

# **National Park Service Southern Plains Network Final Inventory Report for New Mexico Parks**



Kristine Johnson, Giancarlo Sadoti, Gabor Racz, Josh Butler, and Yvonne Chauvin

Natural Heritage New Mexico  
Biology Department, University of New Mexico  
167 Castetter Hall, Albuquerque, NM 87131  
505-277-3822, X223; kjohnson@unm.edu

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## General Introduction

The mission of the National Park Service (NPS) is to conserve national parks unimpaired. In keeping with this mission, NPS policy and recent legislation (National Parks Omnibus Management Act of 1998) require that park managers know the condition of natural resources under their stewardship and that they monitor long-term trends in those resources.

The Servicewide Inventory and Monitoring Program (I&M Program) aims to comply with legal requirements, fully implement NPS policy, and guide management activities. The I&M Program has adopted the following major long-term goals:

1. Establish natural resource inventory and monitoring as a standard practice throughout the National Park system that transcends traditional program, activity, and funding boundaries.
2. Inventory the natural resources and park ecosystems under National Park Service stewardship to determine their nature and status.
3. Monitor park ecosystems to better understand their dynamic nature and condition and to provide reference points for comparisons with other, altered environments.
4. Integrate natural resource inventory and monitoring information into National Park Service planning, management, and decision making.
5. Share National Park Service accomplishments and information with other natural resource organizations and form partnerships for attaining common goals and objectives.

The Southern Plains Network (SOPN) includes eleven NPS units in Colorado, Kansas, New Mexico, Oklahoma, and Texas. NPS collaborated with natural heritage programs in these states to create a study plan for inventory of vertebrates and vascular plants in the eleven Southern Plains Network parks. This project is the result of that collaboration.

The goal of the SOPN inventory project is to provide park managers with documented vertebrate and vascular plant inventory information in an accessible and useful format. An important product of this inventory project is data management. This includes assembling and reviewing existing occurrence data and entry of quality checked data into NPSpecies, the NPS database.

The objectives of the SOPN inventories are to:

1. Compile and critically review historical data for vertebrates and vascular plants believed to occur in SOPN parks from a variety of sources including museum records of voucher specimens, previous studies, park databases, etc.; and input these data into appropriate NPS databases.
2. Where quality data do not exist, conduct targeted field investigations to document the occurrence of a majority of the species of vertebrates and vascular plants occurring in SOPN parks. Existing and new data will be evaluated to determine the completeness of the inventories. The goal is to document 90% of the species. It is understood that a 90% inventory may not be possible for all taxa at every park, due to funding availability.

3. Describe the need for future studies to determine the distribution and relative abundance of species of special concern, such as threatened and endangered (T&E) species, exotics, and other species of special management concern occurring within SOPN park boundaries.
4. Gather inventory data by methods that will assist SOPN parks in developing their park “vital signs” monitoring program.

For this project we conducted inventories of vertebrate animals and vascular plants for the three New Mexico SOPN parks, Capulin Volcano National Monument (CAVO), Fort Union National Monument (FOUN), and Pecos National Historical Park (PECO). In each park, we performed inventories of taxa that had not previously been thoroughly surveyed. At CAVO, surveys were needed for vascular plants, reptiles and amphibians, mammals, and birds. At FOUN, plants, herpetofauna, and mammals were being surveyed under a separate project, leaving only birds to be completed. Thorough inventories existed for plants and mammals at PECO. Partial inventories were available for birds, herpetofauna, and fishes. We conducted surveys of birds and limited surveys of amphibians and reptiles. Intensive fish surveys at PECO were deemed outside the scope of this project.

The intention was to locate and identify as many species as possible in each park. Methods can be characterized as standard natural history surveys, based on subjective searches of a representation of all major habitats. A variety of survey techniques and sampling methods was used, including plots for plants; visual encounter surveys for plants, herpetofauna, and birds; live-trapping of herpetofauna and mammals; track stations for mammals; and auditory surveys for amphibians and birds. Use of particular survey methods was subject to constraints imposed by the specific parks; for example, digging for pitfall traps was not allowed at FOUN.

### **General Methods**

As part of the SOPN inventory proposal process, NMNHP staff created target species lists for each taxon and each park (Appendices 1,4,7,10,13,16,19). These lists were based on park checklists, field guides, other published literature, and expert opinion. Once the project began and we saw the park habitats, we realized that the target lists included species that could not reasonably be expected to occur in the parks. We therefore revised these lists, using additional data sources, expert opinion, and our knowledge of park habitats (Appendices 2,5,8,11,14, 17, 20). Lists were revised independently of our survey results. The original target lists are included as appendices for reference, but we used the more realistic, revised lists to compute the survey coverage.

In addition to our own observations during the study, we included credible 2002 detections by park biologists, after discussion with the biologists and only for species very likely to be present but missed by our surveys.

#### *Vascular plants*

### Target Lists

We revised the original target list (Appendix 1) by examining distribution maps in the local flora (Martin and Hutchins, 1980) and the National Plants Database (USDA, NRCS, 2002) of each species on the list or held in the CAVO herbarium. We removed several species on the CAVO herbarium list, because they are not known to occur in New Mexico or suitable habitat is not present. These specimens should have their identifications and/or locations verified.

### Field Surveys

The floristic survey was designed to provide an accurate and comprehensive collection of plant species found at CAVO. In the floristic survey, 400 m<sup>2</sup> vegetation plots (see CAVO Methods, Plants, below) served as reference points, providing a detailed accounting of species within each plot. From each plot, the surrounding landscape within this vegetation type was searched exhaustively for any additional species not found in the plot. We canvassed additional areas outside plots to ensure that all vegetative communities within the park were fully evaluated.

### *Reptiles and Amphibians*

#### Target Lists

We revised the original target lists (Appendices 4 and 16) by re-examining historical records (Degenhardt et al., 1996) of each species on the original target list, consulting experienced herpetologists of New Mexico (Ted Brown), and checking the database at the Museum of Southwestern Biology for additional records since 1996.

For this study, we recognize the species as the unit of biological diversity and use no subspecific designations, due to significant variation within species and species' populations (e.g., Cole, 1983). For the revised lists we removed subspecific epithets and lumped subspecies into the nominate species. For example, two morphotypes of *Sceloporus undulatus* occur within CAVO, but because there are no apparent geographic barriers to prevent interbreeding, we lump these types into one species.

#### Field Surveys

We surveyed for reptiles and amphibians using walking transects, live traps, and call identification (amphibians). Field work was conducted from May to August 2002. The particular sampling strategies used depended on various constraints (e.g., access and weather). Observations and trap locations were recorded with latitude and longitude (datum: WGS-84) using a handheld GPS unit (Garmin eTrex Vista™). Maps were compiled using ArcView (ESRI, Inc.). Maps are for general reference and are not intended to be precise representations.

Cover-board arrays consisted of three 30 cm X 30 cm plywood boards arranged approximately five to 10 m apart in habitat where drift-fences could not be installed. Animals could freely enter and exit cover-boards. Once installed in early May 2002, they were left behind until the end of the inventory period in late August 2002.

Drift-fence arrays trapped both herpetofauna and mammals. These arrays (Figure 1) were composed of two 30.5 m lengths of silt-fencing material staked to the ground and arranged at right angles in an X shape. Two 3.5 or 5 gal buckets were sunk into the ground at the intersection of the two fences. Most captured animals were identified and released away from the array. The few incidental casualties were preserved and collected for the Museum of Southwestern Biology as voucher specimens, per permit conditions. Traps were covered with boards when not in use. We opened arrays for 2-4 days at a time and checked them daily. A trap day is defined as one array open for 24 hours. Multiple arrays open in a park multiply the number of days (i.e., four arrays open for 24 hours counts as four trap days).

Aquatic turtle traps were constructed of cloth netting rolled into a tube, with hardware cloth “funnels” wired into each end. These traps were baited with sardines and fixed in shallow water.

Active-search hikes were conducted in all habitat types. Lizards were caught live with a noose-and-pole capture method to insure positive identification and released unharmed. Non-venomous snake species were caught by hand, inspected for sex, and then released. Amphibians were handled in a similar manner. Venomous species were gently hooked and visually inspected, then released. To calculate active-search hikes, we recorded beginning and ending times and doubled time periods if two individuals were present. Active-search hikes are recorded as person-hours.

Using the GPS, we recorded the paths walked during active-search hikes (track records) and recorded the locations of reptiles and amphibians observed. Incidental observations were recorded separately. We also searched at night from a vehicle for amphibians (during periods of high humidity or rain) or reptiles when conditions permitted. Track records and observations were recorded with the GPS unit.

Observations of species that could not be identified were not recorded. Additionally, abundant species were recorded at least twice and more often if an individual observation was noteworthy, but every occurrence was not necessarily noted.



**Figure 1. Drift fence and pitfall trap array, CAVO.**



## *Birds*

### Target Lists

We developed revised target lists for each national monument, using previously-published species lists, results from breeding-bird survey (BBS) routes in the area, New Mexico Ornithological Society (NMOS) data (1967-1998), and available reports from bird-specific or general vertebrate studies on the monuments (Appendices 7, 13, 19). Species were added to the initial target list to reflect recent changes in avifauna. Species were removed for a variety of reasons; for example, the park was at the edge of the species' known range, the birds were rare spring or fall migrants or wintering species, or the species were found in habitats nearby but seldom within park boundaries. Previous detection on a BBS survey in the area was not considered grounds for retaining a species on the target list, because those routes encompassed large areas outside the park, and the species' requisite breeding habitats often did not occur on the park.

### Field Surveys

We surveyed breeding birds using linear point counts with distance sampling. Prior to point-count surveys, point locations were flagged in representative habitats. Linear transects consisted of 4-8 points situated at a minimum distance of 250 meters between points. This distance served to minimize the possibility of counting individual birds more than once. Each 25 m interval in at least two cardinal directions was flagged with tape or pin flags to assist the estimating of distances. The number of points in each transect depended on the amount of available habitat or location of property boundaries.

Each survey point encompassed a 100 m radius centered on the pre-determined point locations. All birds were detected by sight and/or sound during a 5-minute survey period at each point. Surveys started at dawn and finished by about 8:30 am. We surveyed one full-length transect (6-8 points) or two shorter transects (4-5 points each) per day. Date, time, species, number of individuals, sex (if discernable), detection method (i.e., visual, song, call, drumming, etc.), distance from observer, and associated notes were recorded for each bird observation. A digital rangefinder was also employed for estimating distances. Birds detected outside the 100 m point radius were recorded but not included in summary analyses of species richness and relative abundance. All points were visited twice during the survey period, with a two-week period between surveys. The second visit to each survey point was conducted by walking the transect in the opposite direction from the first visit, to increase the potential of detecting birds that vocalized for only a short period in the morning.

Additional sightings were made while walking between survey points or at other times during the day. These sightings occurred opportunistically or at locations targeted for their potential to be occupied by species not detected during point counts.

For the final species lists, we included 2002 sightings by surveyors for the New Mexico Breeding Bird Atlas (NMBBA) and 2002 observations by park personnel.

### Partners In Flight Conservation Priority Criteria

The national Partners In Flight (PIF) priority scores are specific to each physiographic region in the U.S. and are based on known population trends, importance of the region to the population, and known threats to the species. National PIF scores for birds of concern in New Mexico range from 14 to 31. Higher-priority birds are considered those with priority scores over 21. New Mexico Partners In Flight (NMPIF) has similar criteria for NM birds, based on global and state abundance and breeding distribution, threats to breeding in NM, importance of NM to breeding, and several considerations for NM wintering birds. NMPIF scores for all NM breeding birds range from 8 to 34. We considered the top 20% (priority score greater than 23) to be higher-priority birds.

### *Mammals*

#### Target List

We removed several species from the original mammal target list for various reasons: their distributions did not overlap the park, the list contained synonyms for the same species, or the species was extremely rare and unlikely in park habitats (Appendix 10). Park checklists, which were used to generate original target lists, frequently contained species known from outside the park but never documented on the park proper. Three species were added either because their distributions overlapped the park or there were nearby records in similar habitats.

#### Field Surveys

Mist nets for capturing bats are typically set at places where bats have difficulty avoiding them; for example, close to the entrance of the bat's roosting site or over small ponds in dry environments. Because there are no such netting sites at CAVO and because resources were limited, we did not set mist nets for bats. We left bats on the original and revised target lists, for park reference.

We trapped small mammals with Sherman live traps baited with a mixture of oatmeal and peanut butter and set five meters apart along line transects. We set traps and left them at the same location for three consecutive nights. Each morning and late afternoon, traps were checked for captured animals. Animals were removed from the traps, identified, sexed, aged, and weighed. Each animal was then released at the same spot where it was caught. The empty trap was re-baited and reset. We used GPS units to record the exact locality of the capture. To trap for smaller carnivores, we set large Tomahawk-type traps and baited them with canned tuna. These traps were checked each morning.

In addition to the Sherman traps, we used the same pitfall trapping array for small mammals described above for amphibians and reptiles.

We also detected some species visually and searched for sign. We set up tracking stations made from 5' X 5' metal sheets coated black with fine carbon particles deposited by a butane torch. Canned tuna was placed in the middle of the sheets for bait. We used a halogen spotlight to spot species that are more active at night. During the daytime, we looked for sign of animals, such as tracks in mud or sandy soil, fecal droppings, dens, or

typical signs of feeding. We recorded GPS locations where we observed animals or found unmistakable sign.

### Capulin Volcano National Monument

#### *Introduction*

CAVO is a 793 ac unit established in 1916 to preserve "...a striking example of recent extinct volcanoes...of great scientific and geologic interest..." Capulin Volcano is a rocky, forested island surrounded by shortgrass prairie, in the rain shadow of the Rocky Mountains. The monument contains an exceptionally diverse range of volcanic features for a small area. Corresponding to the diversity of geologic features, various plant communities are found within its boundaries. The cinder cone is primarily covered with pinyon-juniper woodland. The rest of the monument is covered by scrub oak and other shrubs, has remnants of a once much larger ponderosa pine forest, and protects over 200 acres of high plains short-grass prairie.

Checklists are available for plants, reptiles and amphibians, birds, and mammals, but complete inventories had not been conducted (Table 1), and existing checklists contain errors (see below).

**Table 1. Inventory status of vascular plants, vertebrates, and species/areas of special concern at CAVO, prior to this project.**

Category	Pre-project inventory status	
	Presence/absence	Distribution and abundance
General vegetation	Needed	Not needed
Weed species	Needed	Needed
General fish	N/A	N/A
Amphibians and reptiles	Needed	Not needed
Breeding birds	Needed	Not needed
General mammals	Needed	Not needed
<i>Myotis thysanodes</i>	Present	Complete
<i>Myotis ciliolabrum</i>	Present	Complete

A survey targeted at federally listed and category species detected two species of bat that were Category 2 species in 1994 (*Myotis thysanodes*, *Myotis ciliolabrum*); however, these species were not included as candidate species when the category designation was dropped, and they currently have no species designation (Parmenter et al., 2000). In addition, a thorough survey has recently been conducted for these species (Parmenter et al., 2000), and further study is not required.

Twenty-two alien plant species have previously been detected on the monument. The degree of potential impact on the monument's resources is unknown. Further study is required to allow for management of these species. No park-specific, cross-boundary, or other agency inventory efforts are currently underway.

## Methods

### Vascular Plants

Two investigators conducted floristic surveys from 28 – 30 August 2002. We established nine, 400 m<sup>2</sup> plots throughout the park (Figure 2), to include each of the major community types (Table 2) in six major habitats (Table 2, Figures 3-8). We visually estimated plant species cover, described physical characteristics, and took a documentary photograph. We took vegetation plot locations directly in the field using a GPS unit or indirectly from a 1:24,000 USGS topographic quadrangle map. The vegetation classification assigned to each plot was based on the New Mexico Natural Heritage Program (NMNHP) New Mexico Vegetation Community Classification. In this classification a vegetation community type or association is based on multiple factors, including dominant species, sub-dominant species, unique associations of species, and environmental characteristics. Community types at CAVO were characterized following standard sampling protocols (Muldavin et al., 1997).

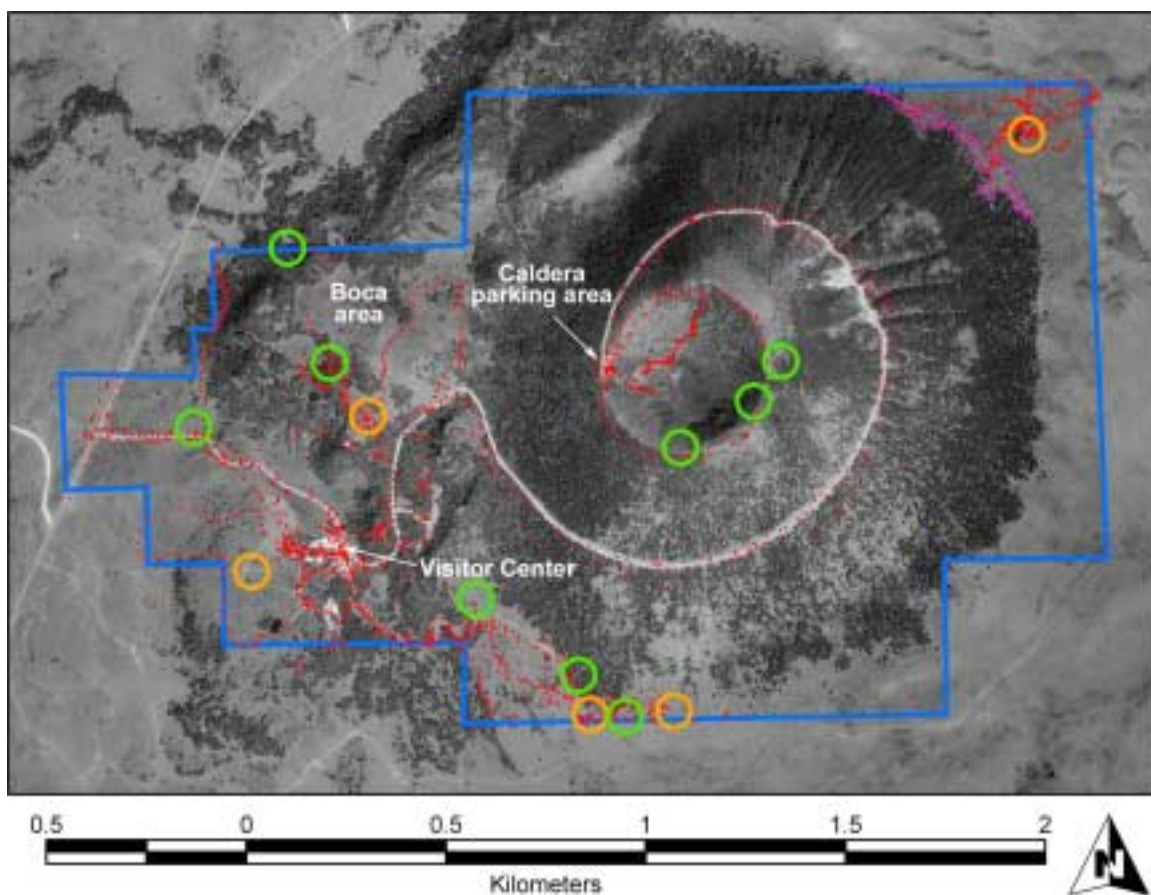
From each plot, we exhaustively searched the surrounding landscape within the vegetation type for any additional species not found in the plot. Additional areas were canvassed without plots to ensure that all vegetation communities within the park were fully evaluated.

