, as well as lagomorph tracks or scat found during other wildlife or vegetation surveys throughout the summer were recorded on a standardized data sheet, and the locations logged using a handheld GPS unit.

16.1.1.6 Sciurids

Surveys for sciurids (e.g., squirrels [*Spermophilus* spp.], chipmunks [*Tamias* spp.], Gunnison's prairie dogs [*Cynomys gunnisoni*], etc.) were conducted concurrently with other pedestrian and driving surveys in Areas 4 North, 4 South, and 5 in 2004, 2005, and 2007. Any incidental sightings, as well as sciurid tracks or scat, were recorded on a standardized data sheet, and the locations were logged using a handheld GPS unit.

Additionally, Ecosphere revisited the locations in Areas 4 South and 5, where biologists observed prairie dogs earlier that spring, to determine the size of each prairie dog town. The outer-most burrow entrances of each town were identified and recorded with a GPS unit to create a polygon and calculate the size of each

town in ArcGIS. Ecosphere enumerated the number of burrows within two prairie dog towns (or polygons) by marking each counted burrow and recording it with a GPS unit to approximate burrow densities for each town.

16.1.1.7 Felids

Surveys for felids, namely bobcats (*Felis rufus*), were conducted concurrently with spotlighting surveys for kit fox (*Vulpes macrotis*) in Areas 4 North, 4 South, and 5 in 2004, 2005 and 2007. Any incidental sightings, as well as felid tracks and scat found during other wildlife or vegetation surveys, were recorded on a standardized data sheet, and the locations logged using a handheld GPS unit.

16.1.1.8 Canids

Surveys for canids, such as coyotes (*Canis latrans*), red foxes (*Vulpes velox*), and gray fox (*Urocyon cinereoargenteus*), were conducted concurrently with spotlighting surveys for kit fox in Areas 4 North, 4 South, and 5 in 2004, 2005, and 2007 ([Exhibit 16.1-1](#)). Incidental sightings, including canid tracks and scat found during other wildlife or vegetation surveys, were recorded on a standardized data sheet, and the locations logged using a handheld GPS unit.

Field Code Changed

16.1.1.9 Mustelids

Surveys for mustelids, namely badgers (*Taxidea taxus*), were conducted concurrently with spotlighting surveys for kit fox in Areas 4 North, 4 South, and 5 in 2004, 2005, and 2007. Any incidental sightings, including mustelid tracks, scat, and observations made during vegetation or other wildlife surveys – especially those of prairie dogs - were recorded on a standardized data sheet, and the locations logged using a handheld GPS unit.

Survey protocols for black-footed ferrets are described in Section 16.1.2.5.

16.1.1.10 Bats

In 2004, Ecosphere conducted surveys for sensitive bat species in Area 4 North to document the presence of bats listed by the State of New Mexico and federally listed species of concern. Sites within the study area with distinct topographic features were identified and standard 32-foot mist nets were used to capture and identify bats. Shortly before dusk, mist nets were set up between two 20-foot lengths of polyvinyl chloride (PVC) piping supported by rebar. Two to three observers silently waited for bats to become active and inadvertently fly into the mist nets. Upon tangling themselves in the mist net, bats were carefully removed, identified, sexed, and released. Nets were taken down by midnight. Following these methods, four nets were run in a dry wash along the eastern boundary of Area 4 North on June 2, 2004 and two mist nets were run on June 6, 2004 and June 23, 2004 near the stock pond in Area 4 North. No bat surveys were conducted in Areas 4 South or 5.

16.1.1.11 Big Game

Surveys for big game, specifically mule deer (*Odocoileus hemionus*), pronghorn antelope (*Antilocapra americana*), and elk (*Cervus elaphus*), were conducted concurrently with other surveys in Areas 4 North, 4 South, and 5 in 2004, 2005, and 2007. Any incidental sightings made during other wildlife or vegetation surveys throughout the summer and fall were recorded on a standardized data sheet, and the locations logged using a handheld GPS unit. Pronghorn antelope and elk are not known to occur in the mining lease; mule deer are likely only an occasional sighting.

