



VALLES CALDERA NATIONAL PRESERVE

Wildlife

Existing Condition Report

VALLES CALDERA TRUST

State of New Mexico

Sandoval and Rio Arriba Counties

P.O. Box 359

Jemez Springs, NM 87025

(505) 661-3333

comments@vallescaldera.gov

Valles Caldera National Preserve

Existing Condition - Wildlife

Introduction

This section addresses existing condition to proposed, threatened, endangered or sensitive (TES) fauna (USDA-Forest Service, 2007) that have been documented or have suspected occurrences on the Valles Caldera National Preserve (VCNP). The existing condition is described for each species, group of species, or habitat.

Species presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, and non-Forest Service databases. Effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. This strategy is based upon science that demonstrates connections between species populations and viability and the quantity and condition of habitat at appropriate scales of analysis (Baydack, Campa III, & Hauffer, 1999).

Effects on species will be determined by assessing how alternatives affect the structure and function of vegetation relative to current and historical distributions. Some wildlife habitats require a detailed analysis and discussion to determine potential effects on a particular species. Other habitats may either not be impacted or are impacted at a level which does not influence the species or their occurrence. The level of analysis depends on the existing habitat conditions, the magnitude and intensity of the proposed actions, and the risk to the resources.

The analysis focuses on Threatened, Endangered and Sensitive Species (TES), landbirds including neotropical migratory birds (NTMB), and species of interest. A threatened species is an animal or plant species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. An endangered species is an animal or plant species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range. A sensitive species is an animal or plant species identified by the Forest Service Regional Forester for which species viability is a concern either a) because of significant current or predicted downward trend in population numbers or density, or b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Threatened, endangered, and sensitive species effects are summarized by TES status and species. The assessment includes species that are being considered for listing as either endangered or threatened (*proposed*) as well as those listed.

NTMB are discussed because many species are experiencing downward population trends. NTMB were analyzed based on review from wildlife databases for the Preserve and local scientific knowledge.

Species of interest are not listed or sensitive and, in fact may be quite common. However they are either important to the management of the preserve (elk) , are indicators of ecological health (Abert's squirrel, or may be important regionally (predators such as coyotes, mountain lions and bobcat). Species of interest were analyzed based on review from wildlife databases for the Preserve and local scientific knowledge.

Table 1 summarizes species status currently listed as TES (including proposed) and Species of Interest that are deemed to have suitable habitat identified, and have either documented or suspected occurrence within the project area.

Table 1– Threatened, Endangered and Sensitive species and species of interest considered in the analysis

Species		Status
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Threatened
Bald eagle	<i>Haliaeetus leucocephalus</i>	Sensitive
New Mexico meadow jumping mouse	<i>Zapus hudsonius luteus</i>	Sensitive
Northern goshawk	<i>Accipiter gentiles</i>	Sensitive
Peregrine falcon	<i>Falco peregrinus anatum</i>	Sensitive
Boreal owl	<i>Aegolius funereus</i>	Sensitive
Jemez Mountain salamander	<i>Plethodon neomexicanus</i>	Sensitive
Northern leopard frog	<i>Rana pipiens</i>	Sensitive
Dwarf shrew	<i>Sorex nanus</i>	Sensitive
Water shrew	<i>Sorex palustris navigator</i>	Sensitive
Pika	<i>Ochotona princeps</i>	Sensitive
Goat Peak Pika	<i>Ochotona princeps nigrescens</i>	Sensitive
Gunnison's prairie dog	<i>Cynomys gunnisoni</i>	Sensitive
Southern red-backed vole	<i>Clethrionomys gapperi</i>	Sensitive
Long-tailed vole	<i>Microtus longicaudus</i>	Sensitive
American marten	<i>Martes americana origenes</i>	Sensitive
Ermine	<i>Mustela erminea muricus</i>	Sensitive
Spotted bat	<i>Euderma maculatum</i>	Sensitive
Pale Townsend big-eared bat	<i>Corynorhinus townsendii</i>	Sensitive
Elk	<i>Cervis elaphus nelsoni</i>	Species of Interest
Mule deer	<i>Odocoileus hemionus</i>	Species of Interest
Black bear	<i>Ursus americanus</i>	Species of Interest
Merriam's turkey	<i>Meleagris gallopavo merriami</i>	Species of Interest
Mountain lion	<i>Puma concolor</i>	Species of Interest
Coyote	<i>Canis latrans</i>	Species of Interest
Bobcat	<i>Lynx rufus</i>	Species of Interest
Gray fox	<i>Urocyon cinereoargenteus</i>	Species of Interest
Abert's squirrel	<i>Sciurus aberti</i>	Species of Interest
Blue grouse	<i>Dendragapus obscurus</i>	Species of Interest

Threatened or Endangered Species Considered but Eliminated from Analysis

Species were eliminated from evaluation and/or consideration based upon: lack of potential habitat; area not included in historic or current range of the species; or extirpation of the species without current feasibility for reintroduction. There will be no further discussion of the following species in this environmental analysis.

Black-footed ferret – (Mustela nigripes) – Endangered

The FWS had determined that if prairie dog towns are less than 200 acres in size there is no need to survey for black-footed ferrets. No prairie dog towns greater than 200 acres are located on the VCNP, therefore the black-footed ferret will not be addressed further in this document.

Southwestern willow flycatcher – (Empidonax traillii extimus) – Endangered

Southwestern willow flycatcher require extensive riparian habitat. Southwest willow flycatcher requires dense patches of trees or shrubs with slow to still water available at or near nesting habitat (USDI-National Park Service, 1997). Currently there is no habitat within the preserve. Due to the absence of suitable habitat for this species, the Southwestern willow flycatcher will not be addressed further in this document.

There are no Critical Habitat Units for the southwestern willow flycatcher located within the preserve.

Least tern (Interior population) – (Sterna antillarum athalassos) - Endangered

Habitat for Least tern does not exist within the preserve. Due to the absence of suitable habitat for this species, the Least tern will not be addressed further in this document.

Federally Listed Threatened and Endangered Species

Proposed, threatened and endangered (T&E) species are managed under the authority of the Federal Endangered Species Act (ESA), (Pub. L 93-205, as amended in 1973) and the National Forest Management Act (Pub. L 94-588). The ESA requires federal agencies to ensure that all actions, which they “authorize, fund, or carry out”, are not likely to jeopardize the continued existence of any T&E species.

The only Federally threatened species where suitable habitat exists on the preserve is the Mexican spotted owl (*Strix occidentalis lucida*) (USDI-Fish and Wildlife Service, 2008).

Mexican spotted owl (Strix occidentalis lucida)



The Mexican spotted owl (MSO) can be found in the forested mountains and canyons of central Colorado and southern Utah south through Arizona and New Mexico into Central Mexico. The owl's distribution in this range is not contiguous, but occurs in patches of suitable habitat. Mexican spotted owls commonly use mixed-conifer forests throughout most of their range (USDA-Forest Service, 1995). Mixed conifer forests are generally dominated by Douglas-fir and/ or white fir, with codominant species including southwestern white pine, limber pine, and ponderosa pine. The understory often consists of the species above as well as broadleaved species such as Gambel oak, maples, boxelder, and New Mexico locust. Habitat-use patterns vary throughout the range and with respect to owl activity. Much of this variation in habitat could be contributed to differences in regional patterns of habitat and prey availability (USDA-Forest Service, 1995). In the Jemez Mountains, most nests are on cliff ledges or cavities in narrow steep-walled canyons (Wargo, 2006).

Forests used for nesting and roosting usually contain mature or old-growth stands with complex structure. In addition, the stands are typically uneven-aged, multistoried, and have high canopy closure (USDI-Fish and Wildlife Service, 1995). Nest trees are typically large in size. Douglas-fir is the most common species of nest tree; however, tree species used for nesting vary somewhat among areas and habitat types. Douglas-fir is also the most commonly used species for roosting.

Mexican spotted owls are nocturnal and hunt primarily at night. Their diet consists of a variety of prey, but they most commonly eat small-and medium sized rodents such as woodrats, *peromyscid* mice, and *microtine* voles (USDI-Fish and Wildlife Service, 1995). They may also consume bats, birds, reptiles, and arthropods.

