

BIOLOGICAL RESOURCES REPORT
CR KENDALL MINE
(August 2010)



Historic Town of Kendall

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INTRODUCTION

The CR Kendall Mine, now in closure, is located in the North Moccasin Mountains approximately 15 miles north of the community of Lewistown, Montana. There are four mine pits that remain on the mine site with steep headwalls composed largely of limestone bedrock. Tailings and former leach pads have been recontoured and covered with growth medium and seeded to promote establishment of self-sustaining vegetation cover to stabilize soils and provide habitat for wildlife. Because of the location of the mine is on forested slopes with high levels of biodiversity, the primary objective of post-mining land use is to provide habitat for wildlife species. Reclamation of the mine site to the desired post-mining land use is directed by the Reclamation Plan and Specific Reclamation Requirements (82-4-336 Montana Code Annotated).

To evaluate the use and suitability of the mine site habitats for a variety of wildlife species, ATNA Resources LTD. has initiated an annual monitoring program to evaluate wildlife presence and utilization and to develop measures to enhance habitat values for wildlife. Monitoring and enhancement of habitat will provide the basis for adaptive management to help ensure that the mine site provides the post-closure objectives. This report presents results of the first year of wildlife monitoring and recommendations for improvement of habitats.

DESCRIPTION OF MINE SITE HABITATS

The North Moccasin Mountains, the site of the Kendall Mine, is a small mountain range surrounded by native grasslands and agricultural land. It is an island of conifer-dominated forest in a matrix of rolling lowland habitats; consequently, the wildlife and vegetation species typical of prairie and montane habitats contribute to the high levels of biodiversity that are found on and adjacent to the mine site.

The mine site is bounded by private land on the east and by land administered by the Bureau of Land Management (BLM) at higher elevations. The North Moccasin Mountains are managed by the BLM for motorized access. There are no maintained hiking trails, campgrounds, or other developed recreational facilities. Dispersed activities such as hunting, sight seeing, and motorized travel are the most common recreational uses. Following mine closure, the primary road through the mine site will become a public access route and included in the network of roads currently used to access BLM land.

The conifer forests on and adjacent to the mine site include mature stands of ponderosa pine on the drier slope with denser stands of Douglas-fir at higher elevations and on moister, cooler sites. Patches of quaking aspen of multiple age classes is present on moist sites interspersed with conifers and riparian areas.

Numerous ephemeral and perennial stream drainages originate in the North Moccasins, often from springs. The incised stream channels and associated wetland and riparian vegetation are movement corridors for wildlife between higher elevation forest habitats and surrounding lowland habitats. The Kendall Mine site is on east-facing slopes surrounded by relatively dry forests dominated by ponderosa pine and Douglas-fir with deciduous shrubs and quaking aspen occupying the moist, head-water drainages of Dog Creek, Little Dog Creek, the South Fork of Last Chance Creek, and Barnes-King Gulch. Native grasslands dominated by blue-bunch wheatgrass, arrow-leaf balsamroot and other grasses and forbs are interspersed in forest habitats on warmer and drier slopes with bedrock close to the surface.

Mining-related disturbance at the Kendall Mine site has been a prominent wildlife habitat feature since mining began in the North Moccasin Mining District in 1880. High levels of human activity have been associated with the mine site since the town of Kendall became established in 1901, with development of the Kendall mines. At its peak, the town had a population of 1,500; however, the town was abandoned with closure of the Barnes-King Mine in 1920. Mining operations through the 1930's are believed to have been largely placer mines. Three cyanide mills were also in operation between 1900 and 1941. Modern heap-leach operations were initiated in 1981 and continued through 1997. Major site features include, two heap-leach pads, process water ponds, four pits (Horseshoe, Muleshoe, Barnes-King, and Kendall) and three waste rock repositories. Currently, the Kendall Mine site, comprising 1040 acres, has approximately 447 acres of acres disturbed by mining; 593 acres of undisturbed habitat; 14 acres of land cleared of trees, but with soil and understory vegetation undisturbed. All of the mined land (447 acres) has been or is in the process of being reclaimed, including 55 acres of mine-pit highwall.

A self-sustaining cover of agronomic grasses, with few trees and shrubs or other native plant species, dominates most of the reclaimed areas. Although these areas have low species diversity, they produce large amounts of forage for grazing species such as livestock, elk, and small mammals and provide nesting cover for some grassland birds (vesper sparrow). Controlled livestock grazing is currently occurring on reclaimed areas that have developed vegetation cover capable of sustaining livestock use. The recontoured waste rock dump of the Horseshoe Pit was not seeded with agronomic species as part of the reclamation program; however, this site has been colonized by native species from the surrounding landscape including ponderosa pine, Douglas-fir, common juniper, and numerous forbs and grasses (see following section).