16.1.1.12 Herptiles

Surveys for herptiles (i.e., reptiles and amphibians) were conducted in conjunction with other species-specific and vegetation surveys in Areas 4 North, 4 South, and 5 in 2004, 2005, and 2007. Any incidental sightings made during other wildlife or vegetation surveys were recorded on a standardized data sheet, and the locations logged using a handheld GPS unit.

16.1.1.13 Fish

There are no permanent water bodies with sufficient water levels capable of supporting year-round fish populations within the mining lease.

16.1.2 Threatened and Endangered Wildlife Species

Surveys for threatened and endangered species were conducted in coordination with NNHP species-specific guidelines (Mikesic and Nystedt 2001; NNHP 2005; Mikesic and Roth 2008), U.S. Fish and Wildlife Service (USFWS) protocols, and other accepted scientific standards. Knowledge of the area, biological expertise, and experience with the survey methods for these target species were incorporated into the survey methodologies. Prior to conducting fieldwork, Ecosphere biologists compiled a list of current federal and Navajo Nation listed species and evaluated their habitat requirements to determine their potential to occur in Areas 4 North, 4 South and 5 ([Table 16.2-1](#)). Federally listed species were obtained from the USFWS Southwest Region Endangered Species List (2008). The Navajo Nation listed species were obtained through NNHP consultation and reviewed per the current Navajo Endangered Species List (NESL; Mikesic and Nystedt 2001; NNHP 2005). Consequently, species-specific surveys were conducted to determine the presence of the following target species: kit fox, mountain plover (*Charadrius montanus*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), burrowing owl (*Athene cucularia*), black-footed ferret (*Mustela nigripes*), and pronghorn antelope. Methods used for the threatened and endangered species surveys are discussed in detail in [Appendix 16.C](#).

16.1.2.1 Ferruginous Hawk

In ~~2004~~~~2005~~, ~~2008~~, and ~~2012~~, ~~aerial~~ surveys for ferruginous hawk were conducted in ~~Area 4 North~~ ~~the permit area~~ concurrently with aerial surveys ~~conducted once every three years~~ for all suitable raptor habitat and historic nests in accordance with the ~~current~~ Navajo Mine SMCRA permit (~~OSM Permit No. NM-~~

~~0003F) administered by OSM.~~ The ~~aerial is~~ surveys included the entire mining lease boundary plus a 1-mile buffer. For raptor nests determined to be active during the aerial flight, additional ground surveys were completed to document nestlings and fledging success.

Ground surveys ~~targeted for~~ ferruginous hawk were completed in 2005 and 2007 ~~specifically~~ specifically in Areas 4 South and 5 (Appendix 16.B). Ground surveys are conducted by: (1) identifying potential habitat by analyzing USGS topographic maps and aerial photographs of Area 4 South and Area 5 within a 1-mile buffer, (2) consulting with NNHP and NNDFW biologists to identify known or historic territories, (3) reviewing results of past raptor surveys in Areas 4 South and 5, and (4) conducting field surveys beginning in April for nests or breeding individuals utilizing high-powered binoculars and spotting scopes to minimize disturbance. Neither the USFWS nor the NNDFW has endorsed a species-specific survey protocol for this species.

16.1.2.2 Golden Eagle

The survey methodology for golden eagle was similar to that used for ferruginous hawk. In ~~Area 4 North,~~ 2004, 2008, and 2012 aerial surveys were conducted concurrently with annual raptor surveys of the entire mining lease plus a 1-mile buffer, ~~whereas coupled with ground surveys in non-flight years.~~ ~~g~~Ground surveys were also conducted specifically in Areas 4 South and 5 in 2005 and 2007 (Appendix 16.B). The ground surveys for golden eagle were conducted in March since courtship, breeding, and nesting are typically initiated in mid- to late February.

16.1.2.3 Burrowing Owl

Burrowing owls typically use burrows made by fossorial mammals, namely prairie dogs, but also ground squirrels or badgers (Henny and Blus 1981). In Area 4 North, burrowing owls were documented by visual observation concurrently with other 2004 surveys, especially vegetation, prairie dog, and mountain plover surveys. In Areas 4 South and 5, surveys for burrowing owl were conducted in 2005 and 2007 by walking parallel 100-foot transects with high-powered binoculars in conjunction with mapping, and describing prairie dog towns. Parallel transects covered the entire prairie dog town and varied depending upon the size of each town. Similar methods were used in September 2012 at prairie dog towns located in the permit area to document individual burrowing owl or burrows with sign of burrow use. Incidental observations of burrowing owl or their sign encountered during vegetation and the mountain plover surveys conducted in 2012 were also documented.