Ward and Block (1995) indicate that under heavy livestock grazing in meadows, populations of voles would be expected to decrease and this would improve conditions for deer mice. Deer mice are associated with areas of little herbaceous cover and extensive exposed soil. Long-tailed and Mexican voles use sites with less exposed ground and greater herbaceous cover. Increases in deer mouse abundance in meadows would not offset decreases in vole numbers because voles provide greater biomass per individual and per unit area (Ward & Block, 1995). Such decreases could negatively influence owls where voles are common prey or used as alternative food sources when other prey species are diminished (Ward & Block, 1995).

The recovery plan for the Mexican spotted owl determined that grazing affects the spotted owl in the following ways: 1) altered owl availability; 2) altered susceptibility to fire by limiting the ability of ground fires to occur; and 3) degeneration of riparian plant communities; and 4) impaired ability of plant communities to develop into spotted owl habitat (USDA-Forest Service, 1995).

To accommodate the needs of the owl and its prey species, “key grazing areas” are to be maintained in good to excellent range conditions (USDA-Forest Service, 1996). Key grazing areas will normally be ¼ to 1 mile from water, located on productive soils on level to intermediate slopes, and be readily accessible for grazing. Size of key forage monitoring areas could be 20 to 500 acres. In some situations such as high mountain meadows with perennial streams, key areas may be closer than ¼ mile from water and less than 20 acres. There are approximately 54,078 acres (60%) of “key grazing areas” within the Preserve.

The trust uses a 40% utilization threshold as a firm guide to signal when grazing may become detrimental to grassland health. Drops in livestock numbers and recent good moisture years have led to a drop in utilization below 20 percent for years 2005 through 2007 (TEAMS Enterprise Unit, 2007).

There are approximately 36,560 acres of mixed conifer habitat within the preserve that could provide nesting/roosting/foraging habitat for MSO (see Figure 1). Formal surveys following Regional protocol methodologies for the presence of this species have been conducted in 2005, 2006, and 2009 (survey reports are located at the VCT office). No Mexican spotted owls (MSO) have been documented on the preserve. This could be due to elevation which is at the upper limits of the MSO’s range, lack of suitable cliffs, or the lack of specific habitat characteristics (large, old trees, large snags and downed logs) with the mixed conifer forests. Even though surveys have been conducted and yielded negative results, for this analysis the assumption is made that Mexican spotted owls could occupy the preserve based on presence of suitable habitat. No Protected Activity Centers (PACs) or Critical Habitat Units (CHUs) for Mexican spotted owl are located within the preserve.

Sensitive Species

There are 31 terrestrial species on the Regional Forester's Sensitive Species list (USDA-Forest Service, 2007) that potentially occur on the preserve. The following is a list of those species. The likelihood of occurrence for sensitive species or their potential habitat within the preserve or in an adjacent area in this analysis area is noted below. Those species excluded in the table below will not be addressed further in this document.

Bald Eagle (Haliaeetus leucocephalus)



Wintering bald eagles begin to arrive on the preserve in October and leave by May, with peak numbers only during the coldest period of January (Johnson, 2003). The location and abundance of wintering eagles is dependent on food and availability of appropriate roosting and foraging habitat and can change year to year. Concentrations occur around reservoirs and along rivers, with a scattering of birds in terrestrial habitat (Johnson, 2003).

Nest trees are usually larger than those trees in the surrounding stands (USFS 1990), primarily conifer (Anthony and Isaacs 1989), and have thick, stout limbs. Bald eagles often construct alternate nests within a territory and vary use between them from year to year (USDI 1986).

There are no large water bodies to provide breeding/foraging habitat within or near the preserve. The Jemez Mountains do not contain known breeding habitat. The main areas in which bald eagles are found are along the San Antonio creek, although individuals can be observed during the day at numerous locations throughout the preserve. Most individuals seen away from water are feeding on elk carcasses as a result of hunting activities on the Preserve. Eagles typically use the trees near the creek as overnight roosts (Parmenter, 2003).

Dr. Robert Parmenter, the trust's chief scientist and biologist, noted that hikers and vehicle traffic from two roads near the roost sites along San Antonio creek were the main causes of disturbance for bald eagles in that area.

New Mexico meadow jumping mouse (Zapus hudsonius luteus)



This species is considered to be an extreme habitat specialist that relies on riparian areas that have tall, dense herbaceous vegetation, especially sedges, on perennially moist soil (Frey J. , 2006). Frey (2006) only found the New Mexico meadow jumping mouse in areas with 2 to 3 feet of vertical cover types. No formal surveys have been completed within the Preserve although wildlife data received from the adjoining Santa Fe

National Forest show two locations of this species along the San Antonio Creek within the Preserve.

Montane populations use both persistent emergent herbaceous wetland (i.e. beaked

sedge and reed canary grass) and scrub-shrub wetland (i.e. willow and alder) riparian communities, specific capture sites in scrub-shrub wetlands were nearly always restricted to small patches and narrow strips of herbaceous, usually sedge-dominated, microhabitats found between the water's edge and the shrubs. Tall dense sedge on moist soil appears to be the key microhabitat utilized by New Mexico meadow jumping mouse, regardless of the community type. Preferred habitat in the Jemez Mountains contains permanent streams, moderate to high soil moisture, and dense, diverse streamside vegetation of grasses, sedges, and forbs (Morrison, 1985).

Zwank (Zwank, Najera, & Cardenas, 1997) found that the breeding period for this mouse is June through August, nesting on the surface or beneath brush, logs or stumps. The meadow jumping mouse may produce two litters per year in lower elevations but only one in montane populations, given that mouse hibernates up to nine months a year in montane populations. It has a home range of .5 to 2 acres. It feeds on seeds, insects, and fruits and when seeds are unavailable or limited, insects may compose of up to half of its diet.

The New Mexico meadow jumping mouse is not dependent on the beaver for suitable habitat but Frey (Frey J. , 2006) has found that the loss of beaver and beaver dams in areas could have a negative impact on the mouse habitat in two ways. The dams create the moist soils need for the microhabitat and can provide barriers to people and livestock in using the habitats favored by the New Mexico meadow jumping mouse. The preserve has historically had beavers in Sulfur and Indios Creek and personnel have recently observed an individual moving through the area but currently there are no beaver populations located on the preserve. A beaver restoration project in Indios Creek is ongoing to restore beaver to the area within the next 3 to 4 years (Parmenter, 2009).

The meadow jumping mouse apparently requires dense vegetation for population persistence, and its scarcity may be related to livestock overgrazing in streamside habitats (BISON-M). Periodic severe flooding may also contribute to its rarity. In more mesic areas the subspecies may be favored by the opening up of forests and similar ecological changes (BISON-M). Habitat alteration, such as removal of vegetation from ungulate grazing, loss of beaver, water diversion leading to drying out of habitat, and various recreational activities within the habitat are the chief threats to the species. The meadow jumping mouse has shown a sharp decline in recent years, up to 91 % in the Sacramento Mountain populations, and 67% in the Jemez Mountains (Conservation Services Division, NMDGF, 2008). The continued proper herding of livestock and reducing cattle use of streamside habitat for extended periods could increase the quality of riparian zones by increasing the woody vegetation and thus ensuring good stream bank stability.

Northern goshawk (Accipiter gentiles)

The northern goshawk is a forest generalist that uses a variety of forest types, forest ages, structural conditions, and successional stages (Reynolds, et al., 1992). The principal forest types occupied by goshawks in the southwest are ponderosa pine, mixed conifer, and spruce-fir. Goshawks seem to prefer mature forests with large trees on moderate



slopes with open understories (Squires & Reynolds, 1997). The northern goshawk reaches the southern limits of its breeding range in the highlands of Arizona, New Mexico and possibly western Texas southward to at least Jalisco, Mexico. The small New Mexico population occurs locally in mature coniferous forests of mountains and high mesas. The goshawk is a predator of small birds and mammals. Snags, downed logs, woody debris, openings, large trees, herbaceous and shrubby understories and interspersed vegetation structure are important features contributing to the presence of prey populations (BISON-M).