The small-mammal prey base on reclaimed areas is an attractive to foraging raptors such as the kestrel, red-tailed hawk, Swainson's hawk, and golden eagle (species regularly observed on the mine site). Typically, small mammals rapidly invade reclaimed land, often within one to two years following the start of reclamation (Hingten and Clark 1984a, 1984b). Populations of small mammals

on reclaimed land provide a prey base for raptors, even during early stages of reclamation. The rocky terrain and reclaimed pits with adjacent dense vegetation on the reclaimed areas support exceptionally high populations of yellow-bellied marmots (rock chucks).

The limestone bedrock of the mine site (evident on pit highwalls) and surrounding areas has features of typical karst topography. Karst landforms result from mildly acidic water (carbonic acid) dissolving soluble limestone bedrock creating porous bedrock with cavities and caves. Natural cavities and mined areas with porous, exposed limestone provide breeding and roosting habitat for bats, birds, and small mammals such as bushy tailed woodrats.

Data from the Montana Department of Fish, Wildlife, and Parks (MDFWP) website was reviewed and is summarized in **Appendix A**. Species richness is depicted for all native land-based species in Montana, including amphibians, reptiles, birds, and mammals. Species included are found year round or breed in the state. Sections in the immediate vicinity of the project range from Class 1 to 3 (of 4). Many of the sections immediately outside of the active mining area are Class 1, while the active mining area is primarily Classes 2 and 3. The mountainous terrain has a much higher species richness (primarily classes 1 and 2) compared to the valleys (Primarily classes 3 and 4). The MDFWP website also shows seasonal ranges for big game animals. The Moccasin range is identified as winter range for elk and year-around range for mule deer and white-tailed deer.

METHODS

I conducted auditory and visual observations of wildlife and/or their sign (e.g., tracks, scats, nests, and skeletal remains) on May 25 and 26 and on June 8, 9, and 10, 2010. Roads on the project area were slowly driven in a vehicle twice each day and observations of wildlife were recorded. Pedestrian surveys were also conducted in habitats around the periphery of the mine disturbance. Pit highwalls and other habitats were examined using binoculars and a spotting scope for the presence of nesting birds.

Tom Butts of Continental Divide Ecological Consulting conducted bat surveys on June 8 and 9 using mist nets and acoustic recorders. Acoustic surveys were conducted each night using Anabat bat detectors and Pettersson D 240 bat detectors. Bat detectors were placed on the ground. Each night four bat detectors were deployed at four of five sites identified as having potential for bat activity. Two of these sites had standing water (the settling ponds located in the Barnes-King drainage and the water treatment pond located in timber about 100 meters north of the settling ponds) where bats may forage and drink, and three of the sites were at mine pits (Barnes-King, Muleshoe, and Horseshoe pits) with exposed limestone pit walls that may provide bat roosting habitat and foraging areas. The use of bat detectors and recorders allowed the determination of bat

species presence and relative abundance at sampling locations. Each day, recordings were analyzed and results tabulated by location, species, and relative abundance.

Mist nets also were used where bat presence was likely. One 18 foot and one 30 foot mist net were deployed at the settling ponds, across the small dams separating the ponds. Ponds were approximately 8 X 20 feet each, in a series down the drainage. Each pond had some open water where bats could drink and forage.

Photographs taken during the wildlife studies are included in **Appendix B**.

RESULTS

GENERAL WILDLIFE OBSERVATIONS

Wildlife species recorded on and adjacent to the Kendall Mine site are typical of species in central Montana that occupy mountain ranges and habitats transitional to prairie grasslands and agricultural land. Mule deer, white-tailed deer, elk, and wild turkey are common game species that utilize the mine site for foraging and as a movement corridor. Less commonly observed species include black bear, mountain lion, coyote, and raccoon. The yellow-bellied marmot is the most evident small mammal. This species has colonized the entire mine site. Evidence of voles in reclaimed grassland was observed.

Raptors regularly observed on the mine site included golden eagle, red-tailed hawks, Swainson's hawks, and kestrels. A bald eagle was observed on one occasion foraging over the mine site. Golden eagles were frequently observed hunting along the steep pit highwalls and over reclaimed areas. The thermals that develop along the highwalls as the temperature increases appear to attract golden eagles as most eagle foraging activity was observed after 10:00 AM. The high density of yellow-bellied marmots probably is important in attracting eagles to the mine site.

Tree swallows were also observed foraging over the mine pits. The Muleshoe Pit was especially heavily used by tree swallows; perhaps because the upper pit margin is a land-application site for water from the treatment facility. This water may contribute to the production of insects, on which the tree swallows feed.

During the May site visit, a pair of golden eagles was observed doing courtship displays and carrying sticks to a ponderosa pine at the upper edge of the Horseshoe Pit. Typically, golden eagles have constructed nests and are incubating eggs by May. A June inspection of the tree where the golden eagles were carrying sticks found a partially constructed nest and no eagles were at the nest.