16.1.2.4 Mountain Plover

In 2004, mountain plover were surveyed in Area 4 North concurrently with general breeding bird surveys. Mountain plover surveys were conducted in all suitable habitats in Areas 4 South and 5 in 2005 and 2007 following the methodology developed by Delbert et al. (1999) for the USFWS. In 2012, mountain plover surveys were conducted in suitable habitat mapped in the permit area (Appendix 15.D). Suitable habitat

was identified and mapped as- short-vegetation (less than 4~~four~~ inches tall), a bare ground component of at least 30 percent, on flat or gently sloping landscapes (usually less than 5 percent slopes), and sometimes associated with prairie dog towns (Dinsmore 2003).

16.1.2.5 Black-Footed Ferret

In 2004 and 2007, Ecosphere surveyed or mapped active prairie dog towns to determine if they were large enough to support black-footed ferret. In June 2004, Ecosphere observed an active prairie dog town in Area 4 North ([Appendix 16.A](#)) and determined it was too small to warrant protocol surveys for black-footed ferret (USFWS 1989).

Ecosphere also observed several prairie dog towns on several occasions in late spring and early fall 2007 in Areas 4 South and 5 ([Appendix 16.C](#)). The boundaries of these towns were mapped using a handheld GPS unit and approximate burrow densities for individual towns were calculated. Ecosphere enumerated burrows within two prairie dog towns to estimate burrows per hectare. The size and density of prairie dog burrows indicated the potential to support a population of black-footed ferrets; therefore, nocturnal surveys for black-footed ferret were conducted in 2008 following USFWS and NNDFW protocols (USFWS 1988, NNDFW 1985) in Areas 4 South and 5. Prior to conducting field work, prairie dog towns were divided into three survey tracts: towns A and B represented tract one, towns C and D represented tract two, and tract three was comprised solely of town E. Ecosphere conducted surveys with three field crews, consisting of two biologists in a 4-wheel drive vehicle, assigned to one survey tract. Each field crew spotlighted continuously from dusk until dawn on three separate occasions in July and August 2008 ([Appendix 16.BD](#)).

Field Code Changed

16.1.2.6 Kit Fox

In 2004, nocturnal spotlighting was conducted in Area 4 North using vehicular surveys on passable roads in the study area. Surveys were conducted two to four hours after midnight on three occasions. In addition, scent posts were established in sandy areas where canid tracks were identified. Scent posts were marked with fox urine and beaver castor, and the surrounding area was swept with a household broom to identify the tracks of any visitors. Predator calls were used at the end of each spotlighting session to attract any canids in the area, which could then be identified.

Similarly, in 2007, four biologists, operating in pairs in separate vehicles, conducted nocturnal spotlight surveys on two consecutive nights for two to four hours after midnight on four different occasions in Areas 4 South and 5. Survey routes included passable roads throughout Areas 4 South and 5 ([Exhibit 16.1-1](#)). Predator calls were used during each spotlighting session to attract canids in the area to allow for identification.

Field Code Changed

In 2012, nocturnal surveys for black-footed ferret that included spotlighting for kit fox were conducted across 1,064 acres of prairie dog colonies in Areas 4 North, 4 South, and 5 ([Appendix 15.D](#)).

16.1.2.7 Pronghorn Antelope

According to NNDWF, pronghorn antelope are not known to occur within the mining lease (Mikesic and Roth 2008). Therefore, no formal or systematic surveys were conducted for pronghorn. Incidental surveys for pronghorn were conducted concurrently with vegetation and wildlife surveys in Areas 4 North, 4 South, and 5 in spring, summer, and fall by searching for individuals, tracks, and scat.