Northern goshawks nest in coniferous, deciduous, or mixed-pine forests, depending on availability. A nest area is composed of the nest tree and stand(s) surrounding the nest that contain prey handling areas, perches, and roosts. Reynolds *et al.* (1992) stated that nest areas are often on mesic sites (northerly facing slopes, along streams). However, La Sorte *et al.* (2004) found that aspect was not a factor in nest location; rather the average nest site was centered in a forested area with small non-forested areas dispersed around the perimeter of the territory (La Sorte, Mannan, William, Reynolds, & Grubb, 2004). The forested area around the nest site corresponded well with the size of a post-fledgling family area (Reynolds, et al., 1992). Numerous studies have documented that goshawk nest sites are associated with characteristics of mature forest structure such as high canopy closure, mature trees, and open understories (Reynolds, et al., 1992), (La Sorte, Mannan, William, Reynolds, & Grubb, 2004).

A goshawk's nesting home range is about 6,000 acres (Reynolds, et al., 1992). A breeding pair usually occupies its nest area from early March until late September. The nest area is the center for all activity associated with breeding from courtship through fledging of young (Reynolds, et al., 1992). Nest trees are usually one of the largest trees in the nest area. Most territories contain several alternative nest trees. Most goshawks have two to four alternate nest areas within their home range. Alternate nest areas may be used in different years, and some may be used for decades.

No formal surveys have been conducted and no known nests occur on the Preserve but several designated foraging areas overlap onto the Preserve from the Santa Fe National Forest. These areas are located on the east, west and northwest edges of the Preserve. Goshawks have been observed foraging on the Preserve. Breeding, roosting and foraging habitat is available on the Preserve within the mixed conifer and Ponderosa pine forests.

American Peregrine falcon (Falco peregrinus anatum)

Peregrine falcon usually inhabit open country, preferably where there are rocky cliffs with ledges overlooking rivers, lakes or other open water and an abundance of birds. Nesting habitat includes cliffs or platforms near water and an abundance of prey. Peregrines are primarily aerial hunters; small to medium sized birds are usually captured in flight; birds too large to be carried are knocked to the ground. Peregrines feed on a wide variety of birds but they occasionally also take mammals, insects and fish.



In NM, breeding habitat is provided locally by cliffs in forested habitats in mountain and river canyons statewide. They prefer elevations from 6,500-8,600' but may be found from 3,500-9,000'. Data from NMDGF show that although productivity in the state had recovered from historic lows by the 1980s, it began trending lower after 1984. The goal for recovery is sustained occupancy of 85% of known territories. In NM, pairs occupied 81% of known falcon territories in 2004. Occupancy increased however, productivity was slightly below recent averages and below historic levels (Terrell & Williams III, 2004). There is no suitable peregrine nesting habitat within the Preserve. Peregrines do nest on the cliffs just to the west and use areas within the Preserve as foraging habitat (Parmenter, Valles Caldera Trust, Chief of Science and Education, 2009).

Boreal Owl (Aegolius funereus)



Boreal owls are primarily found in mature, multilayered spruce-fir forest. In 1996, NMDGF surveys found this species to be resident in very small numbers in spruce-fir and similar habitats in the San Juan, Sangre de Cristo, and Jemez mountains (BISON-M). Tends to occur at higher elevations in summer, may move to lower elevation for winter. This owl roosts in dense cover by day, in cool microsites in summer, and frequently changes roost site (NatureServe, 2009).

The Boreal owl may forage day or night, although most hunting occurs at night. It eats mainly small mammals (often *Microtus* and *Clethrionomys*, also *Sorex* and *Peromyscus*), also sometimes birds and insects (NatureServe, 2009).

This owl nests in tree holes, natural cavities or old woodpecker holes; sometimes in artificial nest boxes. Nest site may be used in consecutive years. Nests are initiated from mid-April to late May or early June. Clutch size is usually 4-6, young fledge at 4-5 weeks. Home range size is larger in the winter than summer and averages 3,775 ac (NatureServe, 2009).

Although no formal surveys have been conducted specifically for Boreal owl raptor surveys conducted in 2009 did not find any Boreal owl. The preserve does contain, suitable habitat (elevation, vegetation type) however key habitat characteristics such as large snags are lacking. (Parmenter, Valles Caldera Trust, Chief of Science and Education, 2009).

Jemez Mountains salamander (Plethodon neomexicanus)



Jemez Mountain salamanders are primarily found in habitats between 7,200-9,600 feet in specific microhabitat conditions within the Jemez Mountains. Preferred microhabitat is characterized by relatively high humidity and soils that contain deep, igneous, subsurface rock that is fractured vertically and horizontally to allow the species to retreat underground to below

the frost line. Habitats where pumice is the dominant subsurface structure are generally not occupied. Jemez Mountains salamanders are rarely encountered on the surface or under bark, litter, or in aspen logs. Much of the life cycle occurs underground, with surface activity occurring inside rotted coniferous logs or under rocks during a brief period of the summer (typically June through August) when conditions are warm and wet. Individuals are rarely found exposed on the surface. The microhabitat is coniferous forest dominated by Douglas fir, blue spruce, Engelmann spruce, ponderosa pine, or white fir. Other trees in the area may include aspen, Rocky Mountain maple, New Mexico locust, oceanspray, and various shrubby oaks.

Breeding likely occurs in the spring, with eggs laid beneath the soil surface in interstitial spaces between fractured rocks, in rotted root channels, or in the burrows of rodents or large invertebrates. Ants of at least 3 species make up approximately 74 percent of the diet. Other important prey items for the Jemez Mountains Salamander include beetles, mites, spiders, earthworms, and other small invertebrates found in rotting logs and under rocks.

Forest management practices that lead to drier habitat conditions are thought to negatively affect JMS abundance and detectability. These woodland salamanders lack lungs and gills, and exchange gases almost entirely through cutaneous respiration. Thus, Jemez Mountain salamanders, as well as other plethodontids, seek moist micro-environments and are sensitive to silvicultural treatments that modify the prevailing temperature, humidity, soil moisture, soil surface cover, and soil porosity.

Threats to the species include activities that may impact individuals or populations and or alter habitat conditions in the following manner: 1) ground disturbance such as excavation, churning, compaction, or any activity that reduces interspaces and subsurface channels; 2) vegetation modification to the extent that ground surface microclimate is made drier or otherwise altered through increased exposure to sun and wind; and 3) suppression of populations of ants and other surface-dwelling invertebrates, which are the primary prey of the Jemez Mountain salamander.

Individual Jemez Mountains salamanders are very difficult to detect at a site because of their fossorial habits and intimate dependency upon exacting moisture conditions. Even when environmental conditions are ideal for surface activity, it is believed that only a small percentage of the individuals that occur at a site are surface active and therefore detectable using high-grade survey protocol. Therefore, data collected during high-grade surveys are believed to significantly underestimate the actual numbers of Jemez Mountains salamanders present at a site.

Surveys were conducted on the Preserve from July to September of 2002. Three out of ten locations revealed positive results (see Figure 3.44). Most of the forested areas (47 percent totally approximately 41,500 ac) of the preserve have been identified as potential habitat (see Figure 2). The majority of the suitable habitat is in denser mixed conifer.