For each plant species not already vouched at the CAVO herbarium, three flowering or fruiting specimens were collected. For previously-vouched species, two specimens were collected when possible. Specimens were pressed, dried, and decontaminated of pests. We identified specimens to species, using the reference collection at the MSB Herbarium. We entered specimen information into the NMNHP database and checked for accuracy before generating detailed specimen labels. One specimen will be accessioned into the herbarium at UNM. The second specimen of each species was laminated onto a specimen board and provided to CAVO. The third specimen of each species was mounted on specimen board for accession into the CAVO herbarium. For cacti, we took photographs in lieu of living samples (Figure 9).

**Table 2. Vegetation communities surveyed during the fall 2002 plant survey.**

Plot ID	Survey Date	NMNHP Community Type	Final Species List Category	Elev. ft.	UTM's	
					Easting	Northing
02CV001	8/28/2002	<i>Festuca arizonica-Muhlenbergia montana</i>	Crater Grassland	7,940	591947	4070843
02CV002	8/28/2002	<i>Pinus edulis/Cercocarpus montanus</i>	Pinyon - Juniper	8,020	592130	4070959
02CV003	8/28/2002	<i>Pinus edulis/Muhlenbergia montana</i>	Pinyon - Juniper	8,080	592189	4071094
02CV004	8/28/2002	<i>Bouteloua gracilis/Pascopyrum smithii, Aristida divaricata</i> phase	Disturbed Grassland	7,200	591436	4070463
02CV005	8/29/2002	<i>Pinus edulis-Juniperus scopulorum/Quercus undulata</i>	Pinyon - Juniper	7,140	591692	4070273
02CV006	8/29/2002	<i>Bouteloua gracilis-Aristida purpurea</i>	Disturbed Grassland	7,070	591809	4070169
02CV007	8/29/2002	<i>Quercus gambelii/Carex occidentalis</i>	Gambel Oak	7,320	590964	4071343

02CV008	8/29/2002	<i>Pinus ponderosa/Quercus gambelii</i> , <i>Andropogon gerardii</i> phase	Ponderosa	7,400	591069	4071055
02CV009	8/30/2002	<i>Bouteloua gracilis-Bouteloua</i> <i>curtipendula, Andropogon gerardii</i> phase	Lowland Grassland	7,220	590729	4070893
all UTM's in NAD27, Zone 13						



## Legend

- Vegetation sampling plots
- ⋯ Dense patch of prickly Russian thistle (*Salsola tragus*)
- Pitfall trapping locations
- ⋯ Walking herpetofauna survey routes
- Capulin Volcano National Monument boundary

Figure 2. Vegetation and herpetofauna sampling sites, CAVO.





Figure 3. Crater Grassland.



Figure 5. Disturbed Grassland.



Figure 4. Pinyon-Juniper.



Figure 6. Lowland Grassland.



Figure 7. Gambel Oak.



Figure 8. Ponderosa.



Figure 9. Tulip pricklypear (*Opuntia phaeacantha*)

### **Reptiles and Amphibians**

Two pitfall arrays were open on 11 May 2002, and four were open on 12 May 2002. Four were trapped 2-5 July and 29 July –1 August 2002 (Figure 2). Two cover boards were set out from 11 May-1 August 2002 and checked daily during the trapping periods. We also conducted walking surveys during the first two visits (Figure 2).

### **Birds**

At CAVO, habitats targeted for survey outside of point counts included the residential area, visitor center, the crater rim, and within the crater itself. We surveyed 2 transects in 2 habitats, between 28-29 May and 11-12 June 2002 (Figure 10).

### **Mammals**

We set pitfall (Figure 2) and Sherman traps (Figure 3) for three nights on each of three visits: 10-13 May, 3-6 June, 29 July-1 Aug, 2002. Two tracking stations were placed in open grassland east of the visitor center. During the May 2002 survey, the nights were very windy. During the June 2002 survey, it rained at night, and the tracking stations were not set up.

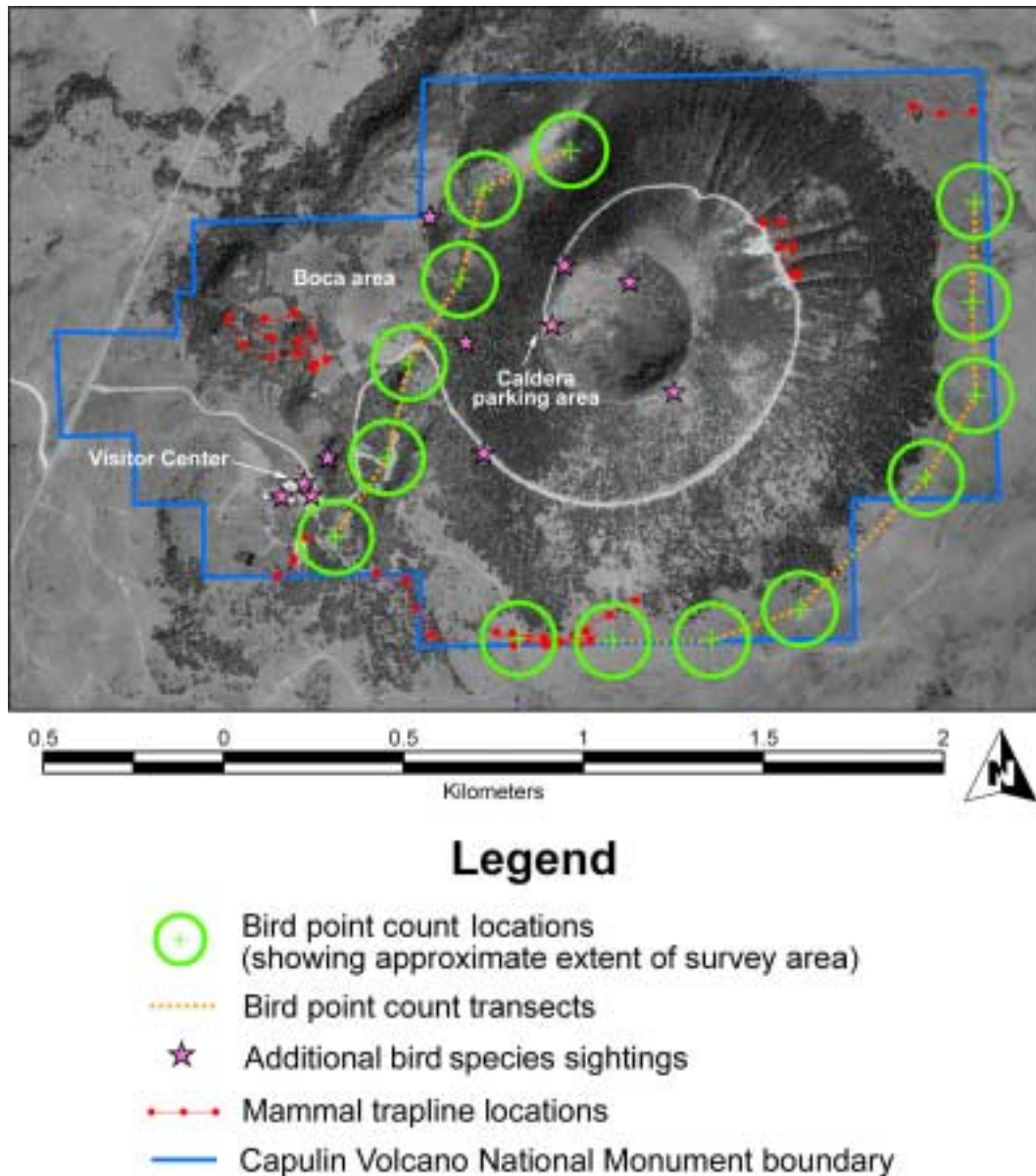


Figure 10. Bird and mammal sampling sites, CAVO.

### Results

#### Vascular Plants

##### Target List

The original target list contains 230 species. Twenty-one of these species were removed because the species are not known to occur in New Mexico, the CAVO herbarium specimens may be misidentified, or habitat was not suitable. For example, roundleaf monkeyflower, *Mimulus glabratus*, which is a riparian plant, and one removed species (*Lycurus phleoides*) is a nomenclatural change, on the revised target list as *L. setosus* (Appendix 1). This leaves a revised target list of 208 species (Appendix 2)



### Field Survey

The field survey identified 146 (98 of which are on the revised target list) plant species, subspecies, or varieties, (representing 43 families, 115 genera, and 146 species). We found four trees, 17 shrubs, 7 sub-shrubs, 32 grasses, and 86 forbs on the park. Of the 146 species detected, 123 species were collected and one was photographed for vouchers. The photographed specimen is a cactus, tulip pricklypear (*Opuntia phaeacantha*, Figure 9). The remaining 22 species were not collected because they lacked either flowers or fruits necessary for identification or were otherwise unsuitable for vouchers. Of the 146 species observed, 47 species were not on the revised target list. Thus, we found 47.1% of species on the revised target list, and 62.4% of the number of species on the final species list. We added an additional 88 plant species that were not found during the survey to the final species list, because CAVO and MSB herbaria vouchers existed for them (Appendix 3). In summary, 189 of 208 target species, 91%, were accounted for (101 observed and 88 in herbarium specimens). Of actual and potential plants found, 243 (Appendix 3) of 255 or 92% were documented (208 on revised target and 47 observed that were not on the target list).

Eleven of these 88 are introduced species. While potential habitat for the herbarium specimens is present at CAVO, it is possible that some of the CAVO herbarium vouchers are misidentified or were collected off the site. We therefore recommend that these 88 specimens be reviewed for accuracy. No rare or sensitive species was observed during the survey.

To address the invasive weed situation, the State of New Mexico categorized species into classes A, B, and C (Table 4). Class A weeds are not native to an ecosystem and are not currently present in New Mexico or have limited distribution. Preventing new infestations of these species and eradicating existing infestations is the highest priority. Class B weeds are not native to an ecosystem and are presently limited to a particular area of the state. Management priorities are to contain them within their current areas and prevent infestations in new areas. Class C weeds are not native to the ecosystem, but they are widespread throughout the state. Management decisions for these species should be determined at the local level, based on feasibility of control and level of infestation. Long-term programs of management and suppression are encouraged (Lee, no date; USDA and NRCS, 2002).

The final species list contains 21 introduced species (Table 3), ten of which were located during the survey. Eleven are vouched in the CAVO herbarium. While none of these species is federally listed as noxious, one species (*Convolvulus arvensis*) is listed by the State of New Mexico as a Class C noxious weed (Table 4). The NM state list does not include every plant species with a potential to negatively impact the state's environment and economy, but the State of New Mexico encourages vegetation managers to recognize plant species listed on noxious weed lists in other western states as having potentially negative impacts and to manage them accordingly. Eight species on the final species list (*Bromus tectorum*, *Cichorium intybus*, *Chenopodium album*, *Cynoglossum officinale*,

*Descurainia sophia*, *Kochia scoparia*, *Salsola tragus*, and *Verbascum thapsus*) are listed as noxious by other states (Table 5).

**Table 3. Introduced species found at CAVO**

Scientific Name	Observer or Source if other than NMNHP	NM Status
<i>Agropyron cristatum</i>	CAVO Herbarium	None
<i>Bromus inermis</i>	CAVO Herbarium	None
<i>Bromus japonicus</i>	CAVO Herbarium	None
<i>Bromus tectorum</i>	CAVO Herbarium	None
<i>Echinochloa crus-galli</i>	CAVO Herbarium	None
<i>Setaria pumila</i>	CAVO Herbarium	None
<i>Setaria viridis</i>		None
<i>Chenopodium album</i>	CAVO Herbarium	None
<i>Cichorium intybus</i>	CAVO Herbarium	None
<i>Convolvulus arvensis</i>		Class C
<i>Cynoglossum officinale</i>	CAVO Herbarium	None
<i>Descurainia sophia</i>	CAVO Herbarium	None
<i>Euphorbia davidii</i>		None
<i>Kochia scoparia</i>		None
<i>Marrubium vulgare</i>		None
<i>Melilotus officinalis</i>		None
<i>Polygonum convolvulus</i>		None
<i>Salsola tragus</i>		None
<i>Tragopogon dubius</i>	CAVO Herbarium	None
<i>Tragopogon pratensis</i>		None
<i>Verbascum thapsus</i>		None

**Table 4. New Mexico Noxious Weed List**

The New Mexico Department of Agriculture has selected the following plant species to be targeted as noxious weeds for control or eradication pursuant to the Noxious Weed Management Act of 1998		
<b>Latin name</b>	<b>Common Name</b>	<b>Origin</b>
<b>Class A Weeds</b>		
<i>Alhagi pseudalhagi</i>	Camelthorn	Asia
<i>Asphodelus fistulosus</i>	Onionweed	Mediterranean
<i>Cardaria draba</i>	Hoary Cress	Europe
<i>Centaurea calcitrapa</i>	Purple Starthistle	Europe
<i>Centaurea diffusa</i>	Diffuse Knapweed	Mediterranean
<i>Centaurea maculosa</i>	Spotted Knapweed	Eurasia
<i>Centaurea solstitialis</i>	Yellow Starthistle	Europe
<i>Cirsium arvense</i>	Canada Thistle	Eurasia
<i>Drymaria arenarioides</i>	Alfombrilla	Mexico
<i>Euphorbia esula</i>	Leafy Spurge	Eurasia
<i>Hydrilla verticillata</i>	Hydrilla	South Africa
<i>Hyoscyamus niger</i>	Black Henbane	Europe
<i>Isatis tinctoria</i>	Dyer's Woad	Europe
<i>Lepidium latifolium</i>	Perennial Pepperweed	South Europe
<i>Linaria genisitifolia</i> ssp. <i>dalmatica</i>	Dalmatian Toadflax	Europe
<i>Linaria vulgaris</i>	Yellow Toadflax	Eurasia
<i>Lythrum salicaria</i>	Purple Loosestrife	Europe
<i>Myriophyllum spicatum</i>	Eurasian Watermilfoil	Eurasia
<i>Onopordum acanthium</i>	Scotch Thistle	Europe
<b>Class B Weeds</b>		
<i>Acroptilon repens</i>	Russian Knapweed	Eurasia
<i>Carduus nutans</i>	Musk Thistle	South Europe
<i>Centaurea melitensis</i>	Malta Starthistle	Europe
<i>Cirsium vulgare</i>	Bull Thistle	Eurasia
<i>Conium maculatum</i>	Poison Hemlock	L. Europe
<i>Dipsacus fullonum</i>	Teasel	Europe
<i>Halogeton glomeratus</i>	Halogeton	Asia
<i>Peganum harmala</i>	African Rue	North Africa
<b>Class C Weeds</b>		
<i>Aegilops cylindrica</i>	Jointed Goatgrass	South Europe
<i>Convolvulus arvensis</i>	Field Bindweed	L. Europe
<i>Elaeagnus angustifolia</i>	Russian Olive	L. Europe
<i>Tamarix</i> sp.	Saltcedar	Europe
<i>Ulmus pumila</i>	Siberian Elm	Europe

**Table 5. Noxious weed information showing state status for species that are listed as noxious in states other than New Mexico.**

Scientific Name	Common Name	State	Listing
<i>Bromus tectorum</i>	downy brome/cheatgrass	Colorado	Noxious weed
<i>Cichorium intybus</i>	Chicory	Colorado	Noxious weed
<i>Chenopodium album</i>	common lambsquarters	Minnesota	Secondary noxious weed
<i>Cynoglossum officinale</i>	Houndstongue	Colorado	Noxious weed
		Montana	Category 1 noxious weed
		Oregon	B designated weed
		Washington	Class C noxious weed
		Wyoming	Noxious weed
<i>Descurainia sophia</i>	flixweed	Colorado	Noxious weed
		Minnesota	Secondary noxious weed
<i>Kochia scoparia</i>	kochia	Colorado	Noxious weed
		Minnesota	Secondary noxious weed
		Oregon	B designated weed
		Washington	Class B noxious weed
<i>Salsola tragus</i> *	prickly Russian thistle	California	C list (noxious weeds)
		Colorado	Noxious weed
		Ohio	Prohibited noxious weed
<i>Verbascum thapsus</i>	common mullein	Colorado	Noxious weed
		Hawaii	Noxious weed
		Washington	Class C noxious weed
*Plant Synonyms:			
<u>Current</u>	<u>Old</u>		
<i>Salsola tragus</i>	<i>Salsola australis</i>		
	<i>Salsola iberica</i>		
	<i>Salsola kali</i> L. ssp. <i>ruthenica</i>		
	<i>Salsola kali</i> L. ssp. <i>tenuifolia</i>		
	<i>Salsola kali</i> L. ssp. <i>tragus</i>		
	<i>Salsola pestifer</i>		
	<i>Salsola ruthenica</i>		

## Reptiles and Amphibians

The original target list (Appendix 4) contained a few unlikely species. A few park records; e.g., *Kinosternon flavescens* and *Rana pipiens*, probably represent exceptional migratory events but are unlikely to occur within the CAVO park boundary on a regular basis. We also took *Chelydra serpentina*, *Crotalus atrox*, *Crotalus molossus*, *Natrix sipedon*, *Liochlorophis (Opheodrys) vernalis*, and *Uta stansburiana* off the list after review of Museum of Southwestern Biology records and because habitat types at CAVO are incompatible with these species' requirements. *Thamnophis elegans* and *Thamnophis*

*radix* were added to the list as possible species because of habitat preferences and records. Additionally, a name change from *Pituophis melanoleucus sayi* to *Pituophis catenifer* should be noted (Rodríguez-Robles et al., 2000). Finally, *Sonora episcopa* is an old synonym of *Sonora semiannulata* and is essentially a geographic variant of *S. semiannulata*. The CAVO revised target list (Appendix 5) contains 34 species of reptiles and amphibians.

We spent 19 person hours on active area searches for herpetofauna at CAVO. We documented 8 species within the park, 23.5% of the target list. Four of the eight observed species were captured in 31 drift-fence trap days. Coverboard arrays were not effective.

The final species list for CAVO (Appendix 6) includes two species seen by CAVO park staff, *Thamnophis elegans* and *Crotalus viridis*, which were included because they are easily identified and were described by park staff. Including these two species brings our total to 10, or 29% of the target list (see Conclusions for possible explanations).

## **Birds**

### Target List

The official CAVO bird checklist included species that had been observed at habitats outside the park boundaries; for example, several grassland species were included. Although grassland surrounds the park, grassland patches on the park are so small that these species would not be expected as typical breeders. Therefore, we removed these species for the revised target list.

The original target list included 58 species. Nine species were removed (reasons for removal detailed in Appendix 7). Fourteen were added because they were observed, leaving 63 species on the revised CAVO target list included (Appendix 8). The final species list contains 59 species. Three of these 59 species observed during the 2002 breeding season were migrants and were therefore not added to the revised target list: pine siskin (*Carduelis pinus*, observed by NMNHP staff), rufous hummingbird (*Selasphorus rufus*, observed by NPS staff), and yellow-rumped warbler (*Dendroica coronata*, observed by NPS staff). Thus, 56 of 63 species, or 88.9% of the species on the target list were detected by NMNHP or park staff in 2002.

In total, 16 target list species were not observed by NMNHP staff, nine because they were reported by park personnel and 7 that were missed altogether. This gives a detection rate of 74.6% of target species by NMNHP staff (Appendix 9).

### Species Richness

We surveyed in two habitats, grassland and pinyon-juniper. Considering all species observed by NMNHP or NPS staff during the breeding season (59 species), grassland habitats accounted for 45.8% (27 species), while pinyon-juniper habitats accounted for 78.0% (46 species), and human-impacted areas accounted for 25.4% (15 species) of all species observed (20 species used more than one habitat).

### Relative Abundance

We detected 22 species on point counts (37.3% of all target species observed by NMNHP, NPS, or NMBBA). We observed 128 birds on four days of point counts. Adjusted for the number of points in each habitat type (8 points in grassland, 6 in pinyon-juniper), grassland points accounted for 37.6%, and pinyon-juniper 62.4%, of all birds detected on points counts.