16.2 General Fish and Wildlife Results

Numerous wildlife species were documented during wildlife baseline surveys in Area 4 North in 2004 ([Appendix 16.A](#)). In Areas 4 South and 5 (and 1-mile buffer zone for raptors), a total of 62 different wildlife species were documented during the 2005 and 2007 baseline surveys, including nine raptor species, 29 avian non-raptor species, 14 mammal species, and ten herptile species ([Table 16.2-2](#)). A detailed discussion on the results of the general wildlife surveys in Areas 4 South and 5 are provided in [Appendix 16.B](#).

16.2.1 Raptors

Raptor surveys for the baseline wildlife surveys in Area 4 North ([Appendix 16.A](#)) relied upon aerial raptor surveys conducted ~~annually every three years~~ under the ~~current Navajo Mine~~ SMCRA permit ([OSM Permit No. NM-0003F](#)) for the entire mining lease boundary. These raptor surveys, conducted by Hawks Aloft, documented several raptor species on Navajo Mine, but none were documented in Area 4 North (Hawks Aloft 2005). However, within the mining lease, the following territories have been documented as occupied at least once during 28 years of monitoring: red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk, golden eagle, American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), great-horned owl, and burrowing owl (Hawks Aloft 2005; [Ecosphere 2009](#)).

In Area 4 North juvenile bald eagles were identified on two different occasions in Area 4 North: on August 7 and August 14, 2004. Burrowing owls were seen on several occasions within the prairie dog town. A burrowing owl was heard at the stock pond located in Area 4 North on June 5, 2004 while netting for bats and observed in the same area again on June 22, 2004. Gamble's quail (*Callipepla gambelii*) was seen on two occasions in the west-central portion of the study area: July 10 and August 5, 2004. Two American avocets (*Recurvirostra americana*) and several killdeer (*Charadrius vociferus*) were noted at a stock pond on the south boundary of Area 4 North in early June; neither was present in late June.

In 2005, five raptor species were observed in Areas 4 South and 5, including red-tailed hawk, ferruginous hawk, prairie falcon, burrowing owl, and great-horned owl (*Bubo virginianus*). Nine raptor species were observed during the 2007 surveys conducted in Areas 4 South and 5. These species include northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), red-tailed hawk, ferruginous hawk, golden

eagle, American kestrel, prairie falcon, burrowing owl, and great-horned owl. Detailed results from ferruginous hawk, golden eagle, and burrowing owl surveys are described in Section 16.3.

In 2012 during an aerial survey of the mining lease an active red-tailed hawk nest was identified in the permit area. –Also during the aerial survey, a pair of American kestrel was flushed in Area 4 North. Flushing a pair of raptors in nesting habitat is a good indicator of an active territory. However, no nest was located for this pair.

16.2.2 Avian non-raptor species

In 2004, bird species heard or observed while conducting general breeding bird surveys in Area 4 North include: white-crowned sparrow (*Zonotrichia leucophrys*), sage sparrow (*Amphispiza belli*), song sparrow (*Melospiza melodia*), black-throated sparrow (*Amphispiza bilineata*), Cassin's finch (*Carpodacus cassinii*), horned lark (*Eremophila alpestris*), ash-throated flycatcher (*Myiarchus cinerascens*), Cassin's kingbird (*Tyrannus vociferans*), Say's phoebe (*Sayornis saya*), brown-headed cowbird (*Molothrus ater*), rock wren (*Salpinctes obsoletus*), common nighthawk (*Chordeiles minor*), northern mockingbird (*Mimus polyglottos*), mourning dove (*Zenaida macroura*), and common raven (*Corvus corax*).

A variety of non-raptor birds were documented during 2007 breeding bird surveys in Areas 4 South and 5. Mean number of individuals per 1-kilometer transect, species richness (i.e., number of species detected), and species diversity were calculated for five vegetation communities (Table 16.2-3). On average, Alkali Wash and Arroyo Shrub communities equally yielded the highest number of individuals (14.8 individuals per 1-kilometer transect), whereas Sands and Thinbreaks communities contained slightly lower numbers (13.8 and 12.8, respectively). Badlands communities were largely devoid of breeding birds. Species richness and diversity were the highest in Arroyo Shrub communities (16 species, 0.8, respectively) followed by Sands and Alkali Wash (7 species, 0.3, and 5 species, 0.2, respectively) (Table 16.2-3). The lowest species richness and diversity was associated with Badlands and Thinbreaks communities.