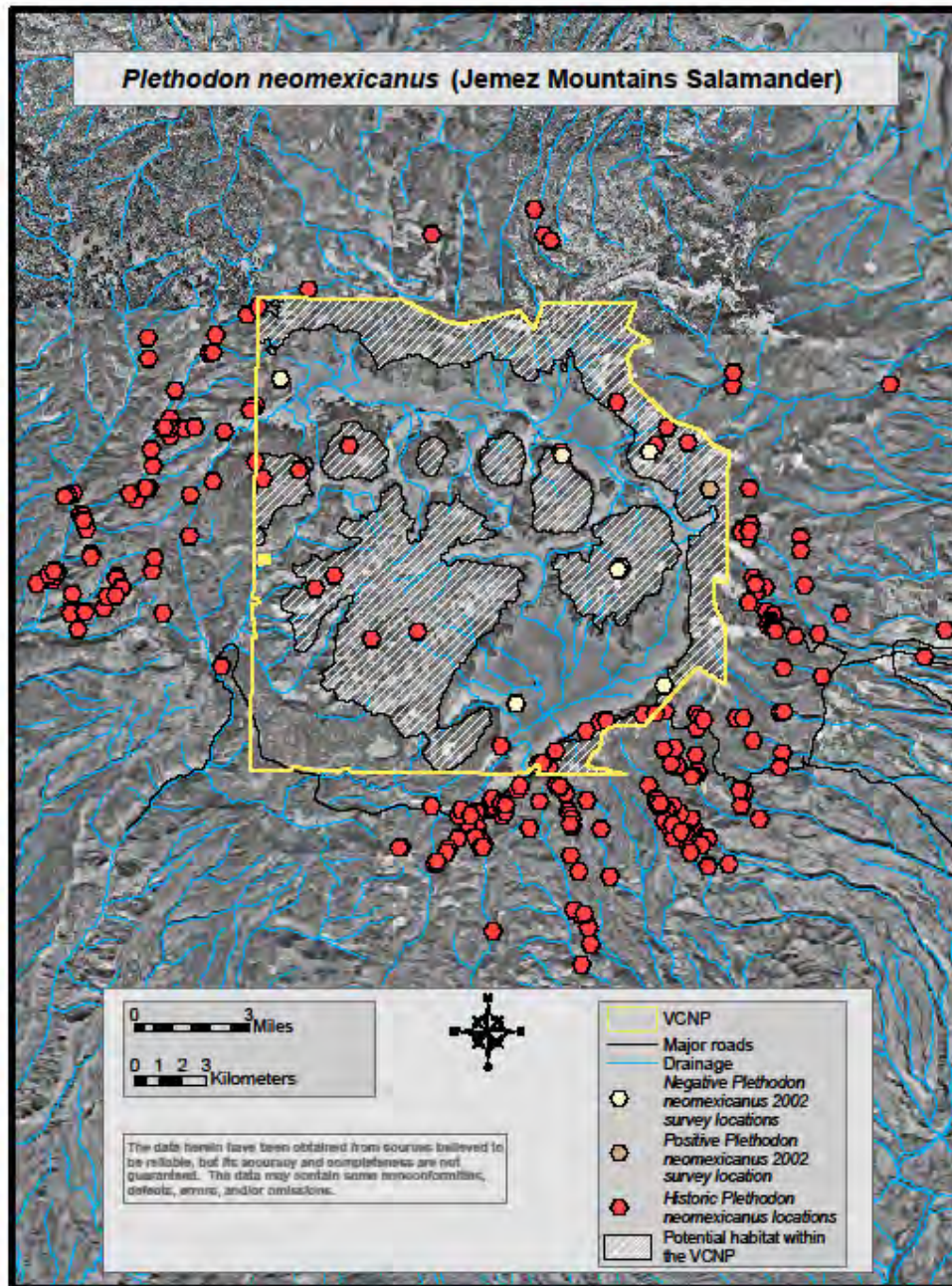


Figure 2 - Locations and potential habitat of the Jemez Mountain salamander within the preserve.

Northern leopard frog (Rana pipiens)



The northern leopard frog (NLF) is typically associated with streams and rivers, although lakes, marshes and irrigation ditches are also occupied. Much of the river valley habitat of these frogs has been modified by human activities, including draining of wetlands, channelization and damming of rivers, and the development of irrigation systems (Degenhardt, Painter, & Price, 1996). In New Mexico, they occur at elevations of about 3,500 to 11,000'. Their habitats include cattail marshes, beaver ponds and other water sources with aquatic vegetation. Breeding can occur at any time of year following heavy rainfall or in higher elevations later in the season. Egg masses are attached to emergent vegetation or lie on the bottom of the pond in shallow slow moving or still water (AmphibiaWeb, 2008). In New Mexico Scott and Jennings (Scott & Jennings, 1985) reported eggs and small tadpoles of this species from April through July and September through October.

It will be important for breeding habitat to maintain water in most areas from July to October. Initial breeding activity is related more to temperature than precipitation (Degenhardt, Painter, & Price, 1996). Threats to local populations include alterations in wet areas, stocking of predatory fish; local extinctions as water dries up during years of low precipitation, and predation and competition by bullfrogs.

Food habits of northern leopard frogs are unknown but undoubtedly feed on a wide variety of invertebrate prey (Degenhardt, Painter, & Price, 1996). The frog may forage long distances from water in upland habitat during wet periods (Degenhardt, Painter, & Price, 1996).

No formal surveys have been completed within the Preserve although wildlife data received from the adjoining Santa Fe National Forest show four locations of this species within the Preserve. Three historic locations are also recorded within the Preserve (see Figure 3). Approximately 45 miles of potential habitat is present along riparian corridors within the Preserve (see Figure 3).

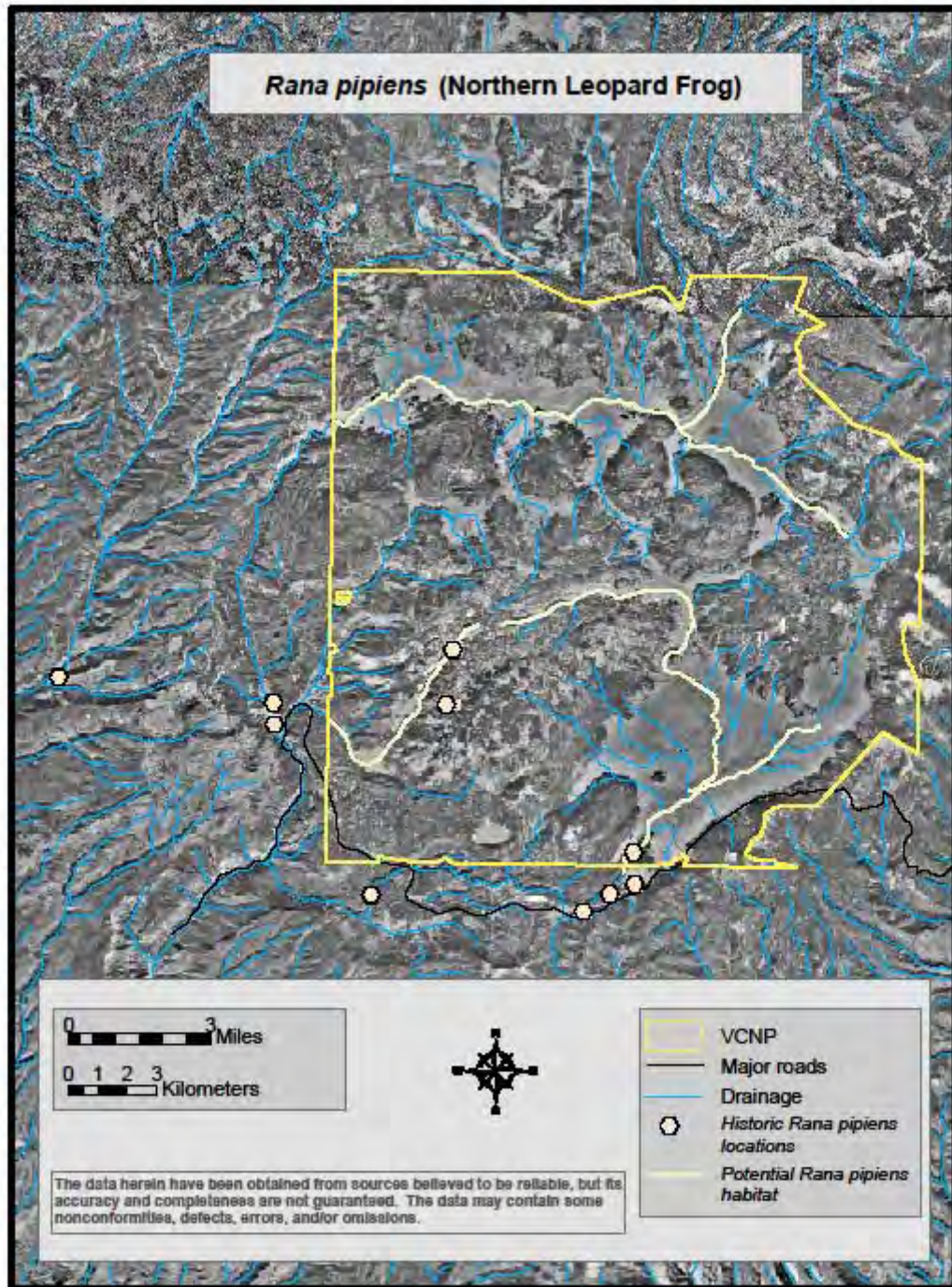


Figure 3 - Historic Locations and potential habitat of the northern leopard frog on the VCNP.