The highwalls, with many pockets and crevices in the dissolved limestone, probably provide roosting habitat for several bat species (see following section). The mine pit highwalls also provide nesting habitat for ravens, mountain bluebirds, rock wrens, and rock doves. During the May studies, three raven nests with young were observed on the pit highwalls. Mountain bluebirds and rock wrens were observed flying into crevices in the highwalls, probably associated with nesting and brood rearing. The relatively numerous rock doves indicate that they are nesting on the highwall. Near the upper margin of the Muleshoe Pit, staining on the rocks indicates that bushy-tailed woodrats also utilize the pit highwall.

There are no perennial drainages on the mine sites, but springs on the east (down-slope) margin of the mine site establish perennial flows in Dog Creek, Little Dog Creek, South Fork of Last Chance Creek and Barnes-King Gulch. Beaver dams have been constructed over the upper reaches of these drainages, off the mine site, and form a complex of wetlands and riparian plant communities that support waterfowl and numerous passerine birds and provide breeding habitat for amphibians.

The stand of aspen near the pump-back well in the headwaters of Little Dog Creek has a diverse age structure (saplings, mature trees, dead snags) and high density of understory shrubs and intermixed ponderosa pine. Unlike other areas of the West, quaking aspen in the North Moccasins appears to be reproducing and maintaining stands of diverse size and age structure. This habitat supports ruffed grouse, wild turkey, and a high density of red-naped sapsuckers. White-tailed deer are especially numerous in this area.

On the mine site, at the head of Barnes-King Gulch there is a small wetland with perennial water where an experimental water treatment facility was constructed and later abandoned. About 100 feet from this wetland, there is a water treatment pond that collects water for pumping to the mine site for land application. The wetland and treatment pond provide breeding habitat for chorus frogs and several bat species forage over the sites. Bats and chorus frog were observed at both of these sites.

BAT STUDIES

Six bat species were recorded during two nights of acoustic surveys. **Table 1** lists the species recorded at each survey site, and the relative abundance of each species based on total bat passes recorded during the survey periods. Where a site was surveyed both nights, results are combined.

Table 1
Bat Species Recorded and Relative Abundance

Species	Sampling Location				
	Barnes-Noble Pit	Horseshoe Pit	Muleshoe Pit	Settling Ponds	Treatment Pond
Little brown myotis	X	X	X	X	
Long-legged myotis		X		X	
Western long-eared myotis	?		X		X
Western small-footed myotis			X	X	X
Big brown/silver-haired bat		X		X	
Silver-haired bat	X			X	X
Relative abundance	LOW	LOW	HIGH	MODERATE	MODERATE

(¹ Some calls of Silver-haired bats and Big Browns were not possible to differentiate, therefore they are recorded as Big brown bat/Silver-haired bat. Other calls can be positively identified as Silver-haired bats.)

The weather on the evening of July 9 at 9:00 PM was mostly clear, with a west breeze of about 5 mph or less, and a temperature of 75°F. Clouds began to build and by about 11:30 PM there was a lot of thunder and lightning in the area. Rain began off and on about midnight. Mist nets were taken down about 11:45, and bat detectors were left out all night.

On July 10 cloud cover was overcast at 9:00 PM, winds were calm, and the temperature was 70°F. Between 9:00 PM and midnight there were a few periods of gusty winds, lasting perhaps 5 minutes, but for the most part it was calm during this period. Again, by about 11:30 PM there was a lot of thunder and lightning in the area. Rain began off and on about midnight. Mist nets were taken down about 11:45, and bat detectors were left out all night.

Bats were observed flying over the settling ponds and foraging at about 9:50 PM both nights. Most bat activity occurred between 9:50 PM and 10:20 PM. After 10:30 there were only a few bat passes every 15 minutes. No bats were captured in mist nets. Bat activity at the Barnes-King Pit was low. Two species were positively identified, and another was possibly identified during two nights of surveys. Bat activity at the Horseshoe Pit was also low, with three species identified (**Table 1**). Bats were most active at the Muleshoe Pit, where there were four species identified (**Table 1**). More than 60 bat passes were recorded during one night of surveys. Bat activity at the pond to the north of the settling ponds was moderate. Three species were recorded (**Table 1**). Most of these were Silver-haired bats. Fifteen bat passes were recorded during one night of surveys. Activity at the settling ponds was moderate during both nights, with the majority of activity occurring between 9:50 and 10:20 PM. Four or possibly five species were identified (**Table 1**). Silver-haired bats were the most commonly recorded

species. Land application of water at the Muleshoe Pit may have contributed to higher densities of insects at the Muleshoe Pit, which could have attracted bats.