Relative abundance of individual species observed during the 2007 survey are summarized by habitat type and for all habitats combined in Table 16.2-4. Horned lark (*Eremophila alpestris*) was the most abundant species in all habitat types. Relative abundance of all other species in all habitat types was less than 0.1, with the exception of mourning dove (*Zenaida macroura*), which was 0.2 in the Arroyo Shrub habitat.

Eleven species of waterfowl and shorebirds were observed at temporary ponds (ponds 1, 2, and 3; Exhibit 16.1-1) in Area 4 South and Area 5 in 2007 (Table 16.2-5). Species observed included American coot (*Fulica americana*), cinnamon teal (*Anas cyanoptera*), common merganser (*Mergus merganser*), Eurasian wigeon (*Anas penelope*), and mallard (*Anas platyrhynchos*), American avocet (*Recurvirostra americana*), black-crowned night heron (*Nycticorax nycticorax*), great blue heron (*Ardea herodias*), killdeer

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(*Charadrius vociferus*), spotted sandpiper (*Actitis macularius*), and Wilson's phalarope (*Phalaropus tricolor*).

16.2.3 Mammal Species

Eleven small mammals were captured in 3,344 trap nights in Area 4 North in 2004 (Table 16.2-6). All captures of small mammals were in Arroyo Shrub habitat. Seven of those small mammals were captured on one trapping web in Arroyo Shrub habitat: four Ord's kangaroo rats (*Dipodomys ordii*), one deer mouse (*Peromyscus maniculatus*), one pocket mouse (*Perognathus apache*), and one recaptured Ord's kangaroo rat (Table 16.2-6). One deer mouse and three Ord's kangaroo rats were captured in two separate trapping grids in Arroyo Shrub habitat.

Although abundance (\hat{N}) could not be estimated due to low capture success, density estimates were calculated using minimum number alive (MNA) (Krebs et al. 1986, Slade and Blair 2000) for Arroyo Shrub habitat (Table 16.2-7). However, this approach does not incorporate the effective area trapped, only the area of trapping web or grid. Density estimation is not simply $\hat{D} = \hat{D}/A$, where A is the area of the trapping grid and \hat{N} is the number of individuals (Appendix 16.A). Therefore, the density estimates reported in Table 16.2-7 may dramatically overestimate density. Although actual densities are probably much lower, densities in this report do represent numbers for future comparison if field and calculation methods are repeated.

In 2005, three species of small mammals were documented during trap efforts in Areas 4 South and 5. Thirteen individuals were captured 14 times in 1,202 trap nights (number of traps x number of nights x number of replicates), including seven banner-tailed kangaroo rats with one recapture, five grasshopper mice (*Onychomys leucogaster*) and one Ord's kangaroo rat. All captures in 2005 were made in the Sands vegetation community; no small mammals were captured in Arroyo Shrub. In 2007, four species of small mammals were documented from trapping in approximately 2,800 trap nights in Areas 4 South and 5. Twenty individuals were captured 21 times; one juvenile antelope squirrel (*Ammospermophilus leucurus*) was recaptured. Other captures included 12 deer mice, four Ord's kangaroo rats, two banner-tailed kangaroo rats, and one piñon mouse (*Peromyscus truei*). Seventy-eight percent of small mammals were captured in Arroyo Shrub habitat, and 11 percent were captured each in Alkali Wash and Sands habitats.

Additionally, tunnels of pocket gophers (*Thomomys* spp.) and the mounds of banner-tailed kangaroo rats were frequently observed in sandy soils within the in Areas 4 South and 5 in both the 2005 and 2007 survey years.

In 2004, prairie dogs were observed at the town in Area 4 North in early June; however, no prairie dogs were seen in later summer. The size of the town was estimated at < 1.0 hectare (2.5 acres) in size. In 2005,

prairie dogs were commonly observed, but towns were not mapped in Area 5. In 2007, five major Gunnison's prairie dog towns, ranging in size from 75 to 317 acres, were mapped in Area 4 South and Area 5 ([Appendix 16.C](#)). Burrows were enumerated in two prairie dog towns (Towns B and C) and each had burrow densities of 5 burrows per acre ([Appendix 16.C](#)). In 2007, badger tracks were observed next to a prairie dog burrow while mapping prairie dog towns in Area 5.