Dwarf shrew (Sorex nanus)



This shrew lives in white fir-Douglas fir zone from about 7,000 to 9,000 feet. The preferred habitat is talus and other rocky areas primarily in sub-alpine coniferous forest. Various other habitats including sedge marsh, subalpine meadow, dry brushy slopes, arid shortgrass prairie, dry stubble fields, and pinyon-juniper woodland (BISON-M). Although no formal surveys have been conducted, dwarf shrew have been found within the Preserve (Hope, 2009).

At higher elevations breeding begins in late June – early July. Two litters are produced with the second one occurring in early September. At lower elevations breeding may begin earlier (NatureServe, 2009).

The shrew feeds primarily on insects, spiders, and other small invertebrates (worms, mollusks, centipedes, etc.) but may also consume vegetable matter as well as some small vertebrates (salamanders, etc.) (NatureServe, 2009).

Water shrew (Sorex palustris navigator)



Water shrews are common inhabitants of northern forests. As the name suggests, water shrews are closely associated with water often found around streams and other aquatic habitats, areas of high humidity surrounded by heavy vegetation, logs and rocks are preferred. Stream banks often provide favorable cover including boulders, large stones, tree roots, overhanging ledges, willow, alder thickets, and spruce. Also found in lakes, bogs, and other lentic habitats (NatureServe, 2009).

In New Mexico, water shrews are confined, so far as known at present, to the Sangre de Cristo, San Juan, and Jemez Mountains where they occur in the vicinity of permanent streams, seldom descending below 8,000 feet in altitude. Findley observed one foraging in July of 1961 on the Rio Las Vacas in the Jemez Mountains (BISON-M). Although no formal surveys have been conducted water shrews have been found within the preserve (Hope, 2009).

Both terrestrial and aquatic invertebrates are consumed by water shrews. The primary aquatic organisms consumed by shrews, including stoneflies, mayflies, and caddisflies are most abundant in streams with fast current and cobble substrate (Orrock, Pagels, McShea, & Harper, 2000).

Water shrew breeds from February through August. Nest sites are near water in underground burrows, rafted logs, beaver lodges, and other areas providing shelter (NatureServe, 2009).

Common predators include fish such as trout, bass and pickerels, monks, otters, weasels, snakes and occasionally hawks and owls (NatureServe, 2009).

Pika (Ochotona princeps)



North American pikas are rather narrowly restricted to mountainous areas where talus slopes provide suitable cover. In New Mexico these animals are confined to talus slides and boulder fields in Alpine and sub-Alpine areas. In the Jemez Mountains pikas have been taken on Goat, Santa Clara, and Pelado peaks, where they live in lava rocks as low as 9,000 feet.

Not just any rock pile will suffice--the rock must be sufficiently large that the spaces between provide corridors for movement, the slide must be of sufficiently recent origin that the spaces have not filled with debris from higher ground, the talus-meadow interface is the best habitat (BISON-M). Although no formal surveys have been conducted pika have been found within the Preserve. The primary habitat being the talus slopes on Redondo (Parmenter, 2009).

This pika feeds primarily on grasses and sedges but also eats some flowering plants and shoots of woody vegetation. In late summer and fall, they harvest and store food (forbs, grasses, and marmot pellets) for winter consumption. They may also forage in winter in snow tunnels. Ingests caecal pellets, either directly or after storage. They are generally active throughout the year but may be relatively inactive on warm days (NatureServe, 2009).

Home range size varies seasonally, being largest during spring breeding season. Home range size is about twice as large as its territory. Male and female territories average the same size, roughly 0.75-1.25 acres. Adjacent home ranges tend to be occupied by opposite sexes (NatureServe, 2009).

Pika do not dig burrows but may enlarge an existing den or nest site under rock. They are seasonally polyestrous and gestation lasts approximately 30 days. They produce one to two litters of young between May and September. There are usually two to five young per litter. The maximum lifespan for the North American pika is seven years (NatureServe, 2009).

Goat Peak pika (Ochotona princeps nigrescens)

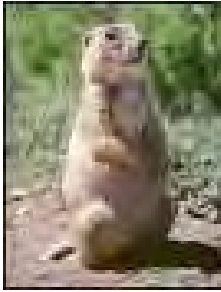


In New Mexico these animals are confined to talus slides and boulder fields in Alpine and sub-Alpine areas. Goat Peak Pikas occupy virtually every patch of appropriate talus in the Jemez Mountains. Specimens have been collected from Chicome Mountain, Pajorito Mountain, Cerro Grande, Rabbit Mountain, the head of Frijoles Creek, Redondo Peak, and Cerro del Abrigo. Additional sightings have been made on Cerro Toledo and Shell Mountain (BISON-M). Although no formal surveys have been conducted Goat Peak pika are thought to occur within the Preserve (Parmenter pers. comm.).

This species of pika breed in late April through early July. They nest under rocks and rock outcrops use grasses, forbs, sticks and leaves for nest material.

Pikas do not hibernate, but are active beneath the snow all winter, foraging out from talus in snow burrows (Smith & Weston, 1990). Loss of appropriate Goat Peak pika habitat can occur by increasing moisture in dry areas which promotes invasion of vegetation that fills the talus slopes (BISON-M).

Gunnison's prairie dog (Cynomys gunnisoni)

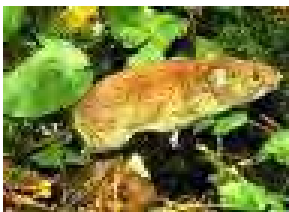


Populations of Gunnison's prairie dog can be considered to occur in two separate range portions – higher elevations referred to as montane populations and lower elevations referred to as prairie populations. The montane habitat found in the northeastern portion of the range (central and south-central Colorado and north-central New Mexico) consists primarily of higher elevation, cooler, and moister plateaus, benches, and intermountain valleys. This habitat comprises 35-40 percent of the species' total current range. (BISON-M). Gunnison's prairie dogs occupy grass and shrub vegetation types in low valleys and mountain meadows within this habitat. Although no formal surveys have been conducted Gunnison's prairie dog is common on the Preserve (Parmenter, 2009)

Diseases such as plague have been known to devastate prairie dog colonies. Prairie dog populations have declined since the settlement period due to poisoning, disease and habitat loss (BISON-M).

Gunnison's prairie dogs feed most extensively on grasses, forbs, and sedges, but they will also eat insects, probably when necessary (BISON-M). While they are sometimes reported as being in direct competition with livestock for grazing forage though some of the literature shows bias and lack data supportive of specific claims about the degree of competition (BISON-M) and a lack of consideration regarding the role that disturbance by prairie dogs may have on the ecosystem.

Southern red-backed vole (Clethrionomys gapperi)



Southern red-backed vole are often common in mature lodgepole pine stands or in mixed spruce-fir forests with good cone production and an abundance of surface litter including stumps, logs, and exposed roots of fallen trees. Red-backed voles frequently use the middens of the squirrels for cover and as a food source. Other habitats include grassy meadows, willow riparian areas, talus, and krummholz (Fitzgerald, Meaney, & Armstrong, 1994) (Frey, Fraga, & Bermudez, 1995). Grass communities are generally unsuitable habitat for southern red-backed voles, probably due to lack of food and cover. No surveys have been conducted for this species within the Preserve. Swickard, Haas, and Martin (Swickard, Haas, & Martin, 1971 (1972)) found them around the Valles Caldera in association with rocks and blue spruce.

They forage by grazing or browsing on the ground, in herbaceous vegetation, snags, stumps, rocks, or logs. These voles feed upon the ectomycorrhizal fungi found in older coniferous stands and also need the coarse woody debris for cover (Buskirk, 2002).