Based on distribution maps in Foresman (2001) and on the Montana Natural Heritage Program (MTNHP 2010) website (www.mtnhp.org), eleven of Montana's fifteen bat species could potentially be found in Fergus County (**Table 2**). Of these, based on bat habitat on the study site, seven species probably occur on-site, another two are possible, and two are unlikely (**Table 2**). None of the probable species are listed by the MTNHP as Species of Concern. Both possible species and both unlikely species are listed as Species of Concern (**Table 2**).

Table 2.
Montana Bat Species and Probability of Occurrence

Common name	Scientific name	Federal or State Species of Concern?	Probability on proposed project area	Documented in this study
Little brown myotis	<i>Myotis lucifugus</i>	No	yes	Yes
Long-legged myotis	<i>Myotis volans</i>	No	yes	Yes
Western long-eared myotis	<i>Myotis evotis</i>	No	yes	Yes
Fringed myotis	<i>Myotis thysanodes</i>	Yes	possible	No
Western small-footed myotis	<i>Myotis ciliolabrum</i>	No	yes	Yes
Big brown bat	<i>Eptesicus fuscus</i>	No	yes	yes?
Hoary bat	<i>Lasiurus cinereus</i>	No	yes	No
Silver-haired bat	<i>Lasiorycteris noctivagans</i>	No	yes	Yes
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	Yes	possible	No
Pallid bat	<i>Antrozous pallidus</i>	Yes	unlikely	No
Spotted bat	<i>Euderma maculatum</i>	Yes	unlikely	No

Of the seven bat species that could be found on-site, six were recorded during this study. Hoary bats were not recorded, though they are probably on-site, at least as seasonal migrants. The fringed myotis is a MTNHP Species of Concern.

None were recorded during this study. Montana is on the extreme northeastern edge of its range (Foresman 2001). There are a few records from eastern Montana. Its habitat is usually in relatively dry ponderosa pine and Douglas-fir forests (Foresman 2001, MTNHP 2010).

Townsend's big-eared bats are a MTNHP Species of Concern. None were recorded. They usually roost in caves or abandoned mines (Adams 2003, Foresman 2001), and could possibly be found in the vicinity of the mine site. They have been recorded in the Bull Mountains north of Billings and in the Little Rocky Mountains in similar habitat (Butts 1993; Hendricks and Genter 1997, Hendricks 1998, Hendricks et al. 2004).

Spotted bats and pallid bats are relatively rare species known primarily from semi-desert regions of the southwest. Both have been documented in the Pryor Mountains and the Bull mountains in south-central Montana (Foresman 2001, Hendricks et al. 2004). Montana is on the extreme northeastern edge of their distribution. Both have been associated with drier ponderosa and Douglas-fir habitats, as well as open country (Adams 2003), and spotted bats roost in rock crevices on high cliffs. Both could be found on or near the mine site but is unlikely based on the known distribution and habitat preferences.

Wildlife Movement Corridors

Deer and elk were observed and their tracks indicate that there are two movement corridors through the mine site that provide movement between the adjacent higher and lower elevations (**Appendix C**). The movement corridor abutting the Muleshoe Pit on the south has tree cover extending downslope on the mine site and topography that provides secure movement. The movement corridor on the south side of the Horseshoe Pit includes the natural drainage that forms the headwaters of Little Dog Creek with a constructed channel across the mine site. The incised topography is continuous with the natural, incised drainage of upper Little Dog Creek and the area downslope from the mine site. The area downslope from the mine site is a stand of aspens, wetlands and springs that discharge to the perennial drainage of Little Dog Creek.

Reclamation

As previously discussed, most of the vegetation on the reclaimed sites is dominated by agronomic grasses, with few native species. The exception is the Horseshoe Dump, which has developed a vegetative cover composed mostly of native species. This site is unusual because little attempt was made to re-establish post-mining vegetation dominated by native species. Presumably, the native plant species colonized this site from adjacent native plant communities on land undisturbed by mining. The substrate of this site differs from most other reclamation sites because it is composed of a high content of rock and gravel. Vegetation on south aspects of this site has 20 to 30 percent canopy cover and

north-facing slopes have more than 60 percent canopy cover. Species recorded on this site and their origin (i.e., native or introduced) are listed in **Table 3**. Of the 46 species of plants recorded on this site, 74 percent are native species.