Black-tailed jackrabbits and desert cottontails were observed in Area 4 North in 2004, especially during spotlight surveys. Black-tailed jackrabbits and desert cottontails, as well as their tracks and scat, were also commonly observed in Areas 4 South and 5 in 2005 and 2007. A white-tailed antelope squirrel and a ground squirrel (*Spermophilus spilosoma*) were observed in rocky draws on two separate occasions within Area 4 North in 2004. Bobcat tracks were also identified in Chaco Wash in Area 4 North in 2004. No bobcats or their sign were observed in Areas 4 South and 5 in 2005 and 2007.

In 2004, mist-netting resulted in the capture of several bat species in Area 4 North: 22 pregnant female and ten male western pipistrelles (*Pipistrellus hesperus*), one pregnant female and six male pallid bats (*Antrozous pallidus*), one non-reproductive female silver-haired bat (*Lasionycteris noctivagans*), and one non-reproductive female hoary bat (*Lasiurus cinereus*). Bats were often observed around dusk, likely *Pipistrellus* species, in Areas 4 South and 5 in 2005 and 2007.

No coyotes were seen or heard during spotlight surveys or any other surveys in Area 4 North in 2004. However, coyote tracks were identified and several scats were found throughout the area. In 2005, during spotlighting surveys for canids, green eyeshine was consistently observed through the night surveys, indicating coyotes and foxes were present throughout Areas 4 South and 5. Scat and tracks of kit fox and red fox (*Vulpes vulpes*) were also documented. Two coyotes, one unidentified canid, four kit foxes and one kit fox den were sighted. One kit fox sighting included two individuals, possibly juveniles. An individual juvenile red fox was observed investigating mounds of banner-tailed kangaroo rats at nearby traps in 2005. Spotlighting efforts for kit fox in 2007 are described in detail in the threatened and endangered species survey report provided in [Appendix 16.C](#).

A few tracks of mule deer were identified, mostly within Chaco Wash, in Area 4 North in 2004. No incidental observations of other big game were made during surveys in Areas 4 South and 5 in 2005 and 2007.

16.2.4 Herptile species

Herptile observations were not reported in Area 4 North in 2004 ([Appendix 16.A](#)). Ten species of herptiles were incidentally observed within Areas 4 South and 5 in 2005 and 2007. Observed species include plateau striped whiptail (*Cnemidophorus velox*), western whiptail (*Cnemidophorus tigris*), gopher snake (*Pituophis melanoceus*), bull snake (*Pituophis melanoceus* sub. *sayi*), short-horned lizard (*Phrynosoma*

douglasii), western yellow-bellied racer (*Coluber constrictor* sub. *mormon*), side-blotched lizard (*Uta stansburiana*), lesser earless lizard (*Holbrookia maculata*), prairie rattlesnake (*Crotalus viridis*), and collared lizard (*Crotaphytus collaris*).

16.3 Threatened and Endangered Wildlife Results

The Navajo Nation Biological Evaluation Guidelines (NNDFW 1997) specify that locations of certain species are confidential and are not to be released in a public document. Therefore, ~~BNCCNTEC~~ will not report locations or population numbers of threatened, endangered, and sensitive species (TES) in public documents.

The TES species and their potential habitats within the permit area are presented in [Appendix 16.A](#) and [Appendix 16.C](#). Seven species were identified as having suitable habitat within and adjacent to Areas 4 North, 4 South and 5. Species-specific surveys were conducted in Area 4 North ([Appendix 16.A](#)) and Areas 4 South and 5 ([Appendix 16.C](#)) to determine presence of the following target species: kit fox, mountain plover, ferruginous hawk, golden eagle, burrowing owl, black-footed ferret, and pronghorn antelope.

[Appendix 16.C](#) is submitted twice; one which redacts the confidential information for public review; and one containing the confidential information which will be submitted separately and maintained as confidential information.