They breed late winter through early fall. The nest sites can be a secondary cavity in a live or dying tree, hole in the ground, stumps, logs, or under rocks and are often the nests of other animals. The nests are made from grass, sticks, leaves, and moss and are close to ground level.

Long-tailed vole (Microtus longicaudus)



M. longicaudus is found in coniferous forests, but are most abundant where there is at least some grassy vegetation present on the forest floor. They are also found from time to time in rockslides (Frey, Fraga, & Bermudez, 1995).

Long-tailed voles in Arizona live in the meadows, grassy valleys, grassy clearings in forests, sagebrush flats, and rocky slopes near or in coniferous forests. Elsewhere in the Southwest where long-tailed voles live with or near montane voles, the former species occupies somewhat drier situations. While the relationship of long-tailed voles to water is not known precisely, in New Mexico long-tailed voles require water for daily sustenance (Frey, Fraga, & Bermudez, 1995), (BISON-M). No formal surveys have been completed within the Preserve although wildlife data received from the adjoining Santa Fe National Forest show fourteen locations of this species within the preserve.

Long-tailed voles feed mostly on green vegetation, as well as on fruits and seeds. During winter, bark buds, and twigs of most locally common trees and shrubs, including spruce, aspen, oak, and snowberry are also consumed. Fescues, sedges, yarrow, and Oregon-grape are also commonly used (Fitzgerald, Meaney, & Armstrong, 1994) (Frey, Fraga, & Bermudez, 1995).

Nests are typically in underground burrows or under logs/rocks, and young are born at least from late April through September.

American marten (Martes Americana origenes)



American martens inhabit forest of spruce, fir, Douglas fir, and associated trees in northern New Mexico. Optimum habitat appears to be mature, old-growth spruce-fir communities with more than 30 percent canopy cover, well-established understory of fallen logs and stumps, and lush shrub and forb vegetation supporting microtine and sciurid prey (BISON-M). Coarse woody debris on the forest floor, including logs, rock piles, stumps, windthrow trees, and slash are thought to be important in providing winter access to subnivean (under the snow) rodent populations.

Martens breed in late summer/early fall, and bear offspring in the spring. The birthing site is usually under the snow or in old squirrel nests.

Martens eat insects, mice, voles, red squirrels (*Tamiasciurus hudsonicus*), pikas, and snowshoe hares. They also feed on carrion. During certain times of the year (mostly in the fall), a significant portion of their diet is comprised of berries.

Martens typically will prey along the edges of meadows surrounded by forests keep to within about 25-75 ft of the forest edge (Buskirk, 2002). They will cross open meadows across distances of 350 ft. It's possible that marten prey species are not abundant and do not provide for energetic efficiencies to hunt beyond the ecotone of the forested edge and meadow openings. Hadley and Wilson (Hadley & Wilson, 2004) found cleared ski runs had low densities of red-backed voles and that captures of red-backed voles only occurred in or near the forested edges.

Home range for martens range from .4 sq. mi. to 5 sq. mi. and are influenced by home ranges that are negatively correlated to the fluctuation of small mammal prey base abundance (Buskirk, 2002). Marten populations may fluctuate by a factor of more than 10 in response to fluctuations of prey populations (Buskirk, 2002). Current research indicates martens are adaptable to human presence. Marten attraction to human structures has been observed due to the presence of mice and voles taking advantage of created habitat and forage found in and adjacent manmade structures.

Bennett and Samson (1984) found marten population size and condition, and dispersal rates are correlated to small mammal populations (Bennett & Sampson, 1994). Microtine rodents, particularly red-backed voles (*Clethrionomys spp.*), other voles (*Microtus spp.*), red squirrels (*Tamiasciurus spp.*), snowshoe hare (*Lepus americanus*), birds, insects and berries comprise the most common foods for marten (Buskirk, 2002). Red-backed voles are often associated with habitat that includes high basal areas of Engelmann spruce, large diameter CWD in older coniferous forests (Ruggiero, Aubry, Buskirk, & Zielinski, 1994). Red squirrels are also important food source and provide important resting and denning habitat for marten; 40 – 50 percent of marten resting/den areas contained red squirrel middens (Ruggiero, Pearson, & Henry, 1998). Snowshoe hare are an important large bodied prey in winter and energetically important to martens during winter metabolic stress (Buskirk, 2002). Red squirrels share a unique relationship with marten since middens provide resting sites, natal/den sites and subnivean access (Ruggiero, Aubry, Buskirk, & Zielinski, 1994).

Surveys were conducted in 2002 within the Preserve; fourteen sites were surveyed with negative results.

Ermine (Mustela erminea murices)



The ermine is a weasel of high altitudes (7,800-11,000 feet) in northern New Mexico in association with small rodent populations in montane meadows, and avoids dense forest. Habitat includes forest-edge, grassland, shrub, wet meadows, and riparian areas. The ermine den in hollow logs or under logs, stump, roots, brushpile, or rocks (NatureServe, 2009).

Swickard, Haas, and Martin (Swickard, Haas, & Martin, 1971 (1972)) took five specimens in the Valles Grande in the Jemez Mountains, four of which came from a meadow and one from a rock slide. All were surrounded by mixed coniferous forest at altitudes of 8,100-8,550 ft. No formal surveys have been completed within the Preserve although wildlife data received from the adjoining Santa Fe National Forest show eleven locations of this species within the VCNP.

Encroachment of trees into meadows, due to fire suppression or changes in climate, may reduce ermine habitat (Buskirk, 2002).

Spotted bat (Euderma maculatum)



Spotted bat is found in patchy distribution throughout central, west North America. They have been captured from British Columbia to Central Mexico. These bats are considered globally and within the United States to be secure although the population is deemed to be declining (NatureServe, 2009). NatureServe notes that abundance, population trend, and threats are essentially unknown. In New Mexico, this bat has been found in about 20 locations (NMDGF, 2009) however, the survey method used (mist netting) is not considered to be effective way to sample for this species (Luce & Keinath, 2007).

The spotted bat has been recorded in very diverse habitats up to 10,000 feet elevation (BISON-M). This species is more dependent on roost availability and water than on vegetation types. The ideal roost sites for this species is cliffs, rock outcrops, or caves that are near water (streams, pond, and tanks) and open areas for foraging of insects. Most of the recorded bats in New Mexico were caught over waterholes near a sandstone cliff with numerous vertical cracks for roosting (NatureServe, 2009).

This species of bat specializes its diet by feeding primarily on moths, and will typically travel 3-6 miles from roosting sites to foraging areas. The species prefers noctuid moths that are obligates of lentic vascular hydrophytes (a plant growing in waterlogged soil) (Luce & Keinath, 2007). Consequently, reduction or elimination of these host plants could affect the noctuid prey base of spotted bats.

One of greatest threats to spotted bats is from disturbance at roost sites. Spotted bats usually have little impact from human disturbance at its cliff-face roost sites.

Modification or loss of foraging areas by the removal or changing of riparian habitat and/or the alteration of native shrub and grasslands is the second greatest threat to this species (BISON-M). Management activities that can affect the foraging site of this species are livestock and wildlife grazing, vegetation treatments, fire, and even-age forestry management.

Pale Townsend big-eared bat (Corynorhinus townsendii)



Townsend's big-eared bat is distributed broadly throughout all western North America, and it occurs in two disjunct, isolated populations in the central and eastern United States. (Gruver & Keinath, 2006). The pale Townsend's big-eared bat is apparently secured both globally and within the United States and is the most widespread subspecies of the *Corynorhinus townsendii* (NatureServe). Although Townsend's big-eared bat is geographically widespread, it exists in relatively low density throughout its range (Gruver & Keinath, 2006), likely due of the relative scarcity of suitable roosting habitat. Within New Mexico, the subspecies is listed as vulnerable to extirpation or extinction. There is habitat for this species within the Preserve although local distribution is limited to the presence of caves and similar structures, most of which are not distributed evenly across the landscape. Limited bat surveys have occurred in this part of the state and it is unknown the local distribution and density for this species.