Table 3
Plant Species Recorded on the Horseshoe Dump

Scientific Name	Common Name	Origin
<i>Agropyron cristatum</i>	Crested wheatgrass	Introduced
<i>Agropyron smithii</i>	Western wheatgrass	Native
<i>Agropyron spicatum</i>	Blue-bunch wheatgrass	Native
<i>Amelanchier alnifolia</i>	Serviceberry	Native
<i>Anemone Canadensis</i>	Windflower	Native
<i>Antennaria parvifolia</i>	Pussy toes	Native
<i>Artemisia frigida</i>	Fringed sage	Native
<i>Bromus inermis</i>	Smooth brome	Introduced
<i>Bromus japonicum</i>	Japanese brome	Introduced
<i>Bromus tectorum</i>	Cheatgrass	Introduced
<i>Campanula rotundifolia</i>	Harebell	Native
<i>Carex praegracilis</i>	Clustered field sege	Native
<i>Cirsium avense</i>	Canada thistle	Introduced
<i>Cirsium undulatum</i>	Wavy-leaf thistle	Native
<i>Festuca idahoensis</i>	Idaho fescue	Native
<i>Festuca ovina</i>	Sheep fescue	Introduced
<i>Fragaria virginana</i>	Wild strawberry	Native
<i>Geranium viscosissimum</i>	Sticky geranium	Native
<i>Grindelia squarrosa</i>	Curly-cup gumweed	Native
<i>Juniperus communis</i>	Common juniper	Native
<i>Koeleria cristatum</i>	Junegrass	Native
<i>Lepidium densiflorum</i>	Pepper-grass	Introduced
<i>Linum perenne</i>	Blue flax	Native
<i>Lithospermum ruderale</i>	Paccoon	Native
<i>Medicago lupulina</i>	Black medic	Introduced
<i>Monarda fistulosa</i>	Bee balm	Native
<i>Penstemon attenuatus</i>	Taper-leaf penstemon	Native
<i>Petalostemon candidum</i>	White prairie clover	Native
<i>Petalostemon purpureum</i>	Prairie clover	Native
<i>Phacelia hastata</i>	Silky phacelia	Native
<i>Phleum pratense</i>	Timothy	Introduced
<i>Physocarpus malvaceus</i>	Ninebark	Native
<i>Pinus ponderosa</i>	Ponderosa pine	Native
<i>Poa pratensis</i>	Kentucky bluegrass	Introduced
<i>Potentilla fruticosa</i>	Shrubby cinquefoil	Native
<i>Potentilla pennsylvanica</i>	Prairie cinquefoil	Native
<i>Pseudotsuga menziesii</i>	Douglas-fir	Native
<i>Ribes cereum</i>	Wax currant	Native
<i>Rosa sp.</i>	Wild rose	Native
<i>Senecio canus</i>	Wooly groundsel	Native
<i>Solidago missouriensis</i>	Goldenrod	Native
<i>Stipa viridula</i>	Green needlegrass	Native
<i>Symphoricarpos occidentalis</i>	Snowberry	Native
<i>Taraxacum officinale</i>	Dandelion	Introduced
<i>Thermopsis rhombifolia</i>	Golden pea	Native
<i>Tragapogon dubius</i>	Salsify	Introduced
<i>Verbascum thapsis</i>	Common mullein	Native

RECOMMENDATIONS

Wildlife presence and utilization of habitat on and adjacent to the Kendall Mine site indicates that the initial stages of reclamation have been compatible with the

habitat needs of wildlife species typical of central Montana; however, future actions that will enhance the capacity of the mine site habitats to support a diversity of wildlife species include the following:

- Erect kestrel nest boxes and perches on and adjacent to reclaimed grasslands.
- Erect birdhouses for mountain blue birds (tree swallows will also use these).
- Construct additional rock piles and brush/wood piles in reclaimed grasslands to provide habitat for small mammals on which raptors and other predators feed.
- Continue to promote the establishment of trees and shrubs on reclamation.
- Record wildlife observations on the mine site. Provide an observation form so employees can record species of wildlife observed, locations, and dates.
- Do not clear trees in the wildlife movement corridors or erect fences or other structures that may inhibit wildlife movement.
- Conduct periodic monitoring of the mine site for a diversity of wildlife including acoustic recording for bats, spring surveys for breeding amphibians, examination of the pit highwalls for nesting birds, and trapping surveys for small mammals on reclamation.

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<http://www.mtnhp.org>.

APPENDIX A

WEBSITE DATA

MONTANA DEPARTMENT OF FISH, WILDLIFE & PARKS

The following datasets were reviewed for info on Deer and Elk Winter Range:

MTFWP. 2008. Elk distribution in Montana. August 12, 2008. Online at:
<http://fwp.mt.gov/gisData/shapefiles/distributionElk.zip>

MTFWP. 2008. Mule deer distribution in Montana. August 12, 2008. Online at:
<http://fwp.mt.gov/gisData/shapefiles/distributionMuleDeer.zip>

MTFWP. 2008. White-tailed deer distribution in Montana. August 12, 2008. Online at: <http://fwp.mt.gov/gisData/shapefiles/distributionWhiteTailedDeer.zip>

General and Winter distribution/use is classified by the source datasets in the following manner:

Definition of Attribute Value

General Distribution - Depicts areas predictably occupied by this species for part or all of its year-long range.