Spotted towhee (*Pipilo maculatus*) was by far the most commonly detected species on point counts, with 25.8% of all detections. Green-tailed towhee (*Pipilo chlorurus*) was the second most common species on point counts, with 11.7% of all detections. Chipping sparrow (*Spizella passerina*) was the third commonest species, with 6.3% of all detections. The remaining 19 species each averaged less than 3.0% ( $\pm 1.8\%$ ) of all detections.

### **Mammals**

The eastern cottontail (*Sylvilagus floridanus*) was removed from the target list, because it occurs further east (Hall, 1981) or further south (Findley *et al.*, 1975). It was very unlikely that the banner-tailed kangaroo rat (*Dipodomys spectabilis*) would be captured. Museum records (MSB database) do not indicate a single specimen captured in the northeastern corner of New Mexico, including Colfax, Union, Mora, San Miguel and Quay Counties. It is also very unlikely that the non-native red fox (*Vulpes vulpes*) occurs in this area, because previous records indicate that it prefers more mesic, high-elevation mountain areas and is very rare in New Mexico (Findley *et al.*, 1975). We added three species to the target list. Distributions of two vole species, the meadow vole (*Microtus pennsylvanicus*) and the long-tailed vole (*Microtus longicaudatus*) suggest that either could occur in the park (Findley *et al.*, 1975; Hall, 1981). Two specimens of the hispid cotton rat (*Sigmodon hispidus*) were caught not far from Capulin in 1978, and this species was also put on the list of possible species.

Out of the 46 species of mammals on the target list, we detected 18 mammal species on our survey, or 39%. We include one additional species, the mountain cottontail, that we observed near the park, because it is highly likely to occur within the park, for 41.3%. The pronghorn antelope, also observed near the park, is less likely to occur within the park because of fences and limited habitat; it was therefore not counted for the detection percentage. Although we were not surveying for bats, we found one species. Three more species were observed by park staff, yielding 23 species for this report, or 50% of the target list. Parmenter *et al.* (2000) found six bats, which, if included, gives 29 total mammal species, or 63% of the target list (Appendix 12).

**Insectivores:** Only a single species of *Sorex* was captured by the pitfall traps. It is most likely a masked shrew (*Sorex cinereus*), which can be easily confused with Merriam's shrew (Findley *et al.*, 1975). Dwarf shrew (*Sorex nanus*), Merriam's shrew (*Sorex merriami*) and desert shrew (*Notiosorex crawfordi*) were on the target list, but they were not captured. Shrews are difficult to capture, hence there is little known about their true distribution and ecology. It is possible that these species are present or show up occasionally on the park but avoid detection because of their secretive habits.

Chiroptera: We did not use nets to capture and identify bats, but we found a Townsend's big-eared bat (*Corynorhinus townsendii*, Figure 11), a US Fish and Wildlife Service species of concern) roosting in a small rock crevice during the day.

Carnivora: Most carnivores were detected by observing tracks or fecal droppings. The tracking stations were not effective in attracting small or medium-sized carnivores. It is possible that the metal surfaces were alien to the animals, and they avoided stepping on them, leaving the bait untouched. We observed gray fox (*Urocyon cinereoargenteus*) feces around the service buildings, and CAVO staff reported seeing gray fox at the park. We observed badger (*Taxidea taxus*) on one occasion. During the June survey, a black bear (*Ursus americanus*) spent a couple of nights on the national monument. We heard coyotes (*Canis latrans*) in the evening but did not observe them. However, park staff reported that they frequently observe these animals in the park. According to CAVO staff, a mountain lion (*Felis concolor*) occasionally spends a couple of days in the park, but their visits are irregular.

Despite our efforts, several carnivore species from the target list went undetected. We found no sign of ringtail (*Bassariscus astutus*), raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), western spotted skunk (*Spilogale gracilis*), striped skunk (*Mephitis mephitis*), western hog-nosed skunk (*Conepatus mesoleucus*) or bobcat (*Lynx rufus*). While some carnivores are easy to detect, others have secretive habits. Also, carnivores have low population densities relative to their prey, which makes them difficult to detect. When rodent populations are low, their predators suffer also and might be forced to hunt in a larger area. For these reasons, it is difficult to detect these animals at a given locality.

Leporidae: We observed cottontail (*Sylvilagus* spp.) with the spotlight while we were driving near the park, but we did not spot a specimen on the park. We identified the specimen as a mountain cottontail (*Sylvilagus nuttalli*). This species is easily confused with the eastern cottontail. Where both species are present they can only be distinguished by comparing skull measurements and skull morphology (Findley et al., 1975). We identified it based on the range of the eastern cottontail.

Other rabbit species, such as the blacktailed jackrabbit (*Lepus californicus*) and the desert cottontail (*Sylvilagus audubonii*) were not detected. The desert cottontail and other cottontail species are probably out-competed locally by mountain cottontail. The absence of jackrabbits is harder to explain. Usually jackrabbits are easy to detect by spot-lighting. It is possible that grazing around Capulin Volcano National Monument has a negative effect on jackrabbits. The presence of competing cows and vulnerability to medium-sized predators (coyotes, mountain lion) could make the area less favorable for jackrabbits.

#### Rodentia

Sciuridae: We found two squirrel species on the national monument. Rock squirrels (*Spermophilus variegatus*, Figure 12) were observed at two different locations. A single

specimen of Colorado chipmunk (*Tamias quadrivittatus*) was captured in the boca area. These two species are probably the only squirrel and chipmunk species on the park, dominating the available ecological niches. Other potential species, such as least chipmunk (*Tamias minimus*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), and spotted ground squirrel (*Spermophilus spilosoma*) were not found. While it is not unusual in New Mexico to find several species of chipmunks and squirrels at the same locality, sites that support a variety of chipmunk species usually also have a broad range of habitats. The Capulin Volcano is relatively small and does not have enough variation in vegetation to support a variety of chipmunk species.

**Heteromyidae:** The Heteromyidae are North American, arid-habitat specialists. Most species in the heteromyid family are desert species, but a few are adapted to grassland habitats. We captured the Ord's kangaroo rat (*Dipodomys ordii*) and a smaller species, the hispid pocket mouse (*Chaetodipus hispidus*), both typical grassland species. Other possible species, such as silky pocket mouse (*Perognathus flavus*), were not detected, but it is still possible that this species is present. The silky pocket mouse is much smaller than Ord's kangaroo rat and the hispid pocket mouse, hence this species is much more sensitive to environmental fluctuations.

**Geomyidae:** Geomyids are fossorial, North American rodents. Botta's pocket gopher (*Thomomys bottae*) was observed and captured in the yard of one of the park rangers. This species is probably quite common at the park; however, it might be difficult to capture because it could be inactive for most of the year.

**Muridae:** This is the most diverse taxonomic group at the park. We captured several species of deer mouse (*Peromyscus* spp.): North American deer mouse (*Peromyscus maniculatus*), pinyon deer mouse (*Peromyscus truei*), northern rock deer mouse (*Peromyscus nasutus*), and brush deer mouse (*Peromyscus boylii*). The area was dominated by scrub specialist deer mouse species such as the northern rock deer mouse and brush deer mouse. Not only were these species captured in their typical habitats, but they dominated open grasslands in the park. The North American deer mouse, a grassland specialist, was present, but it was captured in much lower numbers than the rock deer mouse and brush deer mouse. Mexican woodrat (*Neotoma mexicana*) was captured on several occasions at the lower elevation in transition zones between grassland and juniper woodland. We captured two specimens of western harvest mouse (*Reithrodontomys megalotis*) in the grassland-juniper woodland transition zone on the eastern border of the park. A single specimen of northern grasshopper mouse (*Onychomys leucogaster*) was found in one of the pitfall traps at the eastern edge of the park.

Several other target species were not found at the park. The white-footed deer mouse (*Peromyscus leucopus*) was the only missing species among the potential deer mouse species. Also, only one species of woodrat was found at the park. Two other similar species (*Neotoma albigula*, *N. micropus*) were absent. Woodrats are relatively large rodents, and their population density is typically low compared to smaller rodents. Due



to strong competition between woodrat species, it is rare to find two species at the same locality, unless the locality is in a transition zone between distinct habitat types.

We did not find any voles (*Microtus* spp.) at the park. While the presence of at least one species in the area is very likely, it is possible that unusually dry weather before and during the survey caused local extinction of vole populations. We also did not capture any hispid cotton rats (*Sigmodon hispidus*). Two specimens were caught almost 25 years ago approximately 10 miles north of the park. Because no other records indicate the presence of this species in the area, it is difficult to know whether it was present 25 years ago due to some unusual weather pattern, or its absence during our present survey was caused by the dry spring and summer.

Erethizontidae: Porcupines (*Erethizon dorsatum*) strip bark from juniper. These marks were frequently observed on trees at the top of the cone. Park rangers confirmed that they had occasionally seen these easily-recognized animals. One or two individuals probably wander on and off the park.

Ungulates: Mule deer (*Odocoileus hemionus*) was the only ungulate we observed inside the park. Sign (fecal droppings, hoof prints, shredded antlers) indicated that mule deer utilized every major habitat of the park, including the steep slopes of the volcanic cone, the caldera, and the open grasslands ringing the volcano cone. We observed and photographed pronghorn (*Antilocapra americana*) as it was grazing 10 feet from the park boundary. Park rangers reported seeing pronghorn all around the park, but they could not recall observing pronghorn inside the park. Park rangers also mentioned that they see elk rarely (*Cervus elaphus*) outside the park.



**Figure 11. Townsend's big-eared bat.**



**Figure 12. Rock squirrel.**

## Conclusions

### Vascular Plants

Due to low spring and summer precipitation, we conducted only a fall survey in 2002. The single survey and drought conditions may account for the fairly large number of targeted species that were not found during the survey.

No threatened or endangered plants were located during the field survey. Only one rare plant, Spellenberg's groundsel (*Packera spellenbergii*), is known to occur in Union County, and suitable habitat for this species was not found within the park boundary.

Noxious or invasive weeds can be defined as "any plant or plant product that is not native to a particular ecosystem and can directly or indirectly injure or cause damage to the natural resources of the United States, the environment, the public health, crops (including nursery stock or plant products), livestock, poultry or other interests of agriculture, irrigation, or navigation" (Lee, no date). Invasive weeds are a serious threat to both public and private lands and have been referred to as a biological wildfire that is out of control and spreading rapidly throughout the western United States. Invasive weeds have displaced native vegetation, damaged watersheds, increased soil erosion, reduced recreational activities, increased management input, and reduced opportunities for land use. Weeds have invaded approximately 17 million acres of public lands and have quadrupled their range from 1985 to 1995. This value does not include the rate of spread on non-federal lands, so the rate of spread and its impact is actually much greater. More information on noxious weeds can be found at <http://wric.ucdavis.edu/index.html>.

The final species list contains 21 introduced species. Prickly Russian thistle (*Salsola tragus*), common in disturbed grasslands habitats, and slim amaranth (*Amaranthus hybridus*) are the two most widespread introduced species in the park. We field mapped a large patch of prickly Russian thistle, located in the NE corner of the park (Figure 2). Nine introduced species, including prickly Russian thistle, are recognized as noxious by the State of New Mexico or other states (Tables 4 and 5), but most fall into the Class C category (not native to the ecosystem, but widespread in the state). Management decisions for these species should be determined at the local level based on feasibility of control and level of infestation. Long-term programs of management and suppression are encouraged.

### Reptiles and Amphibians

Cover-board arrays were not productive. They are usually more effective for very specific target species; e.g., montane plethodontid salamanders.

We detected only 29% of the species on the revised target list (Appendix 6). The entire survey period was affected by drought, which occurred from the winter of 2002 through early fall, 2002. This drought affected other herpetofaunal research and monitoring efforts (M. Goode, pers. comm.) in the southwest. Drought usually causes amphibians and reptiles to remain underground in refugia, and they are physiologically suited to wait until adequate surface moisture is present.

To increase the number of species detected, surveys should be conducted in a year when drought is not a factor. More survey dates scheduled throughout the warm seasons should also be effective. Amphibian surveys would likely be more successful during a more normal monsoon season.

## **Birds**

### Target List

This bird inventory detected 74.6% of the target species, 88.9% when park staff observations are included. Sixteen species – prairie falcon, American kestrel, calliope hummingbird, black-chinned hummingbird, Lewis’s woodpecker, hairy woodpecker, downy woodpecker, cliff swallow, juniper titmouse, Bewick’s wren, canyon wren, hermit thrush, black-throated gray warbler, canyon towhee, Cassin’s sparrow, and house sparrow (scientific names in Appendix 8) – were not observed by NMNHP staff during 2002 site visits, but only seven were not observed by either NMNHP or park staff (Appendix 8). None of these species, except for canyon towhee, was previously noted as abundant or common resident or summer birds. Several of the undetected species are limited to higher-elevation coniferous forests (Hubbard 1978, Parmeter 2002) and are likely quite rare due to the limited area of this forest type on CAVO. The absence of other typical pinyon-juniper species such as juniper titmouse and canyon towhee is somewhat surprising. These species might be detected in low numbers with repeated survey.

### Partners In Flight Species of Concern

The breeding season species with the highest national PIF total scores were Virginia’s warbler (*Vermivora virginiae*, 25); prairie falcon, Lewis’s woodpecker (*Melanerpes lewis*) and Cassin’s kingbird (*Tyrannus vociferans*, 23); and black-chinned hummingbird (*Archilochus alexandri*) and black-throated gray warbler (*Dendroica nigrescens*, 22). Of breeding-season species found in this study or previously on CAVO, Virginia’s warbler had a NMPIF priority score of 25, while Lewis’s woodpecker and black-throated gray warbler received scores of 24.

### Park Checklist

The CAVO park checklist is a comprehensive list compiled by an unknown observer over many years of observation. It appears largely accurate, but several transient or migrant species are incorrectly classified as summer residents and vice versa.

### Conservation and Management Recommendations

The absence of livestock grazing on CAVO has apparently encouraged an increased diversity of grassland birds, especially ground- and shrub-nesting birds such as vesper sparrows (*Pooecetes gramineus*) and lark sparrows (*Chondestes grammacus*). At the same time, conifers appear to be invading several areas of grassland and potentially decreasing the area of habitat favored by grassland birds. Efforts to clear these areas, either mechanically or by prescribed fire, will help maintain grassland habitats should forest encroachment become severe.

The human structures and planted deciduous trees have likely also encouraged the abundance of canopy species such as Bullock's oriole (*Icterus bullockii*) and western kingbird (*Tyrannus verticalis*), while modern building structures provide nesting substrates for species such as house wren (*Troglodytes aedon*), Say's phoebe (*Sayornis saya*), and northern flicker (*Colaptes auratus*).

## Mammals

In this study, species richness could have been limited by the small size of the park, which limits habitat diversity; the island-like isolation of the pinyon-juniper habitat; the steep slope and elevation change of the cone; and the absence of a perennial water source.

The park was dominated by species that have broad habitat preferences (*Peromyscus* spp., *Neotoma* spp.) and are efficient in dispersing. At lower elevations we captured typical grassland species (Ord's kangaroo rat, hispid pocket mouse, northern grasshopper mouse). In higher-elevation forested habitats, species richness became gradually poorer. On the steep slopes of the volcanic cone we found very few species. Two species of deer mouse were the only rodents captured at the higher-elevation trapping site. The crumbly volcanic soil is probably unfavorable for many rodent species.

Some species were added to the target list based on their occurrence near the park. These species could require specific habitats that do not occur on the park. Alternatively, they may have colonized habitats in the park in unusual years, such as wet years, and then retreated to their normal refugia under less favorable climate conditions.

This inventory provides a snapshot of the mammalian diversity at CAVO. We are confident that we detected most mammalian species that were present at the park at the time of our survey. During surveys the number of captured species increases with time, following a saturation curve. Rare animals are hard to capture or observe, but as the length of the survey increases, the likelihood of detecting rare species increases. With three-day trapping periods, a few rare mammalian species might have gone undetected, but we did detect some difficult-to-observe species; for example, the masked shrew. Similarly, the Colorado chipmunk was caught only once, which might indicate that this species exists in very low numbers at the park. Larger species, especially carnivores, have large home ranges that could not be contained in the park. We were lucky that a black bear showed up at the park during our stay. However, one can spend a month at the park without seeing sign of mountain lions, even though park staff experience suggests that the home range of at least one individual includes the park.

Certain species that might be present in one year could be absent in another year, due to weather variation. Previous collectors found several species of pocket mouse in the geographic area, but we found only a single species of pocket mouse at the park. The probable explanation for this poor species richness might be that 2002 was extremely dry during the spring and summer, and pocket mouse species, which are small, might have stayed inactive during this very dry period. Similarly, voles were caught in Union County on several occasions (MSB database), but we caught none during the survey.

Vole species require a relatively mesic environment, and the unusually dry weather during the survey might have adversely affected their populations.

Species distribution can change considerably across decades. Evidence for climate-change-driven range extension of certain species can be found in museum records (Frey, 1992). Prior to our survey, researchers from the Museum of Southwestern Biology collected mammals in Union County in 1994. . Previous to the 1994 collection, museum specimens from this area date from 1960-1984. Comparing species diversity among these collection trips might be misleading, because climatic differences might have changed the distribution range of species. Change in distribution might be expected at CAVO in particular, because this area is on the transition zone between the Great Plains and the Rocky Mountains. The southwestern limit of the distributions of several mammal species formerly occurred in Union County (e.g. *Microtus pennsylvanicus*, *M. ochrogaster*). Several other species typical of the Rocky Mountains have their eastern distribution limits in this area (e.g., *Sorex nanus*, *S. merriami*). Species that are at their limit of environmental tolerance are very sensitive to subtle change in climatic conditions, and they are the most likely to disappear or appear at these locations.

Increased survey effort in a wetter year would undoubtedly reveal more target species than were detected on this survey. The use of baited camera stations and more of the Tomahawk traps would probably increase detections of medium-sized mammals.

### **Fort Union National Monument**

#### ***Introduction***

FOUN contains 720 acres of prairie in two noncontiguous parcels in northeastern New Mexico, midway between Santa Fe and Raton (Figure 13). The monument is on the southwestern fringe of the Great Plains short-grass prairie, at an elevation of 6,800 feet. For forty years (1851-1891) Fort Union served the region as a military supply depot, arsenal, and frontier military post. During its active period, three successive forts were constructed in the area, and the majority of the remains of each fort are contained within the monument boundaries. Fort Union is surrounded by a 96,000-acre cattle ranch that pre-dates the abandonment of the post in 1891. The monument has been fenced from grazing since its establishment in 1956. It contains the largest set of adobe ruins in the United States and sits astride the Mountain Branch of the Santa Fe Trail. Many trail swales are preserved within the monument. Since establishment, the focus at FOUN has been on the preservation and interpretation of the cultural and historical resources. Almost no scientific studies or inventories of the plant and animal resources of the park have previously been conducted.

Habitats of special interest include the adobe ruins for which the park was established and a few trees in the northwest corner of the park and near the visitor center that could provide breeding or migratory habitat for migratory birds. The ruins may also provide roosting habitat for bats and shelter for reptiles. The re-vegetation of areas disturbed during ruins stabilization or trail repair projects is of special concern. Recent efforts to re-

seed with native grasses have been unsuccessful, and unwanted species, such as Russian thistle, have taken advantage of the disturbed soil. Identification of these species would



**Figure 13. Grassland habitat at FOUN, old fort section.**

assist with weed management. As a corollary, the monument would like to establish native grasses inside the perimeter of the stone foundations of ruined structures.

The New Mexico Natural Heritage Program has been conducting inventories of vascular plants, mammals, and herpetofauna and creating a vegetation map, under a separate contract with the park, leaving only birds to be inventoried (Table 6). . Original and revised target lists for birds are contained in Appendices 13 and 14.