Of the five recognized subspecies of Townsend's big-eared bats, three are found in the western states including the *Corynorhinus townsendii pallescens*. Due to the taxonomic uncertainty and morphological and ecological similarities within the western group (Gruver & Keinath, 2006) this assessment looks at all three of the western group and simple refer to these bats as Townsend's big-eared bat. This bat is a colonial species and forms aggregations ranging from one to several hundred individuals (Gruver & Keinath, 2006).

Reports indicate that Townsend's big-eared bat is a moth specialist with more than 90% of their diet consisting of lepidopterans (Gruver & Keinath, 2006). Preferred prey items include small moths; however appear to forage opportunistically on other prey items such as beetles and flies as well (Gruver & Keinath, 2006). Townsend's big-eared bat forage in woodlands, canopy gaps, vegetated stream corridors, and other linear landscape elements but avoid foraging and traveling in open areas and grazed lands (Gruver & Keinath, 2006). Individuals or colonies show high fidelity to particular foraging sites as well as to routes to travel between roost and foraging grounds, and tend to follow same linear features (e.g. stream corridors, forest edges) around which it forages. Connectivity of habitat patches may greatly influence the accessibility of foraging sites (Gruver & Keinath, 2006).

Some of the major threats facing this species are loss, modification and disturbances of roosting habitat by closures of abandoned mines, human activity in roost sites, and renewed mining at historical sites. Loss, modification and disturbances of foraging areas

from the elimination of forest canopy, elimination or alteration of wetland habitat, conversion of native shrub and grasslands especially to urban agricultural uses. Activities that reduce the productivity of wetlands likely impact local populations of the Townsend's big-eared bat by reducing the quality of important foraging and drinking sites. The alteration of surface and subsurface hydrology of wetlands and removal of shrub and overstory vegetation ultimately reduce the value of wetlands to this species. In addition, activities that increase sediment loads into the wetland likely alter wetland soil and water chemistry and therefore, have the potential to decrease the value of the wetland to the Townsend's big-eared bat (Gruver & Keinath, 2006).

Species of Interest

Rocky Mountain Elk (Cervis elaphus nelsoni)



Elk inhabit most forest types with good forage and cover. They utilize a variety of habitats during the course of their lives. Certain vegetation types are of limited value to elk due to aspect, elevation, snow depth, lack of water availability and/or vegetation components.

The amount of grazing animals than an area can support depends not only on the amount of forage produced, but the access to that forage and availability of water. Approximately 31 percent of the Preserve was found suitable for grazing (TEAMS Enterprise Unit, 2007). The remaining 69 percent is not suitable for grazing due to limited forage and to a lesser degree because of steep slopes and a lack of nearby water sources. Only an estimated 10 percent of forested acres, primarily in the ponderosa pine type, have the potential to meet or exceed production levels considered suitable for grazing.

Across the preserve, the highest potential herbaceous productivity is located in the broad grassy valleys. Climate, especially moisture, is the limiting factor of forage production on the majority of sites and rates vary widely depending on the timing and form of annual precipitation. As a result, average biomass production can change significantly in relatively short timeframes. For example, forage production doubled between a dry year in 2002 and a wet year in 2007.

Another climate related condition involved the lack of snow in 2004 and 2005 which led to higher use by elk. Elk over-wintered in 2005 and only were gone a short time in winter 2004. This over-wintering may explain the higher usage measured in riparian areas. Riparian utilization was 45 percent and 34 percent for years 2004 and 2005 respectively.

The population trend for the Rocky Mountain elk is stable to increasing. Since 1995, the New Mexico Department of Game and Fish has conducted aerial elk counts over the Jemez Mountains. The most recent population estimate in the Jemez Mountains is 5,500 to 8,400 with an estimate of 3,500 that summers on the Preserve. These estimates are

pre-hunting season (Liley, 2008). The entire Preserve is classified as critical summer range, winter range and calving area habitat. Historically, elk utilized the west side of the Preserve and wintered to the south and west, but elk now concentrate on the east and north sections of the Preserve, which are in or associated with the large grassland valleys, and winter to the south and east (TEAMS Enterprise Unit, 2007).

A current study on the Preserve is an Elk calve mortality study. The study is looking at what percent of calves survive as well as the possible causes of what is considered a low recruitment. Preliminary results show that coyotes are taking about 7 percent of the elk calves and do not appear to appear to be responsible for the unusually low calf recruitment (Parmenter, Valles Caldera Trust, Chief of Science and Education, 2009).

Mule deer (Odocoileus hemionus)



Mule deer inhabit most forest types with good forage and cover. They utilize a variety of habitats during the course of their lives. Certain vegetation types are of limited value due to aspect, elevation, snow depth, lack of water availability and/or vegetation components.

Mule deer utilize higher elevations in the spring and summer and migrate down to lower elevations in the fall and winter. They browse on wide variety of woody plants and grazes on grasses and forbs.

No surveys have been completed for deer on the Preserve. It is believed that the number of deer are limited likely due to lack of open habitat and competition with elk (Parmenter, Valles Caldera Trust, Chief of Science and Education, 2009).

Black bear (Ursus americanus)



Black bears are highly mobile and readily disperse across many types of habitat. Bears prefer mixed deciduous-coniferous forests with a thick-understory. When inactive, they occupy dens under fallen trees, in ground-level or above ground-level tree cavities, hollow logs, in underground cave-like sites, or in dense cover.

The bear is an opportunistic omnivore and has a variable diet of plants and animals (vertebrate and invertebrate), commonly including fruits, insects, carrion and garbage. A current study on the preserve is an elk calve mortality study. The study is looking at what percent of calves die, as well as possible causes to the low recruitment, including the role of predators.

Large predators that occur in the Jemez Mountains include black bear and cougar, both species are hunted in the surrounding public lands but not in the VCNP.

Because of high road densities in the Jemez Mountains and a high occurrence of outfitters nearby, hunting pressure on the black bear and cougar populations is high. Despite heavy hunting pressure large predator populations are healthy according to model projections, harvest and general indicators. The VCNP, Bandelier National Monument, Los Alamos National Laboratories properties and the San Pedro Parks Wilderness serve as *de facto* refugia in the region allowing hunted predators areas of escape and relatively light disturbance.

No surveys have been completed for bear on the Preserve although sightings are frequent. (Parmenter, 2009). A 2008 assessment of trends in the area estimated 33 to 66 individuals exist within the boundaries of the Valles Caldera (Winslow, 2008).

Merriam's turkey (Meleagris gallopavo merriami)



This upland game bird primarily utilizes ponderosa pine and pine-oak as well as the transition habitats between ponderosa and piñon-juniper woodland habitats and ponderosa and mixed conifer. There are three essential habitat components. These include surface water, roosting trees, and openings for summer brood areas (Kamees, 2002).

Turkeys prefer to roost in tall mature or over-mature ponderosa pines with relatively open crowns and large horizontal branches starting at 6 to 9 meters (20-30 ft) from the ground. Trees with a diameter at breast height (dbh) of over 14 inches are used as roosts. Preferred roost sites are often located just below a ridgeline. Hens normally nest within ½ mile radius of water (Boeker & Scott, 1969).

Although no surveys have been completed across the Preserve, turkeys are numerous and are frequently seen by Preserve personnel. In 2007 the Valles Caldera Trust undertook a study of the ecology of the Merriam's Turkey in the Preserve. The goals of the study are to map movements and home ranges on multiple time scales; identify preferred habitat for roosting, nesting, brooding and feeding; determine rates of mortality and natality; and to determine how these factors relate to fire history on the landscape and silviculture treatments. Six walk-in traps were deployed across the preserve in the fall of 2007. Use of the trap sites by turkeys increased dramatically following snowpack and in February 2008 researchers successfully captured and marked two adult male turkeys in Redondo Meadow, in the southwest corner of the VCNP. The turkeys were fitted with radio-transmitters and marked with colored metal leg bands (Chipault & Parmenter, 2008).

Mountain lion (Puma concolor)



Mountain lions inhabit rough, broken foothills and canyon country, often in association with montane forests, shrublands, and pinon-juniper woodlands." (Fitzgerald, Meaney, & Armstrong, 1994)

Mountain lion habitat can be enhanced or expanded by fires that improve habitat for prey species such as deer and elk. Mountain lions may change

their home range in response to fire. The diet of mountain lions consists mainly of ungulates. A current study on the Preserve is an Elk calf mortality study. The study is looking at what percent of calves die, when and which predator is responsible.