16.3.1 Ferruginous Hawk

One ferruginous hawk territory consisting of five nests located about seven miles northwest of Area 4 North mining lease boundary was active in 2004 and fledged two young (Hawks Aloft 2005). In 2007, eight historic ferruginous hawk nests were visited in Areas 4 South and 5. One individual was observed but no nests were active. Further discussion on the presence of ferruginous hawks and their nests in Areas 4 South and 5 is presented in [Appendix 16.C](#). Three, historic ferruginous hawk territories occur in proximity to the permit area. During the aerial and grounds surveys of the permit area in 2012, no active ferruginous hawk nest was observed in any of these territories or within the 1-mile buffer of the permit area.

16.3.2 Golden Eagle

The most recently active golden eagle nest (1999) is within the 1-mile buffer from the Area 4 North mining lease boundary. In 1998, a common raven nest located in the middle of the Area 4 North mining lease boundary was occupied by golden eagle; however, the nest has not since been used by golden eagles and was confirmed occupied again by common raven in 2008 (Ecosphere 2009).

In 2007, four historic golden eagle nests were visited in Areas 4 South and 5 and one was found active. Further discussion on the presence of golden eagles and their nests in Areas 4 South and 5 is presented in [Appendix 16.C](#). [In 2012, one active golden eagle nest was observed about 1-mile southwest of Area 4 North during the aerial survey \(Appendix 15.D\).](#)

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16.3.3 Burrowing Owl

Several incidental observations of burrowing owl were made in Area 4 North in 2004: four burrowing owls were seen on several occasions within the prairie dog town centrally located in Area 4 North. A burrowing owl was heard at the stock pond on June 5, 2004 while netting for bats and observed in the same area again on June 22, 2004 (see [Appendix 16.A](#)).

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Burrowing owls were documented in 2005 and 2007 while mapping prairie dog towns in Areas 4 South and 5. The presence of burrowing owl was also documented on separate occasions during vegetation and mountain plover surveys in June 2007. Survey results for burrowing owl in Areas 4 South and 5 are presented in [Appendix 16.C](#).

16.3.4 Mountain Plover

No mountain plover were documented in Area 4 North during avian surveys in 2004.

In May 2007, mountain plover were observed during the first of three USFWS protocol surveys near Burnham Road in Area 5 ([Appendix 16.C](#)). Repeat visits to the same location during the second and third surveys failed to document any new sightings. Also in May 2007, two males apparently engaged in a territorial dispute were observed during breeding bird surveys east of Burnham Road in Area 5. Additionally, two adult mountain plovers were observed during vegetation surveys in Area 5 in 2007. Detailed survey results for mountain plovers in Areas 4 South and 5 are presented in [Appendix 16.C](#).

16.3.5 Black-Footed Ferret

No surveys for the presence of black-footed ferrets were conducted in Area 4 North. Preliminary field surveys determined that the prairie dog colony in the area was too small to support black-footed ferrets and, therefore, no further investigations were warranted.

Nocturnal spotlighting surveys following NNDFW and USFWS protocols for black-footed ferrets were conducted in July and August of 2008 in Areas 4 South and 5. No black-footed ferrets or their sign were observed. Further, there were no incidental observations of black-footed ferrets or their sign during

previous wildlife and vegetation surveys. Detailed survey results for black-footed ferrets in Areas 4 South and 5 are presented in [Appendix 16.D](#).

No black-footed ferrets or their sign were detected during nocturnal spotlighting surveys conducted in mining lease area Area 4 North, Area 4 South, and Area 5 in 2012 (Appendix 15.D).

16.3.6 Kit Fox

No kit foxes were spotlighted in Area 4 North in 2004; however, scat and tracks were identified and burrows were common throughout the area. None of the burrows showed current occupation, but several indicated recent use because no spider webs or debris obscured the entrances. Fresh scat and tracks were identified at one burrow. A scent post was set up at this site, but subsequent checks showed no indication of a canid visiting the scent post.

Spotlighting surveys in 2005 and 2007 documented the presence of several individual kit fox and at least two dens within Areas 4 South and 5. Detailed survey results for kit fox in Areas 4 South and 5 are presented in [Appendix 16.C](#).

An individual kit fox was observed during nocturnal spotlighting surveys in the permit area in 2012 (Appendix 15.D).

16.3.7 Pronghorn Antelope

No pronghorn antelope or sign thereof were observed during any surveys in Areas 4 North, 4 South, and 5 in 2004, 2005, ~~or 2007~~, or 2012.

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