Winter Distribution - Depicts areas where populations of this species tend to concentrate during the winter season, commonly December through April. These areas are also considered part of the General Distribution. NOTE: Not all populations concentrate on specific ranges during the winter season. In areas where no winter distribution is delineated animals depend upon and occur across their General Distribution area during the winter season, or they may occur in localized concentrations that can not be depicted at the scale of these maps. Keep in mind that weather extremes can have a large influence on winter distribution in any given year.

Elk: The use of elk in the project area is shown on the accompanying map.

White-Tailed Deer: All of the Moccasin mountains and adjacent valley bottoms are identified as a general distribution area for white-tailed deer. The nearest white-tailed deer winter range is 12+ miles to the north and northeast of the project. Due to uniform coverage/use in the vicinity of the project, no figure was prepared.

Mule Deer: All of the Moccasin mountains and adjacent valley bottoms are identified as a winter distribution area. Due to uniform coverage/use in the vicinity of the project, no figure was prepared.

Information provided by MTFWP's Crucial Area Planning System was also reviewed online at the following links:

<http://fwp.mt.gov/wildthings/conservationInAction/crucialAreas.html>
<http://fwp.mt.gov/gis/maps/caps/>

The following descriptions present the most notable findings for each of the layers/datasets provided.

AQUATIC LAYERS

- **Aquatic Connectivity** – depicts stream corridors for fish species that require connected habitats to complete all or a portion of their life history. The nearest streams are Moccasin Creek beginning in T17N, R18E S16 to the south and Little Dog Creek beginning in T18N R18E, S 24 to the east. Both of these streams are rated class 3, the lowest class shown. More info at: <http://fwpiis.mt.gov/content/getitem.aspx?id=41523>
- **Fish Native Species Richness** – Depicts native biodiversity using counts of native fishes present in waterbodies and streams. The nearest tributaries of note are Hamilton Coulee headwaters (T18N R17E SW1/4 S23 and NW1/4 S26) and Plum Creek headwaters (T18N R17E S 19). Both are class 4, the lowest class shown. More info at: <http://fwpiis.mt.gov/content/getitem.aspx?id=42834>
- **Fish Species of Concern** – Highlights areas with rare, declining or Federally Listed T&E fish species present as recognized by the joint MTFWP, MTNHP Species of Concern Report. Species were ranked by their ESA status or SOC status. This layer only includes fish species, not aquatic invertebrates or plants. The nearest channel noted is the main channel of Moccasin Creek to the south of the project. The creek is identified as Class 3, the lowest class shown. More info at: <http://fwpiis.mt.gov/content/getitem.aspx?id=41486>
- **Game Fish Quality** – Depicts the relative quality of cold and warm water game fish populations available to anglers in Montana. The nearest stream shown is Moccasin Creek to the south of the project. The creek is identified as a Class 2 water body; four classes are identified. More info at: <http://fwpiis.mt.gov/content/getitem.aspx?id=41529>
- **Game Fish Life History** – Depicts habitats that support at least one of the 43 recognized game fish species during life history states. The nearest water

body noted is the Judith River to the west, which is identified as Class 2, the lowest class listed. More info at:

<http://fwpiis.mt.gov/content/getitem.aspx?id=41530>

TERRESTRIAL LAYERS

- **Terrestrial Conservation Species** – Depicts the cumulative expected occurrence of 85 of Montana’s vertebrate species. The majority of sections within 5 miles of the project are Class 3 (of 4), but several sections including T18N, R18E Sections 18 and 29; T17N, R18E, Sec 7; and T17N, R17E, Section 12 are Class 2. More info at:
<http://fwpiis.mt.gov/content/getitem.aspx?id=41536>
- **Terrestrial Species Richness** – Depicts all native land-based species in Montana, including amphibians, reptiles, birds, and mammals. Species included are found year round or breed in the state. Sections in the immediate vicinity of the project range from Class 1 to 3 (of 4). Many of the sections immediately outside of the active mining area are Class 1, while the active mining area is primarily Classes 2 and 3. The mountainous terrain has a much higher species richness (primarily classes 1 and 2) compared to the valleys (Primarily classes 3 and 4). More info at:
<http://fwpiis.mt.gov/content/getitem.aspx?id=41535>
- **Terrestrial Game Quality** – Depicts areas considered valuable to 12 native game species and their specific habitat requirements. The North Moccasin range, including the mine area, is identified as Class 2 (of 4), with valley bottoms being Class 3. More info at:
<http://fwpiis.mt.gov/content/getitem.aspx?id=41531>
Contributing factors to big game quality
 - Big Game Winter Range Habitat – Mountains have Score 2 (high) big game winter range habitat vs Score 2 in the valley bottoms. (see: <http://fwpiis.mt.gov/content/getitem.aspx?id=42870>).
 - Prairie Grouse Habitat – Areas outside of the mountains (valleys) are identified as Score 1 (lowest) habitat for sage grouse and sharp-tailed grouse. (see: <http://fwpiis.mt.gov/content/getitem.aspx?id=42868>).