**Table 6. Inventory status of vascular plants, vertebrates, and species/areas of special concern at FOUN, prior to this project.**

Category	Pre-project inventory status	
	Presence/absence	Distribution and abundance
General vegetation	Not needed	Not needed
Weed species	Not needed	Not needed
General fish	N/A	N/A
Amphibians and reptiles	Not needed	Not needed
Breeding birds	Needed	Not needed
General mammals	Not needed	Not needed

No T&E or exotic species have been identified in the park; however, invasive plants may be detected by the vegetation survey and mapping study being performed by NMNHP.



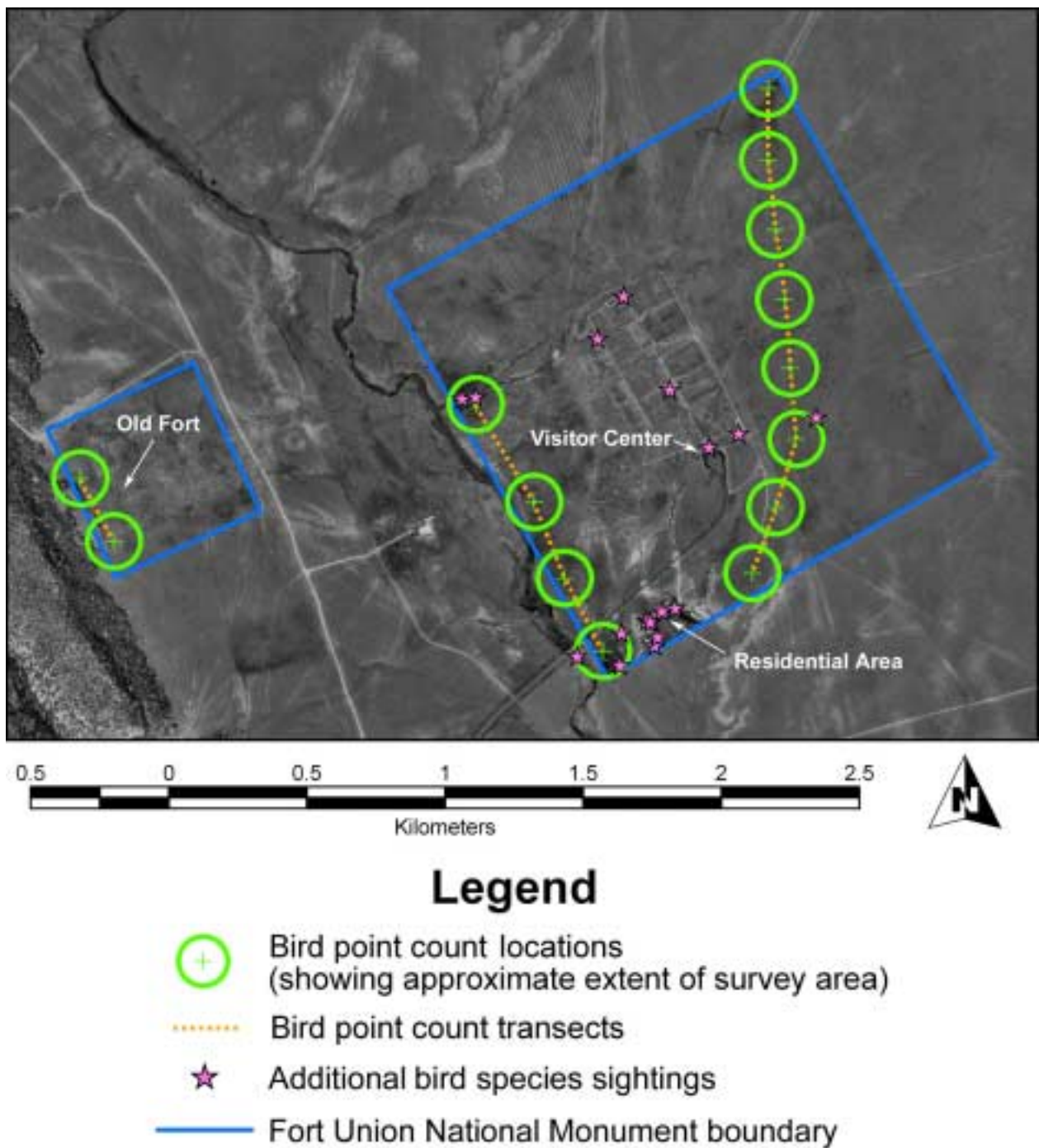


Figure 14. Bird sampling locations, FOUN.

*Methods*

At FOUN, habitats targeted for survey outside of transects included areas in and/or around the residential area, the visitor center, the remains of historical adobe structures, the sewage ponds, and the southwest monument boundary near Wolf Creek.

We conducted point count surveys of three transects in grassland habitat, one adjacent to wetland/riparian, and one adjacent to pinyon-juniper habitats, between 30-31 May and 13-14 June 2002 (Figure 14).

## *Results*

### **Birds**

#### Target List

The FOUN bird checklist included species that had been detected in habitats outside the park; for example, pinyon-juniper and wetland/playa. Although these habitats occur in the county not far from the park, species particular to these habitats would not be expected as typical breeders. We therefore removed these species for the revised target list.

The original FOUN target list included 59 species. Twenty of these species were removed (reasons for removal documented in Appendix 13). Thirteen species that were observed but were not on the original list were added, for a total of 52 target species on the revised target list (Appendix 14). Ten other species were observed during the 2002 breeding season but were excluded from the revised target list, because they were typical of and occurred in habitats immediately outside park boundaries and were unlikely to be detected inside park boundaries. These included several woodland- or scrub-associated birds such as western wood-pewee (*Contopus sordidulus*), spotted towhee (*Pipilo maculatus*), and Virginia's warbler (*Vermivora virginiae*). In total, six target list species were not observed by NMNHP staff; four were observed by no one and two were observed by NPS staff but not NMNHP staff (Appendices 14 and 15). Thus, 88.5% of target species were detected by NMNHP staff; 92.3% were detected if NPS sightings are included.

#### Species Richness

In considering all species observed by NMNHP, NPS, or NMBBA staff during the breeding season (58 species), grassland habitats accounted for 55.2% (32 species), pinyon-juniper habitats accounted for 43.1% (25 species), and riparian habitats for 34.5% (20 species) of all species observed.

#### Relative Abundance

We detected 20 species (34.5% of all species observed by NMNHP, NPS, or NMBBA) on point counts. We detected 165 individual birds on 4 days of point counts. Adjusted for the number of points in each habitat type (8 points in grassland, 2 in pinyon-juniper, and 4 in riparian), grassland points accounted for 10%, pinyon-juniper for 15%, and riparian points for 75% of all birds detected on points counts. These results were weighted by a riparian habitat point containing 80 perching brown-headed cowbirds (*Molothrus ater*). Reducing this flock to a single bird brought the total detections to 86



birds and the adjusted total detections per habitat to 20% for grassland points, 21% for pinyon-juniper points, and 59% for riparian points.

Brown-headed cowbird (*Molothrus ater*) was obviously the most commonly detected bird, with 48.5% of detections. Cliff swallow (*Petrochelidon pyrrhonota*) and western meadowlark (*Sturnella neglecta*) were the second and third commonest species, with 13.3% and 12.2% of total detections, respectively. The average percentage of total detections for the remaining 17 species was 1.5% ( $\pm 1.2\%$ ). Reducing the cowbird flock to a single bird would elevate cliff swallow and western meadowlark to first and second commonest species, with 25.6% and 23.3% of total detections, respectively. Mourning dove (*Zenaida macroura*) was the third commonest species under this adjustment, with 9.3% of all detections. Under this adjustment, the remaining 17 species each averaged less than 2.5% ( $\pm 1.7\%$ ) of all detections.

### *Conclusions*

#### Target List

This bird inventory detected 92.3% of the target species. Four target species, golden eagle, scaled quail, common poorwill, and house sparrow (scientific names in Appendix 14), were not detected during 2002. None of these species, with the exception of house sparrow, are noted as common in the FOUN checklist. The reasons for non-detection of house sparrows (*Passer domesticus*) is unclear. Additional survey efforts during the breeding season would have likely increased the species list to include those species observed by NPS or NMBBA staff.

#### Partners In Flight Species of Concern (abbreviated for FOUN)

Species with high national PIF priority scores found in this study or previously on FOUN or in the vicinity included scaled quail (*Callipepla squamata*, 25), prairie falcon (*Falco mexicanus*, 23), and black-chinned hummingbird (*Archilochus alexandri*, 22). Species with high NMPIF priority scores found in this study or previously on FOUN or in the vicinity included mountain plover (*Charadrius montanus*, 28), ferruginous hawk (*Buteo regalis*, 24), and long-billed curlew (*Numenius americanus*, 24). These species are noted on the FOUN checklist (which covers an area from Interstate 25 to the monument) and were reported to NMOS, but it is uncertain if they were detected within FOUN boundaries. Virginia's warbler (*Vermivora virginiae*) had a NMPIF score of 25, but it was found outside park boundaries and is highly unlikely to breed in the habitats on FOUN.

#### Park Checklist

The FOUN park checklist covers the monument and an area from Interstate 25 to the monument along NM highway 161. It appears to have been compiled from the records of Robert and Sarah Paxton from observations in the 1960s. The broad geographic area and age of the information in the existing checklist necessitate a thorough revision.

#### Conservation and Management Recommendations

The absence of livestock grazing on FOUN has apparently encouraged diversity of grassland birds, especially ground- and shrub-nesting birds such as vesper sparrows

(*Poocetes gramineus*) and lark sparrows (*Chondestes grammacus*). Absence of livestock has probably allowed the persistence of a small marshy area near the westernmost corner of the monument. The stabilization of historical structures has also allowed nesting by several species favoring cavities for nest placement, such as mountain bluebird (*Sialia currucoides*) and American kestrel (*Falco sparverius*). Several clusters of planted and naturally-occurring deciduous trees have likely also encouraged canopy birds such as Bullock's oriole (*Icterus bullockii*) and western kingbird (*Tyrannus verticalus*), while modern building structures provide nesting substrates for birds such as cliff swallow (*Hirundo pyrrhonota*) and Say's phoebe (*Sayornis saya*). The maintenance of historical and modern buildings, tall trees, and continued exclusion of livestock will ensure the persistence of bird diversity on FOUN.

### **Pecos National Historical Park**

#### ***Introduction***

PECO is located 28 miles southeast of Santa Fe, New Mexico. Most of the park lies in the Upper Pecos River Valley at an elevation of about 7,000'. This valley is bordered by the 13,000' Sangre de Cristo Mountains to the north, the rugged hills of the Tecolote Range to the east, and the steep, 8,200' Glorieta Mesa to the west. The park was less than 300 ac in size for decades until 1990 when Congress authorized the purchase of Greer Garson's Forked Lightning Ranch, which completely surrounded the old monument. In 1993, NPS purchased the ranch, and the park became roughly 6,800 ac in area, including four miles of the meandering Pecos River. The park, largely cultural in nature, now includes not only the old pueblo ruins and Catholic Mission, but also the Santa Fe Trail, dozens of circa-1700 Hispanic homestead sites, and the Glorieta Battlefield. The park's predominant vegetation is pinyon-juniper woodland, which is now taking over the historical pastures of the old Forked Lightning Ranch (Figure 15).



**Figure 15. Trading post area, showing grassland habitat with riparian and pinyon-juniper habitat in background.**

Habitats of special interest that require focused inventory include Glorieta Creek, a riparian restoration area, a pond, and marshy habitats that harbor amphibian and bird species not found in the pinyon-juniper forest and shrub habitats in the park. Recent inventories have been conducted for plants (Sivinski, 1995), fish in Glorieta Creek. (Pittinger, 1997), reptiles and amphibians (Parmenter and Lightfoot, 1996), and mammals (Parmenter and Lightfoot, 1996). In the opinion of the park natural resource manager and NMNHP personnel, all except the reptile/amphibian inventory appear sufficiently comprehensive (Table 7).

The Glorieta Creek fish survey is satisfactory, but a 1992 population survey in the Pecos River reach is inadequate due to recent development and environmental impacts occurring in the river upstream from the park, and therefore it should be repeated. However, such a survey is beyond the scope of this project.

NMNHP staff and the park natural resource manager concur that the 1989 survey of the avifauna of the Forked Lightning Ranch, which comprises the majority of the current park area, does not represent a 90% survey of breeding birds (Mukai, 1989).

**Table 7. Inventory status of vascular plants, vertebrates, and species/areas of special concern at PECO, prior to this project.**

Category	Pre-project inventory status	
	Presence/absence	Distribution and abundance
General Vegetation	Complete	Complete
Dwarf Milkweed	Present	Needed
Weed Species	Complete	Needed
General Fish	Needed	Not needed
Amphibians and Reptiles	Partial	Not needed
Breeding Birds	Needed	Not needed
General Mammals	Complete	Not needed

One T&E species and numerous weed species occur at PECO. Sivinski (1995) searched the park for seven endangered and sensitive plant species with potential to occur there and found only one species, the dwarf milkweed (*Asclepias uncialis* Greene). Faunal surveys detected no endangered or threatened animal species (Parmenter and Lightfoot, 1996).

Exotic weed management is the primary vegetation management issue in the park. Exotic trees such as salt cedar (*Tamarix* spp.), Russian olive (*Elaeagnus angustifolia*), and Siberian elm (*Ulmus pumila*) are not presently abundant (Sivinski, 1995), but there is potential for invasion in wet areas.

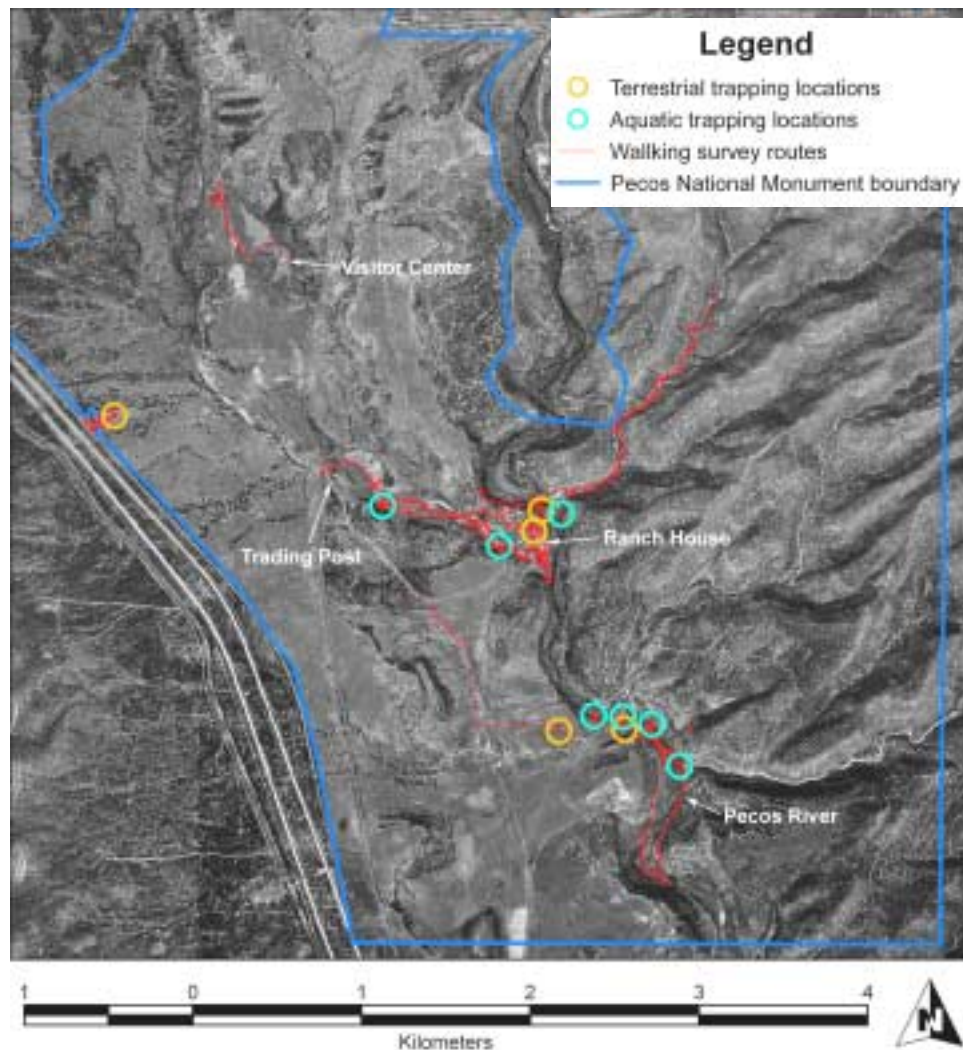
Park personnel have recently planted large numbers of cottonwood and willow trees as part of a riparian restoration project that occurred in conjunction with the removal of an earthen dam. Feral dogs present a significant threat to the native fauna of the park; they

are trapped and removed from the park on a regular basis. No cross-boundary or cross-agency inventories are currently underway.

### *Methods*

#### **Reptiles and Amphibians**

Two trapping arrays were active 21-24 May, and three were trapped 2-5 July, and 29 July – 1 August, 2002. Seven turtle traps were set 21-24 May, 2-5 July, and 29 July – 1 August, 2002. One cover board was out from 21 May – 1 August, 2002 and was checked during trapping periods. We conducted walking surveys during each trapping period (Figure 16).



**Figure 16. Herpetofauna sampling locations, PECO.**



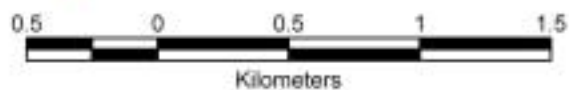
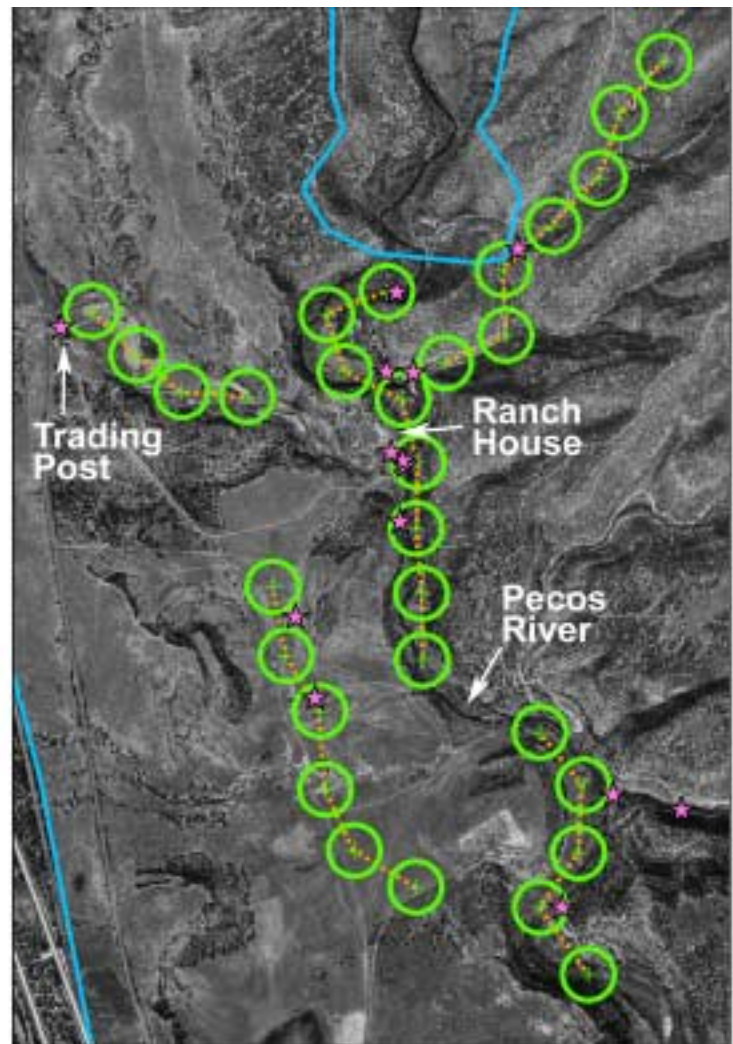
## Birds

We established a relatively large number of points along the Pecos River and Glorieta Creek at PECO (17) because the riparian habitat

was quite variable there. Along the river, for example, some areas had pinyon-juniper or ponderosa pine growing down to the water's edge, while other areas had well-developed riparian vegetation with cottonwood and willow. These points picked up forest species as well as riparian species.