Prescribed burning programs designed to improve habitat for large ungulates such as deer and elk also benefit mountain lions. Information was not found in the literature regarding direct effects of fire on mountain lions. Kittens are probably most vulnerable to fire (Prescribed Fire and Fire Effects Research Work Unit, 1996) (BISON-M).

The Jemez Mountains are comprised of Game Management Units (GMUs) 6A, 6B and 6C. GMU 6B is the Valles Caldera National preserve. Large predators that occur in the Jemez Mountains include black bear and cougar, both species are hunted in GMUs 6A and 6C but not in 6B. Because of high road densities in the Jemez Mountains and a high occurrence of outfitters nearby, hunting pressure on the black bear and cougar populations is high. Despite heavy hunting pressure large predator populations are healthy according to model projections, harvest and general indicators. GMU 6B, Bandelier National Monument, Los Alamos National Laboratories properties and the San Pedro Parks Wilderness serve as *de facto* refugia in the greater GMU 6 allowing hunted predators areas of escape and relatively light disturbance. Cougar harvest could be sustainable in GMU 6B at a very light level. Cougar populations tend to replace losses rapidly, particularly from surrounding areas that are harvested lightly, and can be harvested fairly aggressively (Winslow, 2008).

It has been noted (BISON-M) that there is a large population of lions on Bandelier National Monument, which is adjacent to the Preserve and undoubtedly migrate between the two areas. No surveys for lion have occurred on the Preserve, but occasional observations by personnel confirm their presence. Approximately 5 to 8 individuals exist within the boundaries of the Valles Caldera (Winslow, 2008).

Coyote (Canis latrans)



Coyote is found in a wide range of habitats from open prairies to heavily forested regions and even within cities. Coyotes are hunted for sport and pelts and regarded as a pest at certain times in some areas due to occasional predation on elk calves, deer, poultry or livestock. They are highly mobile and readily disperse across many types of habitats (NatureServe, 2009); populations tend to encompass huge areas.

Young are born in a den usually in a burrow (enlarged burrow of other mammal or dug by female), with the opening often oriented toward the south. Dens also may be above ground (e.g. at base of tree under low, overhanging branches; in hollow log or rock crevice), or under building. Commonly uses same den in subsequent years (NatureServe, 2009).

A recent study by Gifford et al. (2008) was conducted on the Preserve to describe the ecology and natural history of the coyote (*Canis latrans*) on the VCNP. Preliminary diet assessment based on scat analysis suggests that coyote diet consisted primarily of rodents, followed by insects, and then elk. Preliminary habitat use analysis suggests a late summer avoidance of forest and preference for wet meadows compared with habitat type availability within home ranges. Future analyses will compare seasonal, annual and territorial differences in scat composition; describe space use, habitat use, and movement patterns of collared coyotes; describe population characteristics including population density, social organization, age structure, disease prevalence, and causes of mortality; and finally, assess whether a relationship exists between social cohesion and body size of diet components (Gifford, Gese, Parmenter, & Chipault, 2008).

Bobcat (Lynx rufus)



Bobcat is found in various habitats including deciduous-coniferous woodlands and forest edges, brushlands, deserts and other areas with thick undergrowth. When inactive, occupies rocky clefts, cave, hollow log, or space under fallen tree. Young are born in den in a hollow log or space under fallen tree or in a rock shelter (NatureServe, 2009). Bobcats prey extensively on cottontails and jack rabbits. They also eat a variety of rodents.

Fire may improve the foraging habitat and prey base of bobcats. Fires that create a mosaic of burned and unburned areas including some open areas and some cover are probably most beneficial to bobcats. Fires that reduce vegetation height and create open areas probably increase hunting efficiency. Surface fires often open substrates for quieter stalking and easier capture of prey than can occur in closed forests. Periodic fire helps to maintain habitat for many bobcat prey. Several studies indicate that many small mammal populations increase rapidly subsequent to fire in response to increased food availability. Bobcats are very mobile and can probably escape most fires. There are no reports of direct bobcat mortality due to fire (Prescribed Fire and Fire Effects Research Work Unit, 1996)

No surveys for bobcat have occurred on the Preserve, but occasional observations by personnel confirm their presence.

Gray fox (Urocyon cinereoargenteus)



The gray fox is common and widespread in broken country, woodland, and lower forest zones. It is perhaps most common in pinyon-juniper and oak woodlands but seems to be absent from grasslands that are without rock outcrops or at least some encroachment of juniper. The species is essentially absent from well-developed mixed coniferous and spruce-fir forest. Gray foxes use brush and brushy

woods in most areas. Fire that reduces brush cover will decrease gray fox habitat. Fire usually increases the productivity of early successional prey species and improves predator efficiency by reducing hiding cover for prey.

The fox is an opportunistic omnivore. Diet often chiefly depends on rabbits and other small mammals in winter, insects and fruit in summer. Fire often reduces fruit production in the short term, but edges of older burns are usually good regeneration sites for fruiting shrub species such as blackberries and blueberries; gallberry produces the most fruit a few years after fire pruning (Prescribed Fire and Fire Effects Research Work Unit, 1996). Overall diet may be dominated by plant material in some areas.

No surveys for fox have occurred on the Preserve, but occasional observations by personnel confirm their presence.

Abert's squirrel (Sciurus aberti)

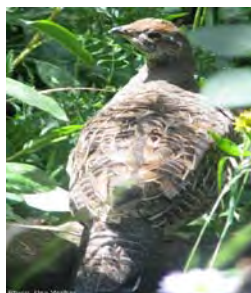


The Abert's squirrel uses interlocking canopies in ponderosa pine. Tree density, diameter, and grouped distribution of trees are the most important components of Abert's squirrel nest cover. The right combinations of these factors provide squirrels with optimum conditions necessary for nest protection. The best cover conditions are found in uneven-aged ponderosa pine stands with trees spaced in small, even-aged groups within the stand. Average tree diameter for the stand is between 11 and 13 inches in diameter at breast height (DBH), but the presence of small groups of larger trees produces a mosaic of height groups (Patton, 1975).

Pine twigs, pine cones, pine seeds, pine bark, as well as truffles (underground mushrooms known to form mycorrhizal associations with ponderosa pine) are used by the Abert's squirrel (Farentinos, Capretta, Kepner, & Littlefield, 1981). Management activities such as prescribed burning, would continue to reduce fuels and competition and enhance the quality of the species' habitat.

No surveys have been completed on the Preserve. Based on observations by preserve personnel Abert' squirrel are present.

Blue grouse (Dendragapus obscurus)



The blue grouse is native to New Mexico and occurs most commonly in the mountainous area of the north-central portions of the state. The Sango de Cristo, San Juan, and Jemez Mountains are principal areas of this species (BISON-M).

Structural diversity is a major determinant of habitat suitability for blue grouse. Structure of habitat is more important than species composition. Important forest cover types include spruce-fir,

Douglas-fir, and ponderosa pine. Mixed-species forests are probably the most important habitat type in high elevation sites in Arizona (BISON-M).

Blue grouse forage in conifer trees, on the forest floor, along ridge tops, and in openings. Major food items in the spring are needles, buds, and new cones of conifers. In the summer and fall; grasses, forbs, and fruits of low growing plants; during the winter, they eat mostly conifer needles (BISON-M).

Blue Grouse selectively feed and roost in the oldest and largest Douglas-fir trees available. Douglas-fir trees repeatedly used within and between winters were typically growing under stressful conditions, such as on dry, steep, talus slopes, and had endured stresses such as lightning strikes or boulder impacts (Remington & Hoffman, 1996).

No surveys have been completed on the Preserve. Based on observations by Preserve personnel blue grouse are present.

Neo-Tropical Migratory Birds (Landbirds)

Landbirds, including migrant and resident species, are those that generally use terrestrial and wetland habitats. Habitats these species could be found using include forest canopies, snags, understories, ground vegetation and structure, existing openings and a wide variety of structural types and successional stages.

List of Preparers

Marie Rodriguez Janet Moser	Valles Caldera Trust USDA Forest Service	Project Lead Wildlife Biologist
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