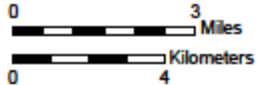
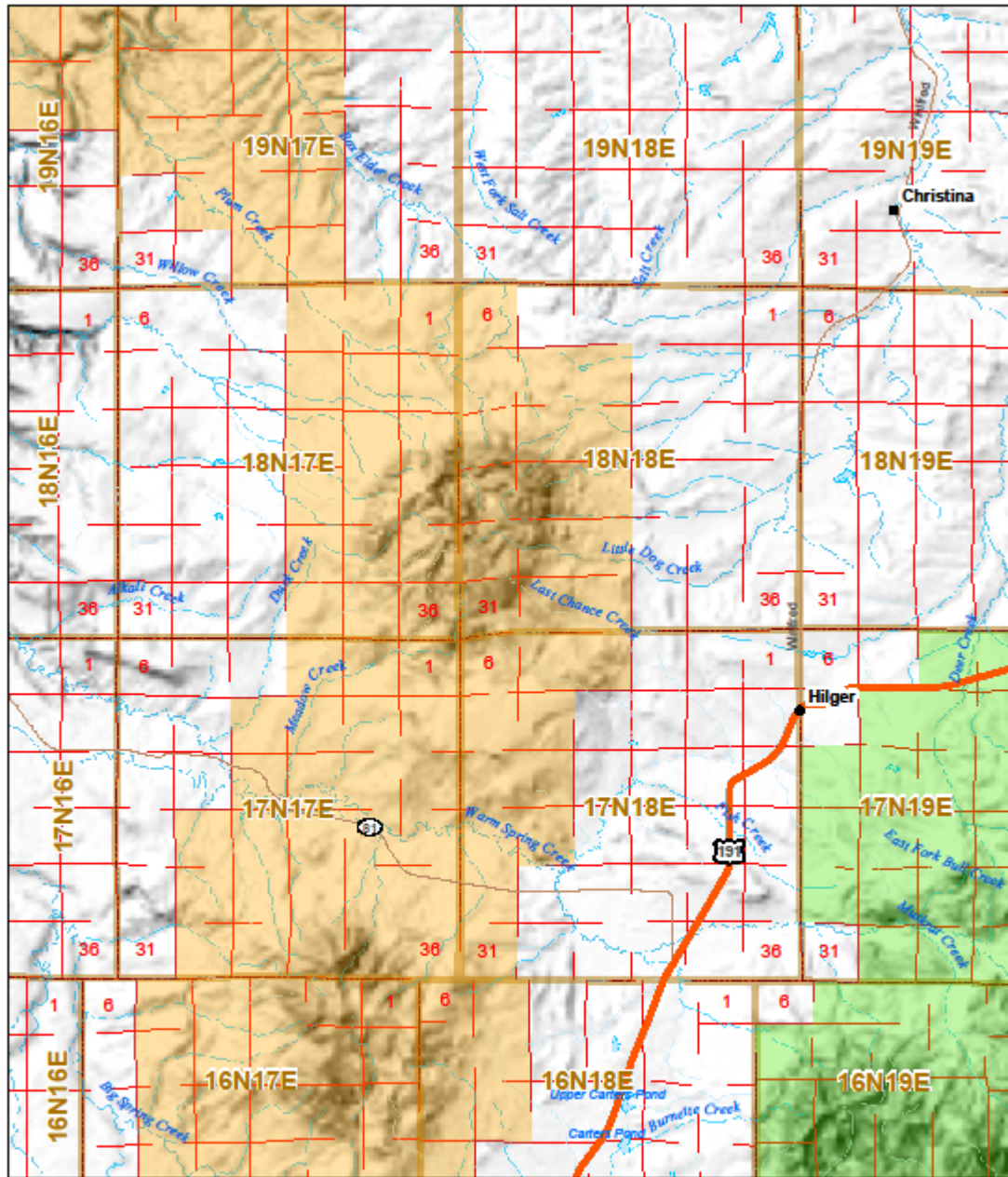
HABITAT LAYERS

- **Riparian Areas** – Depicts the total riparian area by square mile section. Areas within the mountains are not classified, presumably due to low quantity of riparian areas. The nearest classified areas are along Iron Gulch (beginning in T17N, R17E, Sec 2 & 3), Along Duck Creek (beginning in T18N, R17E, Sections 27, 33, and 34), and along Moccasin Creek (T17N, R18E, Sections 9, 10, 16, 21, etc). As expected, the class increases as the elevation decreases, resulting in larger valley bottoms and associated riparian areas.