Areas targeted for survey outside the point counts included areas around the ranger offices (Trading Post), the Forked Lightning ranch house, an incised canyon in the southeast corner of the monument, and several locations along the length of the Pecos River contained within the monument boundaries.

We surveyed five transects in three habitats between 21-24 May and 4-7 June 2002 (Figure 17).



### Legend





-  Bird point count locations (showing approximate extent of survey area)
-  Bird point count transects
-  Additional bird species sightings
-  Pecos National Monument boundary

Figure 17. Bird sampling locations, PECO.

## Results

### Reptiles and Amphibians

A number of species from the original target list were removed (Appendix 16). *Chelydra serpentina*, *Terrapene ornata*, *Phrynosoma cornutum*, *Urosaurus ornatus*, *Coluber constrictor*, *Heterodon nasicus*, *Lampropeltis getula*, *Sonora semiannulata*, *Tantilla nigriceps*, *Thamnophis marcianus*, and *Crotalus atrox* were removed from the list because their preferred habitats do not occur in PECO. “*Sirtalis dorsalis*” was probably a typographic error intended to read “*Thamnophis sirtalis dorsalis*,” the New Mexico Garter snake. We removed it from the list because its range lies outside the park.

The object of herpetofaunal surveys at PECO was to augment the list obtained from previous studies, time permitting. The PECO revised target list includes 35 species of herpetofauna (Appendix 17). In 23.5 person-hours, we documented seven species within the park, only 20% of the target list. We caught four of the seven species in 20 drift-fence trap days (Figure 18). The final species list for PECO (Appendix 18) includes three species that were detected by PECO staff, *Crotaphytus collaris*, *Pituophis catenifer* (Figure 19), and *Ambystoma tigrinum*. Including park staff sightings, 28.7% of species on the revised target list were detected. In 71 turtle trap days we trapped no turtles; thus we can rule out *Chelydra serpentina* and any other aquatic turtle species. Coverboard arrays were not effective.



Figure 18. Eastern fence lizard (*Sceloporus undulatus*).



Figure 19. Gopher snake (*Pituophis catenifer*).

### Birds

#### Target List

The original target list for PECO contained 107 species and was based largely on the bird list in Mukai (1989, Appendix 19). This list included birds detected in non-breeding seasons, and they were placed on our target list before we knew that our surveys would be for breeding birds only. In addition, some species from Mukai (1989) were higher-elevation species or species that for some other reason would be expected to be only rare visitors and not typical breeders. We removed these 12 species for the revised target list (Appendix 20). Ten additional species were observed during the 2002 breeding season but were excluded from the revised target list because they were either migrants (i.e.,

American goldfinch, *Carduelis tristis*); willow flycatcher, *Empidonax traillii*), accidentals from nearby habitats, or very rare or secretive and unlikely to be detected (green heron, *Butorides virescens*).

The revised PECO target list includes 91 species (Appendix 20), including six that were detected but were not on the original target list. In total, 17 target list species were not observed by NMNHP staff, for a total detection rate of 81.3% of target species. If sightings by NPS staff during the breeding season are included, 12 target list species were not detected, bringing the total detection rate to 86.8% of target species (Appendix 21).

#### Species Richness

In considering all species observed by NMNHP, NPS, or NMBBA staff during the breeding season (85 species), grassland habitats accounted for 27.1% (23 species), pinyon-juniper habitats accounted for 31.8% (27 species), and riparian habitats for 78.8% (67 species) of all species observed.

#### Relative Abundance

We detected 62 species (72.9% of all species observed by NMNHP, NPS, or NMBBA) and 574 individuals on 8 days of point counts. Adjusted for the number of points in each habitat type (6 points in grassland, 7 in pinyon-juniper, and 17 in riparian habitats), grassland points accounted for 18.4%, pinyon-juniper points for 17.7%, and riparian points accounted for 63.9% of all birds detected on points counts. Violet-green swallow (*Tachycineta thalassina*) was the most commonly detected bird on point counts, with 10.4% of all detections. Brewer's blackbird (*Euphagus cyanocephalus*), western wood-pewee (*Contopus sordidulus*), and yellow warbler (*Dendroica petechia*) were also among the most commonly detected species, with 7.3%, 6.6%, and 5.2% for each species, respectively. The remaining 48 species each averaged less than 1.2% ( $\pm 1.2\%$ ) of all detections.

#### *Conclusions*

### **Reptiles and Amphibians**

In PECO, as in the other parks, the drought probably played a role in trapping success (see CAVO discussion above). As at CAVO, the number of species detected was probably strongly influenced by low rainfall in the months preceding the inventory. Monsoon rains were sporadic as well, which likely impacted amphibian activity patterns. More intensive surveys conducted in a wetter year would probably reveal many of the target species that we failed to detect.

PECO is the largest park we surveyed and has the most heterogeneous habitats; however, the total number of species encountered and expected is not appreciably greater than for CAVO, possibly due to their similar elevations. The cover-board arrays were not productive at PECO either, for the same reasons as those given in the CAVO discussion.

### **Birds**

### Target List

The bird inventory detected 86.8% of the target species. Seventeen species, common merganser, scaled quail, killdeer, greater roadrunner, belted kingfisher, Lewis's woodpecker, western kingbird, gray vireo, red-breasted nuthatch, pygmy nuthatch, Bewick's wren, hermit thrush, European starling, hepatic tanager, lazuli bunting, pine siskin, and house sparrow (scientific names in Appendix 20), were not detected by NMNHP staff during 2002 site visits. The most likely cause of non-detections was limited habitat. For example, the limited area of higher-elevation coniferous woodland on PECO appears correlated to the absence of the majority of these species (Hubbard, 1978; Parmeter, 2002). Several other species are generally rare and were probably missed due to the relatively short period available for surveys. The reasons for the lack of detections of other species, especially the ubiquitous starling (*Sturnus vulgaris*) and house sparrow, are unclear. Of special note is the absence of Lewis's woodpecker (*Melanerpes lewis*), noted in Mukai (1989) as a common breeder along the Pecos River. This absence may be part of a general decline of this bird as documented by national breeding bird survey efforts (S. Fettig, pers. comm.).

### T & E Species

No species listed as threatened or endangered either by the federal government or the State of New Mexico was detected on surveys of PECO. However, one sex-undetermined and two male willow flycatchers (*Empidonax traillii*) were detected on 4 and 5 June along the Pecos River. A visit by NMBBA staff on June 8 again detected willow flycatchers, but subsequent visits and nest-searches by NMNHP and NMBBA staff detected none. Because habitat conditions at present do not appear suitable for breeding willow flycatchers (Sogge et al., 1997), these birds were very likely migrants. Willow flycatcher subspecies cannot be distinguished by observation; it is therefore unclear if these birds were the northern *E. t. adastus* subspecies or the endangered southwestern *E. t. extimus* subspecies. Breeding willow flycatchers are limited by impacts to vegetation by historical livestock grazing, small patch size of potentially suitable vegetation, and limited riparian regeneration due to lowered river levels from drought and upstream diversions.

### Partners In Flight Species of Concern

PECO species with significant national PIF priority scores included Virginia's warbler (*Vermivora virginiae*, 25), black-throated gray warbler (*Dendroica nigrescens* 22), and Grace's warbler (*Dendroica graciae*, 22). PECO species with high NMPIF priority scores were southwestern willow flycatcher (30, but see T&E species above), Virginia's warbler (25), and black-throated gray warbler, Grace's warbler, gray flycatcher (*Empidonax wrightii*), and Lewis's woodpecker (*Melanerpes lewis*, 24).

### Park Checklist

At present, no checklist exists to document the birds of PECO, although this survey and the surveys by Mukai (1989) and the NMBBA will provide information useful for the development of a checklist.



### Conservation and Management Recommendations

The absence of livestock grazing on PECO has encouraged the regeneration of woody riparian vegetation along Glorieta Creek and the Pecos River. This regeneration is most noticeable in areas containing willow (*Salix* spp.) and other shrub species. These shrub habitats provide ideal nesting conditions for species such as yellow-breasted chat (*Icteria virens*) and song sparrow (*Melospiza melodia*). Regeneration and maturation of trees such as narrowleaf cottonwood (*Populus angustifolia*) will continue to provide habitat for canopy species such as yellow warbler (*Dendroica petechia*) and Bullock's oriole (*Icterus bullockii*). Additionally, efforts by PECO to restore historical gravel pits on Glorieta Creek to a matrix of riparian wetlands and woodlands have clearly benefited marsh-favoring species such as red-winged blackbird (*Agelaius phoeniceus*) and common yellowthroat (*Geothlypis trichas*). Continued restoration efforts will provide habitat for additional species favoring shrub and tree habitats as vegetation matures. The maintenance of minimum flows and continued exclusion of livestock in both Glorieta Creek and the Pecos River will ensure the persistence of riparian vegetation necessary to many breeding birds.

It is not known how abundant grasslands were on PECO in pre-European times, but large areas of pastures originally cleared for ranching activities are presently being invaded by conifers. Efforts to clear these areas, either mechanically or by prescribed fire, will help maintain habitats used by grassland birds and insectivorous birds favoring clearings, for example, western bluebird (*Sialia mexicana*).

### **General Conclusions**

The bird surveys were the most efficient in detecting target species, with 88.9% of the target species detected at CAVO, 92.3% at FOUN, and 86.8% at PECO (including park staff observations). Due to funding limitations, SOPN decided to limit this survey to breeding birds, which eliminates many potential species, including species which were actually detected. The latter species were removed from the target list because they were not typical breeders but were likely to be late migrants or species that winter but do not breed in the area. To detect the remaining target species, more survey effort over more years would be necessary.

The results for birds contrast sharply with the results for amphibians and reptiles, with 29% at CAVO and 28.7% at PECO (although the PECO inventory was not intended to be complete), and mammals, with 50% at CAVO. There are several possible explanations for the disparate results among taxa. Even under optimal conditions, breeding birds can be detected relatively easily via their vocalizations, and, unlike mammals and herpetofauna, it is not necessary to capture or even see birds to identify them. Thus, it is not surprising that relatively more bird species were detected, given the budget constraints in this project. Second, activity patterns of most reptiles, amphibians, and mammals are more strongly affected by drought than those of most bird species. Finally, better information may be available for bird distributions than for the other taxa, which allowed us to construct more realistic target lists for birds. For example, Breeding Bird Survey information, the NMOS database, and the New Mexico Bird Finding Guide provided information that allowed us to eliminate several potential species.

The plant surveys were somewhat more successful, turning up 47.1% of the targeted species and 45 untargeted species. However, when herbarium specimens are included, 91% of species on the revised target list and 92% of actual and potential species were accounted for. Like reptile, amphibian, and mammal surveys, the plant surveys were affected by the low rainfall in 2002. We skipped a spring survey, with hopes that summer monsoons would increase the number of species detected in a later survey, but summer moisture was also below average. The relatively large number of untargeted species discovered, even in a drought year, suggests that prior information on the plants of the CAVO area was quite limited. These 45 species thus represent useful additions to the CAVO plant list.

The above factors notwithstanding, the most important reason for the limited success of these inventories was insufficient funding. Given that funds were limited, the allocation of funds was a secondary factor. The value of several partial surveys is questionable. If more resources had been allocated to fewer inventories, it is possible that 90% inventories for more than one taxon would have resulted. Multi-year, multi-season surveys repeated within seasons would clearly have resulted in more detections, regardless of taxon.

Given our results, it would probably be premature to begin a monitoring program, except in a limited way. Selected species of any taxa could be monitored, but it would only be reasonable to monitor the entire community for birds. More complete inventories producing more reliable target lists would be required before developing a monitoring program. We recommend repeating the plant, mammal and herpetofauna inventories in a wetter year and allocating more resources and more intensive effort to the surveys.

We detected nine introduced plant species recognized as noxious by the State of New Mexico or other states (Tables 4 and 5), but most fall into the Class C category (not native to the ecosystem, but widespread in the state). Prickly Russian thistle (*Salsola tragus*) and slim amaranth (*Amaranthus hybridus*) are especially widespread in the park. Class C weeds are a low management priority, by virtue of their extreme abundance and invasive natures. Control efforts are likely to be frustrated by reinvasion from surrounding areas. We recommend that control efforts of these Class C weeds be coordinated with surrounding landowners. The park should also be periodically surveyed for Class A and Class B species, which should be the target of concerted weed management.

The inventory revealed little in the way of threatened, endangered, or otherwise sensitive species. We detected a USFWS sensitive species, the Townsend's big-eared bat, at CAVO. We also detected willow flycatchers (*Empidonax traillii*) at PECO. The southwestern subspecies of willow flycatcher (*E. t. extimus*) is federally endangered, but this individual was probably a migrant, and thus it is impossible to know if it belonged to the southwestern subspecies. Even in the absence of threatened and endangered species, these parks represent potential refuges of biodiversity and provide the opportunity for NPS to contribute to an important conservation goal: keeping common species common.

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## APPENDICES

**Appendix 1**  
**CAVO Plants Original Target List**

N=native, I=introduced

Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
<b>Trees</b>					
<i>Juniperus deppeana</i>	alligator juniper	N	P. Tonne pers. comm.	Remove	none observed, out of range
<i>Juniperus monosperma</i>	oneseed juniper	N	CAVO Herbarium	Possible	
<i>Juniperus scopulorum</i>	Rocky Mountain juniper	N	CAVO Herbarium	Present	
<i>Pinus edulis</i>	pinyon pine	N	CAVO Herbarium	Present	
<i>Pinus ponderosa</i> var. <i>scopulorum</i>	ponderosa pine	N	CAVO Herbarium	Present	
<i>Populus tremuloides</i>	quaking aspen	N	CAVO Herbarium	Remove	none observed, check location of specimen
<i>Quercus gambelii</i>	Gambel's oak	N	CAVO Herbarium	Present	
<b>Shrubs</b>					
<i>Atriplex canescens</i>	fourwing saltbush	N	CAVO Herbarium	Present	
<i>Brickellia californica</i>	California brickellbush	N	CAVO wildflower and grass list	Possible	
<i>Brickellia eupatorioides</i> var. <i>chlorolepis</i>	false boneset	N	CAVO Herbarium	Present	
<i>Brickellia fendleri</i>	Fendler's brickellbush	N	MSB herbarium	Present	
<i>Cercocarpus montanus</i>	mountain mahogany	N	CAVO Herbarium	Present	
<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	N	CAVO wildflower and grass list	Remove	none observed, habitat limited
<i>Condalia spathulata</i>	Squawbush	N	Gennaro et al., 1976	Remove	none observed, out of range
<i>Jamesia americana</i>	cliffbush	N	CAVO Herbarium	Present	
<i>Krascheninnikovia lanata</i>	winterfat	N	P. Tonne pers. comm.	Possible	

Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
<i>Lycium pallidum</i>	pale wolfberry	N	P. Tonne pers. comm.	Possible	
<i>Parthenocissus quinquefolia</i> var. <i>quinquefolia</i>	Virginia creeper	N	CAVO Herbarium	Present	
<i>Physocarpus monogynus</i>	mountain ninebark	N	CAVO Herbarium	Present	
<i>Prunus virginiana</i>	common chokecherry	N	CAVO Herbarium	Present	
<i>Quercus undulata</i>	wavyleaf oak	N	CAVO Herbarium	Present	
<i>Rhus trilobata</i>	skunkbush sumac	N	CAVO Herbarium	Present	
<i>Ribes cereum</i>	wax currant	N	CAVO Herbarium	Present	
<i>Ribes leptanthum</i>	trumpet gooseberry	N	CAVO Herbarium	Present	
<i>Robinia neomexicana</i>	New Mexico locust	N	P. Tonne pers. comm.	Possible	
<i>Rosa woodsii</i>	Woods' rose	N	CAVO Herbarium	Present	
<i>Rubus neomexicana</i>	New Mexico raspberry	N	CAVO Herbarium	Present	
<b><i>Solidago multiradiata</i> var. <i>scopolorum</i></b>	<b>manyray goldenrod</b>	<b>N</b>	<b>CAVO Herbarium</b>	<b>Remove</b>	<b>none observed, out of range, check ID</b>
<i>Symphoricarpos</i> spp.	snowberry	N	CAVO Herbarium	Possible	check location of specimen
<i>Toxicodendron radicans</i>	poison ivy	N	CAVO Herbarium	Possible	check location of specimen
<i>Yucca glauca</i> var. <i>glauca</i>	soapweed yucca	N	CAVO Herbarium	Present	
<b>Sub-Shrubs</b>					
<i>Artemisia frigida</i>	fringed sagewort	N	CAVO Herbarium	Present	
<i>Brickellia brachyphylla</i>	plumed brickellbush	N	CAVO Herbarium	Present	
<i>Echinocereus viridiflorus</i>	nylon hedgehog cactus	N	CAVO wildflower and grass list	Present	
<i>Escobaria vivipara</i>	spiny star	N	CAVO wildflower and grass list	Possible	
<i>Gutierrezia sarothrae</i>	broom snakeweed	N	CAVO Herbarium	Present	
<i>Heterotheca villosa</i>	hairy goldenaster	N	CAVO Herbarium	Present	
<i>Opuntia polyacantha</i>	plains pricklypear	N	CAVO Herbarium	Present	
<i>Zinnia grandiflora</i>	Rocky Mountain zinnia	N	CAVO Herbarium	Possible	

Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
<b>Grasses</b>					
<i>Agropyron cristatum</i>	crested wheatgrass	I	CAVO Herbarium	Possible	check ID
<i>Andropogon gerardii</i>	big bluestem	N	CAVO Herbarium	Present	
<i>Aristida purpurea</i> var. <i>longiseta</i>	red threeawn	N	CAVO Herbarium	Present	
<i>Blepharoneuron tricholepis</i>	pine dropseed	N	CAVO Herbarium	Possible	
<i>Bouteloua curtipendula</i>	sideoats grama	N	CAVO Herbarium	Present	
<i>Bouteloua gracilis</i>	blue grama	N	CAVO Herbarium	Present	
<i>Bouteloua hirsuta</i>	hairy grama	N	CAVO wildflower and grass list	Present	
<i>Bromus anomalus</i>	nodding brome	N	CAVO Herbarium	Possible	check ID
<i>Bromus frondosus</i>	weeping brome	N	CAVO Herbarium	Possible	check ID
<i>Bromus inermis</i>	smooth brome	I	CAVO Herbarium	Possible	check ID
<i>Bromus japonicus</i>	Japanese brome	I	CAVO Herbarium	Possible	check ID
<i>Bromus lanatipes</i>	woolly brome	N	CAVO Herbarium	Present	
<i>Bromus tectorum</i>	cheatgrass	I	CAVO Herbarium	Possible	check ID
<i>Buchloe dactyloides</i>	buffalograss	N	P. Tonne pers. comm.	Present	Planted at Housing
<i>Echinochloa crus-galli</i>	barnyardgrass	I	CAVO Herbarium	Possible	check ID
<i>Elymus elymoides</i>	bottlebrush squirreltail	N	CAVO Herbarium	Present	
<i>Elymus virginicus</i>	Virginia wildrye	N	CAVO Herbarium	Possible	check ID
<i>Eragrostis intermedia</i>	plains lovegrass	N	P. Tonne pers. comm.	Possible	
<i>Festuca arizonica</i>	Arizona fescue	N	CAVO Herbarium	Present	
<i>Koeleria macrantha</i>	prairie junegrass	N	CAVO Herbarium	Present	
<i>Lycurus phleoides</i>	common wolfstail	N	CAVO Herbarium	Present	Name change, should be <i>Lycurus setosus</i>
<i>Muhlenbergia montana</i>	mountain muhly	N	CAVO Herbarium	Present	
<i>Muhlenbergia torreyi</i>	ring muhly	N	CAVO Herbarium	Present	
<i>Munroa squarrosa</i>	false buffalograss	N	CAVO Herbarium	Present	
<i>Oryzopsis hymenoides</i>	Indian ricegrass	N	CAVO Herbarium	Possible	check location of specimen

Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
<i>Oryzopsis micrantha</i>	littleseed ricegrass	N	CAVO Herbarium	Present	
<i>Panicum capillare</i>	witchgrass	N	CAVO Herbarium	Present	
<i>Pascopyrum smithii</i>	western wheatgrass	N	CAVO Herbarium	Present	
<b><i>Phleum pratense</i></b>	<b>timothy</b>	<b>I</b>	<b>P. Tonne pers. comm.</b>	<b>Remove</b>	<b>none observed, habitat limited</b>
<i>Poa fendleriana</i>	muttongrass	N	CAVO Herbarium	Present	
<i>Poa pratensis</i>	Kentucky bluegrass	N	CAVO Herbarium	Present	
<i>Schizachyrium scoparium</i>	little bluestem	N	CAVO wildflower and grass list	Present	
<i>Setaria pumila</i>	yellow bristlegrass	I	CAVO Herbarium	Possible	check ID
<b><i>Sorghastrum nutans</i></b>	<b>Indiangrass</b>	<b>N</b>	<b>CAVO wildflower and grass list</b>	<b>Remove</b>	<b>none observed, habitat limited</b>
<i>Stipa comata</i>	needle-and-thread grass	N	CAVO Herbarium	Remove	check ID, none observed, habitat limited
<i>Vulpia octoflora</i>	sixweeks fescue	N	CAVO Herbarium	Possible	check ID
<b>Forbs</b>					
<i>Achillea millefolium</i>	common yarrow	N	CAVO Herbarium	Present	
<i>Allium cernuum</i>	nodding onion	N	CAVO Herbarium	Present	
<i>Amaranthus hybridus</i>	slim amaranth	N	P. Tonne pers. comm.	Present	
<i>Amaranthus palmeri</i>	carelessweed	N	CAVO Herbarium	Possible	check ID
<i>Ambrosia acanthicarpa</i>	flatspine burr ragweed	N	Gennaro et al., 1976	Possible	
<i>Ambrosia artemisiifolia</i>	annual ragweed	N	MSB herbarium	Possible	check ID
<i>Ambrosia psilostachya</i>	Cuman ragweed	N	CAVO Herbarium	Possible	check ID
<i>Androsace septentrionalis</i>	pygmyflower rockjasmine	N	CAVO Herbarium	Possible	check ID
<i>Apocynum cannabinum</i>	Indianhemp	N	CAVO Herbarium	Possible	check ID
<i>Arabis hirsuta</i>	hairy rockcress	N	CAVO Herbarium	Possible	check ID
<i>Argemone hispida</i>	prickly poppy	N	CAVO Herbarium	Possible	
<i>Argemone polyanthemus</i>	crested pricklypoppy	N	CAVO wildflower and grass list	Possible	

Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
<i>Artemisia ludoviciana</i>	Louisiana sagewort	N	CAVO Herbarium	Present	
<i>Asclepias latifolia</i>	broadleaf milkweed	N	P. Tonne pers. comm.	Possible	
<i>Asclepias subverticillata</i>	whorled milkweed	N	P. Tonne pers. comm.	Possible	
<b><i>Asclepias tuberosa</i></b>	<b>butterfly milkweed</b>	N	<b>CAVO Herbarium</b>	<b>Remove</b>	<b>check ID &amp; location, out of range</b>
<i>Bahia dissecta</i>	ragleaf bahia	N	CAVO Herbarium	Possible	check ID
<i>Berlandiera lyrata</i>	lyreleaf greeneyes	N	CAVO Herbarium	Possible	check ID
<i>Callirhoe involucrata</i>	purple poppymallow	N	CAVO Herbarium	Possible	check ID
<i>Calochortus gunnisonii</i>	Gunnison's Mariposa lily	N	CAVO Herbarium	Possible	check ID
<i>Castilleja integra</i>	wholeleaf Indian paintbrush	N	CAVO Herbarium	Present	
<i>Chamaesaracha coronopus</i>	greenleaf five eyes	N	CAVO wildflower and grass list	Possible	
<i>Chamaesyce fendleri</i> var. <i>fendleri</i>	Fendler's sandmat	N	CAVO Herbarium	Possible	check ID
<i>Chenopodium album</i>	lambsquarters	I	CAVO Herbarium	Possible	check ID
<i>Chenopodium graveolens</i>	fetid goosefoot	N	CAVO Herbarium	Present	
<i>Chenopodium hians</i>	hians goosefoot	N	CAVO Herbarium	Possible	check ID
<b><i>Chenopodium pallescens</i></b>	<b>slimleaf goosefoot</b>	N	<b>CAVO Herbarium</b>	<b>Remove</b>	<b>check ID, probably <i>C. leptophyllum</i></b>
<i>Cichorium intybus</i>	chicory	I	CAVO Herbarium	Possible	check ID
<i>Cirsium undulatum</i>	wavyleaf thistle	N	CAVO Herbarium	Present	
<i>Clematis hirsutissima</i>	hairy clematis	N	CAVO Herbarium	Possible	check ID
<i>Convolvulus arvensis</i>	field bindweed	I	CAVO wildflower and grass list	Present	
<i>Conyza canadensis</i>	Canadian horseweed	N	P. Tonne pers. comm.	Possible	check ID
<i>Corydalis aurea</i>	golden smoke	N	CAVO Herbarium	Possible	check ID
<i>Cryptantha minima</i>	little cryptantha	N	CAVO wildflower and grass list	Possible	
<i>Cryptantha thyrsoiflora</i>	calcareous cryptantha	N	CAVO Herbarium	Possible	check ID
<b><i>Cryptantha virgata</i></b>	<b>miner's candle</b>	N	<b>CAVO wildflower and</b>	<b>Remove</b>	<b>check ID, out of range</b>



Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
			<b>grass list</b>		
<i>Cynoglossum officinale</i>	hound's tongue	I	CAVO Herbarium	Possible	check ID
<i>Dalea candida</i>	white prairieclover	N	CAVO Herbarium	Present	
<i>Dalea purpurea</i> var. <i>purpurea</i>	purple prairieclover	N	CAVO Herbarium	Present	
<i>Descurainia sophia</i>	herb sophia	I	CAVO Herbarium	Possible	check ID
<i>Dyssodia papposa</i>	fetid marigold	N	CAVO Herbarium	Present	
<i>Engelmannia peristenia</i>	Engelmann's daisy	N	CAVO Herbarium	Possible	check ID
<i>Erigeron divergens</i>	spreading fleabane	N	CAVO Herbarium	Possible	check ID
<i>Erigeron flagellaris</i>	trailing fleabane	N	P. Tonne pers. comm.	Possible	
<i>Erigeron subtrinervis</i>	threenerve fleabane	N	CAVO Herbarium	Possible	check ID
<i>Eriogonum jamesii</i>	James' buckwheat	N	CAVO Herbarium	Present	
<i>Erysimum asperum</i>	plains wallflower	N	CAVO Herbarium	Present	
<i>Erysimum capitatum</i>	sanddune wallflower	N	CAVO Herbarium	Possible	check ID
<i>Erysimum inconspicuuum</i>	shy wallflower	N	CAVO Herbarium	Possible	check ID
<i>Euphorbia davidii</i>	David's spurge	I	MSB herbarium	Present	
<i>Euphorbia marginata</i>	snow on the mountain	N	CAVO Herbarium	Possible	check ID
<i>Euphorbia spathulata</i>	warty spurge	N	CAVO Herbarium	Possible	check ID
<i>Frasera speciosa</i>	showy frasera	N	CAVO Herbarium	Possible	check ID
<i>Galium bifolium</i>	twinleaf bedstraw	N	CAVO Herbarium	Possible	check ID
<i>Gaura coccinea</i>	scarlet beeblossom	N	CAVO Herbarium	Present	
<i>Gentiana affinis</i>	pleated gentian	N	CAVO Herbarium	Present	
<i>Geranium caespitosum</i>	pineywoods geranium	N	CAVO Herbarium	Possible	check ID
<i>Geranium richardsonii</i>	Richardson's geranium	N	CAVO Herbarium	Possible	check ID
<i>Gilia pinnatifida</i>	sticky gilia	N	CAVO Herbarium	Present	
<i>Glandularia bipinnatifida</i>	Dakota mock vervain	N	CAVO Herbarium	Present	
<i>Grindelia acutifolia</i>	sharp-leaf gumweed	N	CAVO Herbarium	Possible	check ID

## CAVO Plants Original Target List A-50

Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
<i>Grindelia nuda</i> var. <i>aphanactis</i>	curlytop gumweed	N	CAVO Herbarium	Possible	check ID
<i>Grindelia squarrosa</i>	curlycup gumweed	N	CAVO Herbarium	Possible	check ID
<i>Helianthus annuus</i>	common sunflower	N	CAVO Herbarium	Present	
<i>Helianthus nuttallii</i>	Nuttall's sunflower	N	CAVO Herbarium	Possible	check ID
<i>Helianthus petiolaris</i>	prairie sunflower	N	P. Tonne pers. comm.	Possible	
<i>Heliomeris longifolia</i>	longleaf falsegoldeneye	N	CAVO Herbarium	Possible	check ID
<i>Heliomeris multiflora</i>	showy goldeneye	N	CAVO Herbarium, MSB herbarium	Present	
<i>Heuchera parvifolia</i>	littleleaf alumroot	N	CAVO Herbarium	Possible	check ID
<i>Ipomoea leptophylla</i>	bush morningglory	N	CAVO Herbarium	Present	
<i>Ipomopsis aggregata</i> ssp. <i>candida</i>	scarlet gilia	N	CAVO Herbarium, MSB herbarium	Possible	
<i>Lappula occidentalis</i>	flatspine stickseed	N	CAVO Herbarium	Possible	check ID
<b><i>Lesquerella intermedia</i></b>	<b>mid bladderpod</b>	N	<b>CAVO Herbarium</b>	<b>Remove</b>	<b>check ID, out of range</b>
<i>Liatis punctata</i>	dotted gayfeather	N	CAVO Herbarium	Present	
<i>Lithospermum multiflorum</i>	manyflowered gromwell	N	P. Tonne pers. comm.	Present	
<i>Lupinus argenteus</i>	silvery lupine	N	CAVO Herbarium	Present	
<b><i>Lupinus kingii</i></b>	<b>King's lupine</b>	N	<b>P. Tonne pers. comm.</b>	<b>Remove</b>	<b>out of range</b>
<i>Lupinus plattensis</i>	Nebraska lupine	N	CAVO Herbarium	Possible	check ID
<i>Lygodesmia juncea</i>	rush skeletonplant	N	CAVO Herbarium	Possible	check ID
<i>Machaeranthera biglovii</i> var. <i>bigelovii</i>	Bigelow's tansyaster	N	CAVO Herbarium	Possible	check ID
<i>Machaeranthera canescens</i> var. <i>canescens</i>	cutleaf goldenweed	N	P. Tonne pers. comm.	Possible	
<b><i>Machaeranthera canescens</i> var. <i>incana</i></b>	<b>cutleaf goldenweed</b>	N	<b>CAVO wildflower and grass list</b>	<b>Remove</b>	<b>out of range</b>
<b><i>Machaeranthera parviflora</i></b>	<b>smallflower tansyaster</b>	N	<b>CAVO Herbarium</b>	<b>Remove</b>	<b>check ID, out of range</b>
<i>Machaeranthera pinnatifida</i>	lacy tansyaster	N	CAVO Herbarium	Present	
<i>Machaeranthera tanacetifolia</i>	tanseyleaf aster	N	CAVO Herbarium	Possible	check ID

Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
<i>Maianthemum stellatum</i>	starry false Solomon's seal	N	CAVO Herbarium	Possible	check ID
<i>Marrubium vulgare</i>	horehound	I	CAVO Herbarium	Possible	check ID
<i>Melampodium leucanthum</i>	plains blackfoot	N	P. Tonne pers. comm.	Possible	
<i>Melilotus officinalis</i>	yellow sweetclover	I	CAVO Herbarium	Present	
<i>Mentzelia multiflora</i>	manyflowered mentzelia	N	CAVO Herbarium	Possible	check ID
<i>Mertensia lanceolata</i>	prairie bluebells	N	CAVO Herbarium	Possible	check ID
<b><i>Mimulus glabratus</i></b>	<b>roundleaf monkeyflower</b>	N	<b>CAVO Herbarium</b>	<b>Remove</b>	<b>check location of specimen, no habitat</b>
<i>Mirabilis linearis</i>	narrowleaf four o'clock	N	CAVO Herbarium	Present	
<i>Monarda fistulosa</i> var. <i>menthifolia</i>	mintleaf beebalm	N	CAVO Herbarium	Possible	check ID
<b><i>Myosotis verna</i></b>	<b>spring forget-me-not</b>		<b>CAVO Herbarium</b>	<b>Remove</b>	<b>check ID, out of range</b>
<b><i>Notholaena standleyi</i></b>	<b>star cloak fern</b>	N	<b>P. Tonne pers. comm.</b>	<b>Remove</b>	<b>out of range</b>
<i>Oenothera caespitosa</i>	tufted eveningprimrose	N	CAVO Herbarium	Possible	check ID
<i>Oenothera coronopifolia</i>	crownleaf evening-primrose	N	CAVO Herbarium	Present	
<i>Oenothera elata</i> ssp. <i>hirsutissima</i>	Hooker's eveningprimrose	N	CAVO Herbarium	Possible	check ID
<i>Oenothera jamesii</i>	trumpet evening-primrose	N	CAVO Herbarium	Possible	check ID
<i>Onosmodium molle</i> ssp. <i>occidentale</i>	western marbleseed	N	P. Tonne pers. comm.	Present	
<i>Orobanche fasciculata</i>	clustered broomrape	N	CAVO Herbarium	Possible	check ID
<i>Orobanche ludoviciana</i> ssp. <i>multiflora</i>	manyflowered broomrape	N	CAVO Herbarium	Possible	check ID
<i>Orthocarpus luteus</i>	yellow owlclover	N	CAVO Herbarium	Possible	check ID
<i>Oxytropis lambertii</i>	Lambert's crazyweed	N	P. Tonne pers. comm.	Possible	
<i>Oxytropis sericea</i>	silvery lupine	N	CAVO Herbarium	Possible	check ID
<i>Packera fendleri</i>	Fendler's ragwort	N	MSB herbarium	Present	
<i>Packera multilobata</i>	lobeleaf groundsel	N	CAVO Herbarium	Possible	check ID
<i>Packera neomexicanus</i> var. <i>mutabilis</i>	New Mexico groundsel	N	CAVO Herbarium	Possible	check ID
<i>Packera pseud aurea</i> var. <i>flavula</i>	falsegold groundsel	N	MSB herbarium	Present	

Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
<i>Pectis angustifolia</i> var. <i>angustifolia</i>	narrowleaf pectis	N	CAVO Herbarium, MSB herbarium	Present	
<i>Penstemon angustifolius</i>	broadbeard beardtongue	N	CAVO Herbarium	Possible	check ID
<i>Penstemon barbatus</i>	beardlip penstemon	N	CAVO Herbarium	Possible	check ID
<i>Penstemon jamesii</i>	James' beardtongue	N	CAVO Herbarium	Possible	check ID
<i>Pericome caudata</i>	mountain leaftail	N	CAVO Herbarium	Present	
<i>Phacelia denticulata</i>	Rocky Mountain scorpionweed	N	CAVO Herbarium	Possible	check ID
<i>Phacelia heterophylla</i>	varileaf phacelia	N	CAVO Herbarium	Present	
<i>Physalis lobata</i>	Chinese lantern	N	CAVO wildflower and grass list	Possible	
<b><i>Physalis pubescens</i></b>	<b>husk tomato</b>	<b>N</b>	<b>CAVO wildflower and grass list</b>	<b>Remove</b>	<b>out of range</b>
<i>Physalis</i> spp.	groundcherry		CAVO Herbarium	Possible	check ID
<i>Plantago patagonica</i>	woolly plantain	N	CAVO Herbarium	Possible	check ID
<i>Polanisia dodecandra</i>	redwhisker clammyweed	N	CAVO Herbarium	Present	
<i>Polygonum convolvulus</i>	black bindweed	I	CAVO Herbarium	Present	
<i>Potentilla hippiana</i>	woolly cinquefoil	N	CAVO wildflower and grass list	Present	
<i>Psoraleidium tenuiflorum</i>	slimflower scurfpea	N	CAVO Herbarium, MSB herbarium	Present	
<i>Pulsatilla patens</i> ssp. <i>multifida</i>	cutleaf anemone	N	CAVO Herbarium	Possible	check ID
<i>Ratibida columnifera</i>	upright prairie coneflower	N	CAVO Herbarium	Possible	check ID
<i>Ratibida tagetes</i>	green prairie coneflower	N	CAVO Herbarium	Present	
<i>Rumex salicifolius</i> var. <i>mexicanus</i>	Mexican dock	N	CAVO Herbarium	Possible	check ID
<i>Salsola tragus</i>	prickly Russian thistle	I	CAVO Herbarium	Present	
<i>Salvia reflexa</i>	lanceleaf sage	N	CAVO Herbarium	Present	
<i>Senecio flaccidus</i> var. <i>flaccidus</i>	threadleaf ragwort	N	CAVO Herbarium	Present	
<i>Senecio multicapitatus</i>	ragwort groundsel	N	CAVO Herbarium	Present	

Scientific Name	Common Name	Origin	Source	Status	Reason for Removal/Comments
<i>Sisyrinchium idahoense</i>	Idaho blue-eyed grass	N	CAVO wildflower and grass list	Possible	
<i>Solanum physalifolium</i>	hoe nightshade	N	CAVO Herbarium	Possible	check ID
<i>Solanum rostratum</i>	buffalobur nightshade	N	CAVO wildflower and grass list	Possible	
<b><i>Solidago canadensis</i> var. <i>lepida</i></b>	<b>Canada goldenrod</b>	<b>N</b>	<b>CAVO Herbarium</b>	<b>Remove</b>	<b>check ID, Known only in Alaska</b>
<i>Solidago canadensis</i> var. <i>scabra</i>	Canada goldenrod	N	CAVO Herbarium	Possible	check ID
<i>Solidago mollis</i>	velvety goldenrod	N	MSB herbarium	Present	
<i>Solidago velutina</i>	threenerve goldenrod	N	MSB herbarium	Possible	check ID
<i>Sphaeralcea coccinea</i>	scarlet globemallow	N	CAVO Herbarium	Present	
<i>Stellaria</i> spp.	starwort		CAVO Herbarium	Possible	check ID
<i>Stephanomeria minor</i>	narrowleaf wirelettuce	N	CAVO Herbarium	Present	
<i>Symphyotrichum eatonii</i>	Eaton's aster	N	CAVO Herbarium	Possible	check ID
<i>Symphyotrichum fendleri</i>	Fendler's aster	N	CAVO Herbarium	Possible	check ID
<i>Thelesperma megapotamicum</i>	Hopi tea greenthread	N	CAVO Herbarium	Present	
<b><i>Thelypodium integrifolium</i> ssp. <i>integrifolium</i></b>	<b>entireleaved thelypody</b>	<b>N</b>	<b>CAVO Herbarium</b>	<b>Remove</b>	<b>check ID, out of range</b>
<i>Thermopsis rhombifolia</i>	golden pea	N	CAVO Herbarium	Present	
<i>Tragopogon dubius</i>	yellow salsify	I	CAVO Herbarium	Possible	check ID
<i>Verbascum thapsus</i>	common mullein	I	CAVO Herbarium	Present	
<i>Verbena macdougalii</i>	MacDougal verbena	N	CAVO Herbarium	Present	
<i>Verbesina encelioides</i>	golden crownbeard	N	CAVO Herbarium	Present	
<i>Vicia americana</i>	american vetch	N	CAVO wildflower and grass list	Present	
<b><i>Viola americana</i></b>			<b>CAVO Herbarium</b>	<b>Remove</b>	<b>check ID, no such name</b>
<i>Xanthium strumarium</i> var. <i>canadense</i>	Canada cocklebur	N	CAVO Herbarium	Possible	check ID