The Sections closes to the project are Class 3 and 4 (of 4), with the main branch of Moccasin Creek being Class 1. More info at:
<http://fwpiis.mt.gov/content/getitem.aspx?id=41541>

- **Watershed Integrity** – Depicts a summation of human caused influences that contribute to the relative intactness of watersheds in Montana. The Kendall mine is located on the watershed boundary created by the Moccasin Range. The northern watersheds from Hamilton Coulee (west) to Little Dog Creek (east) are Class 2 watersheds. Watersheds to the south, from Duck Creek (west) to Moccasin Creek (east) are Class 3 watersheds. More info at:
<http://fwpiis.mt.gov/content/getitem.aspx?id=41484>
- **Wetland Areas** – Depicts the total wetland area by square mile section. The sections within and immediately adjacent to the Moccasin range are not classified (too few wetlands). The nearest sections of Class 4 (lowest class) are T18N, R17E, S33; T18N R18E, S 11 & 12; and T17N, R18E, Section 1. More info at: <http://fwpiis.mt.gov/content/getitem.aspx?id=41532>

National Wetlands Inventory – Delineates the areas extent of wetlands and surface waters as defined by Cowardin et al., (1979). This data set indicates that few sizable wetlands are found within the Moccasin Mountains. Most mapped wetlands and water bodies occur along channels or in upland swales and depressions well outside of the mountains. More info at:
http://nris.mt.gov/nsdi/nris/nwi_poly.html



- General Distribution (Year-round)
 - Winter Distribution (December through April)
- Source: MTFWP 2008

**Elk Distribution & Seasonal Use
Vicinity of Kendall Mine**

APPENDIX B

PHOTOGRAPHS OF STUDY AREA



Barnes-King Pit



Highwall of Muleshoe Pit



Horseshoe Pit – Partial eagle nest in tree in “vee” at pit margin



Rockpile on reclamation for wildlife habitat (May 2010 photograph)



Native vegetation on south slope of Horseshoe Dump



Native vegetation on north slope of Horseshoe Dump



View of mine site from above Horseshoe Pit looking south-east



Wetlands at experimental water treatment ponds (abandoned)



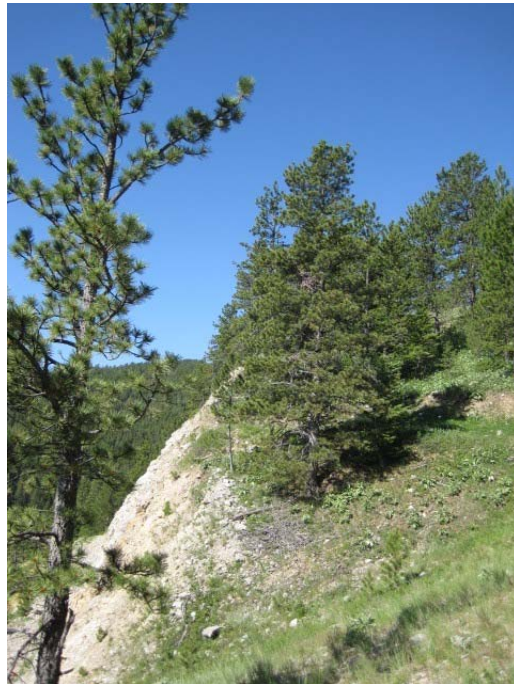
Erecting mist nets at water treatment ponds



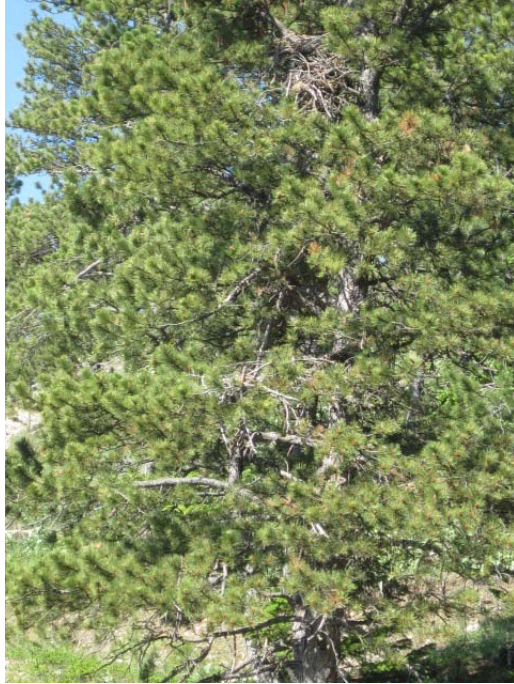
Beaver pond in headwaters of Little Dog Creek drainage



Structurally diverse aspen stand below pump-back well



Partial golden eagle nest at edge of Horseshoe Pit



Partial golden eagle nest at edge of Horseshoe Pit

APPENDIX C
WILDLIFE MOVEMENT CORRIDORS