## Appendix 2

### CAVO Plants Revised Target List

N=native, I=introduced

Scientific Name	Common Name	Origin	Species on original target list	Observed
<b>Trees</b>				
<i>Juniperus monosperma</i>	oneseed juniper	N	X	
<i>Juniperus scopulorum</i>	Rocky Mountain juniper	N	X	X
<i>Pinus edulis</i>	pinyon pine	N	X	X
<i>Pinus ponderosa</i> var. <i>scopulorum</i>	ponderosa pine	N	X	X
<i>Quercus gambelii</i>	Gambel's oak	N	X	X
<b>Shrubs</b>				
<i>Atriplex canescens</i>	fourwing saltbush	N	X	X
<i>Brickellia californica</i>	California brickellbush	N	X	
<i>Brickellia eupatorioides</i> var. <i>chlorolepis</i>	false boneset	N	X	X
<i>Brickellia fendleri</i>	Fendler's brickellbush	N	X	X
<i>Cercocarpus montanus</i>	mountain mahogany	N	X	X
<i>Jamesia americana</i>	cliffbush	N	X	X
<i>Krascheninnikovia lanata</i>	winterfat	N	X	
<i>Lycium pallidum</i>	pale wolfberry	N	X	
<i>Parthenocissus quinquefolia</i> var. <i>quinquefolia</i>	Virginia creeper	N	X	X
<i>Physocarpus monogynus</i>	mountain ninebark	N	X	X
<i>Prunus virginiana</i>	common chokecherry	N	X	X
<i>Quercus undulata</i>	wavyleaf oak	N	X	X
<i>Rhus trilobata</i>	skunkbush sumac	N	X	X
<i>Ribes cereum</i>	wax currant	N	X	X
<i>Ribes leptanthum</i>	trumpet gooseberry	N	X	X
<i>Robinia neomexicana</i>	New Mexico locust	N	X	
<i>Rosa woodsii</i>	Woods' rose	N	X	X
<i>Rubus neomexicana</i>	New Mexico raspberry	N	X	X
<i>Symphoricarpos</i> spp.	snowberry	N	X	
<i>Toxicodendron radicans</i>	poison ivy	N	X	
<i>Yucca glauca</i> var. <i>glauca</i>	soapweed yucca	N	X	X
<b>Sub-Shrubs</b>				
<i>Artemisia frigida</i>	fringed sagewort	N	X	X
<i>Brickellia brachyphylla</i>	plumed brickellbush	N	X	X
<i>Echinocereus viridiflorus</i>	nylon hedgehog cactus	N	X	X
<i>Escobaria vivipara</i>	spinystar	N	X	

Scientific Name	Common Name	Origin	Species on original target list	Observed
<i>Gutierrezia sarothrae</i>	broom snakeweed	N	X	X
<i>Heterotheca villosa</i>	hairy goldenaster	N	X	X
<i>Opuntia polyacantha</i>	plains pricklypear	N	X	X
<i>Zinnia grandiflora</i>	Rocky Mountain zinnia	N	X	
<b>Grasses</b>				
<i>Agropyron cristatum</i>	crested wheatgrass	I	X	
<i>Andropogon gerardii</i>	big bluestem	N	X	X
<i>Aristida purpurea</i> var. <i>longiseta</i>	red threeawn	N	X	X
<i>Blepharoneuron tricholepis</i>	pine dropseed	N	X	
<i>Bouteloua curtipendula</i>	sideoats grama	N	X	X
<i>Bouteloua gracilis</i>	blue grama	N	X	X
<i>Bouteloua hirsuta</i>	hairy grama	N	X	X
<i>Bromus anomalus</i>	nodding brome	N	X	
<i>Bromus frondosus</i>	weeping brome	N	X	
<i>Bromus inermis</i>	smooth brome	I	X	
<i>Bromus japonicus</i>	Japanese brome	I	X	
<i>Bromus lanatipes</i>	woolly brome	N	X	X
<i>Bromus tectorum</i>	cheatgrass	I	X	
<i>Buchloe dactyloides</i>	buffalograss	N	X	X
<i>Echinochloa crus-galli</i>	barnyardgrass	I	X	
<i>Elymus elymoides</i>	bottlebrush squirreltail	N	X	X
<i>Elymus virginicus</i>	Virginia wildrye	N	X	
<i>Eragrostis intermedia</i>	plains lovegrass	N	X	
<i>Festuca arizonica</i>	Arizona fescue	N	X	X
<i>Koeleria macrantha</i>	prairie junegrass	N	X	X
<i>Lycurus setosus</i>	common wolfstail	N	X	X
<i>Muhlenbergia montana</i>	mountain muhly	N	X	X
<i>Muhlenbergia torreyi</i>	ring muhly	N	X	X
<i>Munroa squarrosa</i>	false buffalograss	N	X	X
<i>Oryzopsis hymenoides</i>	Indian ricegrass	N	X	
<i>Oryzopsis micrantha</i>	littleseed ricegrass	N	X	X
<i>Panicum capillare</i>	witchgrass	N	X	X
<i>Pascopyrum smithii</i>	western wheatgrass	N	X	X
<i>Poa fendleriana</i>	muttongrass	N	X	X
<i>Poa pratensis</i>	Kentucky bluegrass	N	X	X
<i>Schizachyrium scoparium</i>	little bluestem	N	X	X
<i>Setaria pumila</i>	yellow bristlegrass	I	X	
<i>Vulpia octoflora</i>	sixweeks fescue	N	X	
<b>Forbs</b>				

## CAVO Plants Revised Target List A-56

Scientific Name	Common Name	Origin	Species on original target list	Observed
<i>Achillea millefolium</i>	common yarrow	N	X	X
<i>Allium cernuum</i>	nodding onion	N	X	X
<i>Amaranthus hybridus</i>	slim amaranth	N	X	X
<i>Amaranthus palmeri</i>	carelessweed	N	X	
<i>Ambrosia acanthicarpa</i>	flatspine burr ragweed	N	X	
<i>Ambrosia artemisiifolia</i>	annual ragweed	N	X	
<i>Ambrosia psilostachya</i>	Cuman ragweed	N	X	
<i>Androsace septentrionalis</i>	pygmyflower rockjasmine	N	X	
<i>Apocynum cannabinum</i>	Indianhemp	N	X	
<i>Arabis hirsuta</i>	hairy rockcress	N	X	
<i>Argemone hispida</i>	prickly poppy	N	X	X
<i>Argemone polyanthemus</i>	crested pricklypoppy	N	X	
<i>Artemisia ludoviciana</i>	Louisiana sagewort	N	X	X
<i>Asclepias latifolia</i>	broadleaf milkweed	N	X	
<i>Asclepias subverticillata</i>	whorled milkweed	N	X	
<i>Bahia dissecta</i>	ragleaf bahia	N	X	
<i>Berlandiera lyrata</i>	lyreleaf greeneyes	N	X	
<i>Callirhoe involucrata</i>	purple poppymallow	N	X	
<i>Calochortus gunnisonii</i>	Gunnison's Mariposa lily	N	X	
<i>Castilleja integra</i>	wholeleaf Indian paintbrush	N	X	X
<i>Chamaesaracha coronopus</i>	greenleaf five eyes	N	X	
<i>Chamaesyce fendleri</i> var. <i>fendleri</i>	Fendler's sandmat	N	X	
<i>Chenopodium album</i>	lambsquartars	I	X	
<i>Chenopodium graveolens</i>	fetid goosefoot	N	X	X
<i>Chenopodium hians</i>	hians goosefoot	N	X	
<i>Cichorium intybus</i>	chicory	I	X	
<i>Cirsium undulatum</i>	wavyleaf thistle	N	X	X
<i>Clematis hirsutissima</i>	hairy clematis	N	X	
<i>Convolvulus arvensis</i>	field bindweed	I	X	X
<i>Conyza canadensis</i>	Canadian horseweed	N	X	
<i>Corydalis aurea</i>	golden smoke	N	X	
<i>Cryptantha minima</i>	little cryptantha	N	X	
<i>Cryptantha thyrsoiflora</i>	calcareous cryptantha	N	X	
<i>Cynoglossum officinale</i>	hound's tongue	I	X	
<i>Dalea candida</i>	white prairieclover	N	X	X
<i>Dalea purpurea</i> var. <i>purpurea</i>	purple prairieclover	N	X	X
<i>Descurainia sophia</i>	herb sophia	I	X	
<i>Dyssodia papposa</i>	fetid marigold	N	X	X



Scientific Name	Common Name	Origin	Species on original target list	Observed
<i>Engelmannia peristenia</i>	Engelmann's daisy	N	X	
<i>Erigeron divergens</i>	spreading fleabane	N	X	
<i>Erigeron flagellaris</i>	trailing fleabane	N	X	
<i>Erigeron subtrinervis</i>	threenerve fleabane	N	X	
<i>Eriogonum jamesii</i>	James' buckwheat	N	X	X
<i>Erysimum asperum</i>	plains wallflower	N	X	X
<i>Erysimum capitatum</i>	sanddune wallflower	N	X	
<i>Erysimum inconspicuum</i>	shy wallflower	N	X	
<i>Euphorbia davidii</i>	David's spurge	I	X	X
<i>Euphorbia marginata</i>	snow on the mountain	N	X	
<i>Euphorbia spathulata</i>	warty spurge	N	X	
<i>Frasera speciosa</i>	showy frasera	N	X	
<i>Galium bifolium</i>	twinleaf bedstraw	N	X	
<i>Gaura coccinea</i>	scarlet beeblossom	N	X	X
<i>Gentiana affinis</i>	pleated gentian	N	X	X
<i>Geranium caespitosum</i>	pineywoods geranium	N	X	
<i>Geranium richardsonii</i>	Richardson's geranium	N	X	
<i>Gilia pinnatifida</i>	sticky gilia	N	X	X
<i>Glandularia bipinnatifida</i>	Dakota mock vervain	N	X	X
<i>Grindelia acutifolia</i>	sharpleaf gumweed	N	X	
<i>Grindelia nuda</i> var. <i>aphanactis</i>	curlytop gumweed	N	X	
<i>Grindelia squarrosa</i>	curlycup gumweed	N	X	
<i>Helianthus annuus</i>	common sunflower	N	X	X
<i>Helianthus nuttallii</i>	Nuttall's sunflower	N	X	
<i>Helianthus petiolaris</i>	prairie sunflower	N	X	
<i>Heliomeris longifolia</i>	longleaf falsegoldeneye	N	X	
<i>Heliomeris multiflora</i>	showy goldeneye	N	X	X
<i>Heuchera parvifolia</i>	littleleaf alumroot	N	X	
<i>Ipomoea leptophylla</i>	bush morningglory	N	X	X
<i>Ipomopsis aggregata</i> ssp. <i>candida</i>	scarlet gilia	N	X	
<i>Lappula occidentalis</i>	flatspine stickseed	N	X	
<i>Liatris punctata</i>	dotted gayfeather	N	X	X
<i>Lithospermum multiflorum</i>	manyflowered gromwell	N	X	X
<i>Lupinus argenteus</i>	silvery lupine	N	X	X
<i>Lupinus plattensis</i>	Nebraska lupine	N	X	
<i>Lygodesmia juncea</i>	rush skeletonplant	N	X	
<i>Machaeranthera biglovii</i> var. <i>bigelovii</i>	Bigelow's tansyaster	N	X	
<i>Machaeranthera canescens</i> var. <i>canescens</i>	cutleaf goldenweed	N	X	

Scientific Name	Common Name	Origin	Species on original target list	Observed
<i>Machaeranthera pinnatifida</i>	lacy tansyaster	N	X	X
<i>Machaeranthera tanacetifolia</i>	tanseyleaf aster	N	X	
<i>Maianthemum stellatum</i>	starry false Solomon's seal	N	X	
<i>Marrubium vulgare</i>	horehound	I	X	
<i>Melampodium leucanthum</i>	plains blackfoot	N	X	
<i>Melilotus officinalis</i>	yellow sweetclover	I	X	X
<i>Mentzelia multiflora</i>	manyflowered mentzelia	N	X	
<i>Mertensia lanceolata</i>	prairie bluebells	N	X	
<i>Mirabilis linearis</i>	narrowleaf four o'clock	N	X	X
<i>Monarda fistulosa</i> var. <i>menthifolia</i>	mintleaf beebalm	N	X	
<i>Oenothera caespitosa</i>	tufted eveningprimrose	N	X	
<i>Oenothera coronopifolia</i>	crownleaf evening-primrose	N	X	X
<i>Oenothera elata</i> ssp. <i>hirsutissima</i>	Hooker's eveningprimrose	N	X	
<i>Oenothera jamesii</i>	trumpet evening-primrose	N	X	
<i>Onosmodium molle</i> ssp. <i>occidentale</i>	western marbleseed	N	X	X
<i>Orobanche fasciculata</i>	clustered broomrape	N	X	
<i>Orobanche ludoviciana</i> ssp. <i>multiflora</i>	manyflowered broomrape	N	X	
<i>Orthocarpus luteus</i>	yellow owlclover	N	X	
<i>Oxytropis lambertii</i>	Lambert's crazyweed	N	X	
<i>Oxytropis sericea</i>	silvery lupine	N	X	
<i>Packera fendleri</i>	Fendler's ragwort	N	X	X
<i>Packera multilobata</i>	lobeleaf groundsel	N	X	
<i>Packera neomexicanus</i> var. <i>mutabilis</i>	New Mexico groundsel	N	X	
<i>Packera pseud aurea</i> var. <i>flavula</i>	falsegold groundsel	N	X	
<i>Pectis angustifolia</i> var. <i>angustifolia</i>	narrowleaf pectis	N	X	X
<i>Penstemon angustifolius</i>	broadbeard beardtongue	N	X	
<i>Penstemon barbatus</i>	beardlip penstemon	N	X	
<i>Penstemon jamesii</i>	James' beardtongue	N	X	
<i>Pericome caudata</i>	mountain leaftail	N	X	X
<i>Phacelia denticulata</i>	Rocky Mountain scorpionweed	N	X	
<i>Phacelia heterophylla</i>	varileaf phacelia	N	X	X
<i>Physalis lobata</i>	Chinese lantern	N	X	
<i>Physalis</i> spp.	groundcherry		X	
<i>Plantago patagonica</i>	woolly plantain	N	X	
<i>Polanisia dodecandra</i>	redwhisker clammyweed	N	X	X
<i>Polygonum convolvulus</i>	black bindweed	I	X	X
<i>Potentilla hippiana</i>	woolly cinquefoil	N	X	X
<i>Psoralidium tenuiflorum</i>	slimflower scurfpea	N	X	X

Scientific Name	Common Name	Origin	Species on original target list	Observed
<i>Pulsatilla patens</i> ssp. <i>multifida</i>	cutleaf anemone	N	X	
<i>Ratibida columnifera</i>	upright prairie coneflower	N	X	
<i>Ratibida tagetes</i>	green prairie coneflower	N	X	X
<i>Rumex salicifolius</i> var. <i>mexicanus</i>	Mexican dock	N	X	
<i>Salsola tragus</i>	prickly Russian thistle	I	X	X
<i>Salvia reflexa</i>	lanceleaf sage	N	X	X
<i>Senecio flaccidus</i> var. <i>flaccidus</i>	threadleaf ragwort	N	X	X
<i>Senecio multicapitatus</i>	ragwort groundsel	N	X	X
<i>Sisyrinchium idahoense</i>	Idaho blue-eyed grass	N	X	
<i>Solanum physalifolium</i>	hoe nightshade	N	X	
<i>Solanum rostratum</i>	buffalobur nightshade	N	X	X
<i>Solidago canadensis</i> var. <i>scabra</i>	Canada goldenrod	N	X	
<i>Solidago mollis</i>	velvety goldenrod	N	X	X
<i>Solidago velutina</i>	threenerve goldenrod	N	X	
<i>Sphaeralcea coccinea</i>	scarlet globemallow	N	X	X
<i>Stellaria</i> spp.	starwort		X	
<i>Stephanomeria minor</i>	narrowleaf wirelettuce	N	X	X
<i>Symphyotrichum eatonii</i>	Eaton's aster	N	X	
<i>Symphyotrichum fendleri</i>	Fendler's aster	N	X	
<i>Thelesperma megapotamicum</i>	Hopi tea greenthread	N	X	X
<i>Thermopsis rhombifolia</i>	golden pea	N	X	X
<i>Tragopogon dubius</i>	yellow salsify	I	X	
<i>Verbascum thapsus</i>	common mullein	I	X	X
<i>Verbena macdougalii</i>	MacDougal verbena	N	X	X
<i>Verbesina encelioides</i>	golden crownbeard	N	X	X
<i>Vicia americana</i>	american vetch	N	X	X
<i>Xanthium strumarium</i> var. <i>canadense</i>	Canada cocklebur	N	X	
<b>Total Counts</b>			<b>208</b>	<b>98</b>

### Appendix 3 CAVO Plants Final Species List

**DG=disturbed grassland, LG=lowland grassland, CG=crater grassland, PJ=pinyon juniper,  
PO=ponderosa, GO=Gambel oak N=native, I=introduced, CAVO=CAVO herbarium, MSB=MSB herbarium**

Scientific Name	Common Name	Origin	DG	LG	CG	PJ	PO	GO	Source other than NMNHP	Observed by NMNHP	Vouched by NMNHP	Voucher at CAVO	On revised target list
<b>Trees</b>													
<i>Juniperus monosperma</i>	oneseed juniper	N							CAVO			X	X
<i>Juniperus scopulorum</i>	Rocky Mountain juniper	N	X	X		X	X	X		X	X	X	X
<i>Pinus edulis</i>	pinyon pine	N	X		X	X	X			X		X	X
<i>Pinus ponderosa</i> var. <i>scopulorum</i>	ponderosa pine	N					X			X	X	X	X
<i>Quercus gambelii</i>	Gambel's oak	N				X	X	X		X	X	X	X
<b>Shrubs</b>													
<i>Amorpha canescens</i>	leadplant	N					X			X	X		
<i>Atriplex canescens</i>	fourwing saltbush	N	X							X	X	X	X
<i>Brickellia eupatorioides</i> var. <i>chlorolepis</i>	false boneset	N		X		X				X	X	X	X
<i>Brickellia fendleri</i>	Fendler's brickellbush	N						X		X	X	X	X
<i>Brickellia grandiflora</i>	tasselflower brickellbush	N				X				X	X		
<i>Cercocarpus montanus</i>	mountain mahogany	N				X	X	X		X		X	X
<i>Jamesia Americana</i>	cliffbush	N			X	X				X	X	X	X
<i>Parthenocissus quinquefolia</i> var. <i>quinquefolia</i>	Virginia creeper	N						X		X	X	X	X
<i>Physocarpus monogynus</i>	mountain ninebark	N			X	X	X			X	X	X	X
<i>Prunus virginiana</i>	common chokecherry	N				X		X		X	X	X	X
<i>Quercus undulata</i>	wavyleaf oak	N		X		X	X			X	X	X	X
<i>Rhus trilobata</i>	skunkbush sumac	N	X	X	X	X	X	X		X	X	X	X
<i>Ribes cereum</i>	wax currant	N	X					X		X	X	X	X
<i>Ribes leptanthum</i>	trumpet gooseberry	N						X		X	X	X	X
<i>Rosa woodsii</i>	Woods' rose	N						X		X	X	X	X
<i>Rubus neomexicana</i>	New Mexico raspberry	N						X		X	X	X	X
<i>Symphoricarpos</i> spp.	snowberry	N							CAVO			X	X
<i>Toxicodendron radicans</i>	poison ivy	N							CAVO			X	X

## CAVO Plants Final Species List A-61

Scientific Name	Common Name	Origin	DG	LG	CG	PJ	PO	GO	Source other than NMNHP	Observed by NMNHP	Vouched by NMNHP	Voucher at CAVO	On revised target list
<i>Yucca glauca</i> var. <i>glauca</i>	soapweed yucca	N				X				X		X	X
<b>Sub-Shrubs</b>													
<i>Artemisia frigida</i>	fringed sagewort	N	X	X	X	X				X		X	X
<i>Brickellia brachyphylla</i>	plumed brickellbush	N		X						X	X	X	X
<i>Echinocereus viridiflorus</i>	nylon hedgehog cactus	N		X						X			X
<i>Gutierrezia sarothrae</i>	broom snakeweed	N		X						X	X	X	X
<i>Heterotheca villosa</i>	hairy goldenaster	N		X						X	X	X	X
<i>Opuntia phaeacantha</i>	tulip pricklypear	N		X						X			
<i>Opuntia polyacantha</i>	plains pricklypear	N		X		X	X			X		X	X
<i>Zinnia grandiflora</i>	Rocky Mountain zinnia	N							CAVO			X	X
<b>Grasses</b>													
<i>Agropyron cristatum</i>	crested wheatgrass	I							CAVO			X	X
<i>Andropogon gerardii</i> var. <i>gerardii</i>	big bluestem	N	X	X		X	X			X	X	X	X
<i>Aristida divaricata</i>	poverty threeawn	N	X	X						X	X		
<i>Aristida purpurea</i> var. <i>longiseta</i>	red threeawn	N		X						X	X	X	X
<i>Aristida purpurea</i> var. <i>purpurea</i>	purple threeawn	N	X	X						X	X		
<i>Blepharoneuron tricholepis</i>	pine dropseed	N							CAVO			X	X
<i>Bouteloua curtipendula</i>	sideoats grama	N	X	X	X	X				X	X	X	X
<i>Bouteloua gracilis</i>	blue grama	N	X	X	X	X	X	X		X	X	X	X
<i>Bouteloua hirsuta</i>	hairy grama	N		X		X				X	X		X
<i>Bromus anomalus</i>	nodding brome	N							CAVO			X	X
<i>Bromus frondosus</i>	weeping brome	N							CAVO			X	X
<i>Bromus inermis</i>	smooth brome	I							CAVO			X	X
<i>Bromus japonicus</i>	Japanese brome	I							CAVO			X	X
<i>Bromus lanatipes</i>	woolly brome	N				X				X	X	X	X
<i>Bromus tectorum</i>	cheatgrass	I							CAVO			X	X
<i>Buchloe dactyloides</i>	buffalograss	N								X	X		X
<i>Carex occidentalis</i>	western sedge	N					X	X		X	X		
<i>Carex</i> spp.	sedge	N		X	X	X		X		X	X		
<i>Echinochloa crus-galli</i>	barnyardgrass	I							CAVO			X	X

## CAVO Plants Final Species List A-62

Scientific Name	Common Name	Origin	DG	LG	CG	PJ	PO	GO	Source other than NMNHP	Observed by NMNHP	Vouched by NMNHP	Voucher at CAVO	On revised target list
<i>Elymus canadensis</i>	Canada wildrye	N				X				X	X		
<i>Elymus elymoides</i>	bottlebrush squirreltail	N		X	X					X	X	X	X
<i>Elymus virginicus</i>	Virginia wildrye	N							CAVO			X	X
<i>Festuca arizonica</i>	Arizona fescue	N			X	X				X		X	X
<i>Koeleria macrantha</i>	prairie junegrass	N			X			X		X	X	X	X
<i>Lycurus setosus</i>	bristly wolfstail	N		X		X				X	X		X
<i>Melica porteri</i>	Porter's melicgrass	N			X	X				X	X		
<i>Muhlenbergia montana</i>	mountain muhly	N		X	X	X	X			X		X	X
<i>Muhlenbergia torreyi</i>	ring muhly	N		X						X	X	X	X
<i>Muhlenbergia wrightii</i>	spike muhly	N		X			X			X	X		
<i>Munroa squarrosa</i>	false buffalograss	N		X						X	X	X	X
<i>Oryzopsis hymenoides</i>	Indian ricegrass	N							CAVO			X	X
<i>Oryzopsis micrantha</i>	littleseed ricegrass	N				X		X		X	X	X	X
<i>Panicum capillare</i>	witchgrass	N		X						X	X	X	X
<i>Pascopyrum smithii</i>	western wheatgrass	N		X						X	X	X	X
<i>Poa fendleriana</i> ssp. <i>fendleriana</i>	skyline blugrass	N					X	X		X	X	X	X
<i>Poa pratensis</i>	Kentucky bluegrass	N						X		X	X	X	X
<i>Schedonnardus paniculatus</i>	tumblegrass	N		X						X	X		
<i>Schizachyrium scoparium</i>	little bluestem	N	X	X	X	X	X			X	X	X	X
<i>Setaria pumila</i>	yellow bristlegrass	I							CAVO			X	X
<i>Setaria viridis</i>	green bristlegrass	I		X						X	X		
<i>Sporobolus cryptandrus</i>	sand dropseed	N	X	X						X	X		
<i>Stipa robusta</i>	sleepygrass	N	X			X				X	X		
<i>Stipa scribneri</i>	Scribner's needlegrass	N				X	X			X	X		
<i>Vulpia octoflora</i>	sixweeks fescue	N							CAVO			X	X
<b>Forbs</b>													
<i>Achillea millefolium</i> var. <i>occidentalis</i>	yarrow	N			X	X				X	X	X	X
<i>Allium cernuum</i>	nodding onion	N		X	X	X				X	X	X	X
<i>Amaranthus hybridus</i>	slim amaranth	N		X		X				X	X		X
<i>Amaranthus palmeri</i>	carelessweed	N							CAVO			X	X

## CAVO Plants Final Species List A-63

Scientific Name	Common Name	Origin	DG	LG	CG	PJ	PO	GO	Source other than NMNHP	Observed by NMNHP	Vouched by NMNHP	Voucher at CAVO	On revised target list
<i>Ambrosia artemisiifolia</i>	annual ragweed	N							MSB				X
<i>Ambrosia confertiflora</i>	weakleaf bur ragweed	N	X	X						X	X		
<i>Ambrosia psilostachya</i>	Cuman ragweed	N							CAVO			X	X
<i>Androsace septentrionalis</i>	pygmyflower rockjasmine	N							CAVO			X	X
<i>Anemone cylindrica</i>	candle anemone	N			X					X	X		
<i>Antennaria parvifolia</i>	smallleaf pussytoes	N						X		X	X		
<i>Apocynum androsaemifolium</i>	spreading dogbane	N						X		X	X		
<i>Apocynum cannabinum</i>	Indianhemp	N							CAVO			X	X
<i>Arabis hirsuta</i>	hairy rockcress	N							CAVO			X	X
<i>Argemone hispida</i>	prickly poppy	N	X	X		X				X	X	X	X
<i>Artemisia carruthii</i>	Carruth's sagewort	N	X	X						X	X		
<i>Artemisia ludoviciana</i>	Louisiana sagewort	N	X		X	X	X			X	X	X	X
<i>Asclepias pumila</i>	plains milkweed	N		X						X	X		
<i>Asclepias</i> spp.	milkweed	N		X						X	X		
<i>Bahia dissecta</i>	ragleaf bahia	N							CAVO			X	X
<i>Berlandiera lyrata</i>	lyreleaf greeneyes	N							CAVO			X	X
<i>Callirhoe involucrata</i>	purple poppymallow	N							CAVO			X	X
<i>Calochortus gunnisonii</i>	Gunnison's Mariposa lily	N							CAVO			X	X
<i>Castilleja integra</i>	wholeleaf Indian paintbrush	N		X	X					X	X	X	X
<i>Chaetopappa ericoides</i>	rose heath	N		X						X	X		
<i>Chamaesyce fendleri</i> var. <i>fendleri</i>	Fendler's sandmat	N							CAVO			X	X
<i>Chamaesyce serpyllifolia</i>	thymeleaf sandmat	N	X	X		X				X	X		
<i>Chenopodium album</i>	lambsquarters	I							CAVO			X	X
<i>Chenopodium fremontii</i>	Fremont's goosefoot	N		X						X	X		
<i>Chenopodium graveolens</i>	fetid goosefoot	N		X						X	X	X	X
<i>Chenopodium hians</i>	hians goosefoot	N							CAVO			X	X
<i>Chenopodium leptophyllum</i>	narrowleaf goosefoot	N				X				X	X		
<i>Chenopodium pratericola</i>	desert goosefoot	N	X	X		X				X	X		
<i>Cichorium intybus</i>	chicory	I							CAVO			X	X
<i>Cirsium undulatum</i>	wavyleaf thistle	N		X						X		X	X

## CAVO Plants Final Species List A-64

Scientific Name	Common Name	Origin	DG	LG	CG	PJ	PO	GO	Source other than NMNHP	Observed by NMNHP	Vouched by NMNHP	Voucher at CAVO	On revised target list
<i>Clematis hirsutissima</i>	hairy clematis	N							CAVO			X	X
<i>Convolvulus arvensis</i>	field bindweed	I		X						X	X		X
<i>Corydalis aurea</i>	golden smoke	N							CAVO			X	X
<i>Cryptantha thyrsoiflora</i>	calcareous cryptantha	N							CAVO			X	X
<i>Cynoglossum officinale</i>	hound's tongue	I							CAVO			X	X
<i>Dalea aurea</i>	Golden prairieclover	N		X						X	X		
<i>Dalea candida</i> var. <i>oligophylla</i>	white prairieclover	N		X			X			X	X	X	X
<i>Dalea purpurea</i> var. <i>purpurea</i>	purple prairieclover	N					X			X	X	X	X
<i>Descurainia sophia</i>	herb sophia	I							CAVO			X	X
<i>Dyssodia papposa</i>	fetid marigold	N		X						X	X	X	X
<i>Engelmannia peristenia</i>	Engelmann's daisy	N							CAVO			X	X
<i>Erigeron divergens</i>	spreading fleabane	N							CAVO			X	X
<i>Erigeron subtrinervis</i>	threenerve fleabane	N							CAVO			X	X
<i>Eriogonum jamesii</i> var. <i>jamesii</i>	James' buckwheat	N			X	X				X	X	X	X
<i>Erysimum asperum</i>	plains wallflower	N		X						X	X	X	X
<i>Erysimum capitatum</i>	sanddune wallflower	N							CAVO			X	X
<i>Erysimum inconspicuum</i>	shy wallflower	N							CAVO			X	X
<i>Euphorbia davidii</i>	David's spurge	I		X						X	X		X
<i>Euphorbia marginata</i>	snow on the mountain	N							CAVO			X	X
<i>Euphorbia spathulata</i>	warty spurge	N							CAVO			X	X
<i>Frasera speciosa</i>	showy frasera	N							CAVO			X	X
<i>Galium bifolium</i>	twinleaf bedstraw	N							CAVO			X	X
<i>Gaura coccinea</i>	scarlet beeblossom	N	X	X						X	X	X	X
<i>Gentiana affinis</i>	pleated gentian	N			X					X		X	X
<i>Geranium caespitosum</i>	pineywoods geranium	N							CAVO			X	X
<i>Geranium richardsonii</i>	Richardson's geranium	N							CAVO			X	X
<i>Gilia pinnatifida</i>	sticky gilia	N				X				X	X	X	X
<i>Glandularia bipinnatifida</i>	Dakota mock vervain	N		X						X	X	X	X
<i>Grindelia acutifolia</i>	sharpleaf gumweed	N							CAVO			X	X
<i>Grindelia nuda</i> var. <i>aphanactis</i>	curlytop gumweed	N							CAVO			X	X



## CAVO Plants Final Species List A-65

Scientific Name	Common Name	Origin	DG	LG	CG	PJ	PO	GO	Source other than NMNHP	Observed by NMNHP	Vouched by NMNHP	Voucher at CAVO	On revised target list
<i>Grindelia squarrosa</i>	curlycup gumweed	N							CAVO			X	X
<i>Helianthus annuus</i>	common sunflower	N	X	X						X	X	X	X
<i>Helianthus nuttallii</i>	Nuttall's sunflower	N							CAVO			X	X
<i>Heliomeris longifolia</i>	longleaf falsegoldeneye	N							CAVO			X	X
<i>Heliomeris multiflora</i>	showy goldeneye	N		X						X	X		X
<i>Heuchera parvifolia</i>	littleleaf alumroot	N							CAVO			X	X
<i>Heuchera</i> spp.	alumroot	N			X					X			
<i>Ipomoea leptophylla</i>	bush morningglory	N	X							X	X	X	X
<i>Ipomopsis aggregata</i> ssp. <i>candida</i>	scarlet gilia	N							CAVO, MSB			X	X
<i>Kochia scoparia</i>	common kochia	I	X							X	X		
<i>Lappula occidentalis</i>	flatspine stickseed	N							CAVO			X	X
<i>Lathyrus</i> spp.	peavine	N					X			X			
<i>Liatris punctata</i>	dotted gayfeather	N		X						X	X	X	X
<i>Lithospermum multiflorum</i>	manyflowered gromwell	N		X						X	X		X
<i>Lupinus argenteus</i>	silvery lupine	N		X						X	X	X	X
<i>Lupinus plattensis</i>	Nebraska lupine	N							CAVO			X	X
<i>Lygodesmia juncea</i>	rush skeletonplant	N							CAVO			X	X
<i>Machaeranthera biglovii</i> var. <i>biglovii</i>	Bigelow's tansyaster	N							CAVO			X	X
<i>Machaeranthera canescens</i> ssp. <i>glabra</i>	hoary tansyaster	N	X							X	X		
<i>Machaeranthera pinnatifida</i>	lacy tansyaster	N		X						X	X	X	X
<i>Machaeranthera tanacetifolia</i>	tanseyleaf aster	N							CAVO			X	X
<i>Maianthemum stellatum</i>	starry false Solomon's seal	N							CAVO			X	X
<i>Marrubium vulgare</i>	horehound	I		X		X				X		X	X
<i>Melilotus officinalis</i>	yellow sweetclover	I		X						X		X	X
<i>Mentzelia multiflora</i>	manyflowered mentzelia	N							CAVO			X	X
<i>Mentzelia nuda</i> var. <i>stricta</i>	bractless blazingstar	N	X			X				X	X		
<i>Mertensia lanceolata</i>	prairie bluebells	N							CAVO			X	X
<i>Mertensia</i> spp.	Bluebells	N			X					X			
<i>Mirabilis linearis</i>	narrowleaf four o'clock	N		X						X		X	X

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Scientific Name	Common Name	Origin	DG	LG	CG	PJ	PO	GO	Source other than NMNHP	Observed by NMNHP	Vouched by NMNHP	Voucher at CAVO	On revised target list
<i>Mirabilis oxybaphoides</i>	smooth spreading four o'clock	N		X						X	X		
<i>Monarda fistulosa</i> var. <i>menthifolia</i>	mintleaf beebalm	N							CAVO			X	X
<i>Nama dichotomum</i>	wishbone fiddleleaf	N				X				X	X		
<i>Oenothera caespitosa</i>	tufted eveningprimrose	N							CAVO			X	X
<i>Oenothera coronopifolia</i>	crownleaf evening-primrose	N	X							X	X	X	X
<i>Oenothera elata</i> ssp. <i>hirsutissima</i>	Hooker's eveningprimrose	N							CAVO			X	X
<i>Oenothera jamesii</i>	trumpet evening-primrose	N							CAVO			X	X
<i>Onosmodium molle</i> ssp. <i>occidentale</i>	western marbleseed	N		X						X	X		X
<i>Orobanche fasciculata</i>	clustered broomrape	N							CAVO			X	X
<i>Orobanche ludoviciana</i> ssp. <i>multiflora</i>	manyflowered broomrape	N							CAVO			X	X
<i>Orthocarpus luteus</i>	yellow owlclover	N							CAVO			X	X
<i>Oxytropis sericea</i>	silvery lupine	N							CAVO			X	X
<i>Packera fendleri</i>	Fendler's ragwort	N			X	X				X	X		X
<i>Packera multilobata</i>	lobeleaf groundsel	N							CAVO			X	X
<i>Packera neomexicanus</i> var. <i>mutabilis</i>	New Mexico groundsel	N							CAVO			X	X
<i>Packera pseud aurea</i> var. <i>flavula</i>	falsegold groundsel	N							MSB				X
<i>Pectis angustifolia</i> var. <i>angustifolia</i>	narrowleaf pectis	N	X	X						X	X		X
<i>Penstemon angustifolius</i>	broadbeard beardtongue	N							CAVO			X	X
<i>Penstemon barbatus</i>	beardlip penstemon	N							CAVO			X	X
<i>Penstemon jamesii</i>	James' beardtongue	N							CAVO			X	X
<i>Pericome caudata</i>	mountain leaftail	N			X					X	X	X	X
<i>Phacelia denticulata</i>	Rocky Mountain scorpionweed	N							CAVO			X	X
<i>Phacelia heterophylla</i>	varileaf phacelia	N				X				X	X	X	X
<i>Physalis longifolia</i> var. <i>longifolia</i>	longleaf groundcherry	N	X							X	X		
<i>Physalis subulata</i> var. <i>neomexicana</i>	New Mexican groundcherry	N	X	X		X				X	X		
<i>Picradeniopsis oppositifolia</i>	oppositeleaf bahia	N		X						X	X		
<i>Plantago patagonica</i>	woolly plantain	N							CAVO			X	X
<i>Polanisia dodecandra</i> ssp. <i>trachysperma</i>	sandyseed clammyweed	N	X	X						X	X	X	X

## CAVO Plants Final Species List A-67

Scientific Name	Common Name	Origin	DG	LG	CG	PJ	PO	GO	Source other than NMNHP	Observed by NMNHP	Vouched by NMNHP	Voucher at CAVO	On revised target list
<i>Polygonum convolvulus</i>	black bindweed	I		X						X	X	X	X
<i>Portulaca oleracea</i>	common purslane	N		X						X			
<i>Potentilla hippiana</i>	woolly cinquefoil	N			X					X	X		X
<i>Potentilla pensylvanica</i>	Pennsylvania cinquefoil	N			X	X				X	X		
<i>Psoraleidium tenuiflorum</i>	slimflower scurfpea	N		X						X	X		X
<i>Pulsatilla patens</i> ssp. <i>multifida</i>	cutleaf anemone	N							CAVO			X	X
<i>Ratibida columnifera</i>	upright prairie coneflower	N							CAVO			X	X
<i>Ratibida tagetes</i>	green prairie coneflower	N		X						X	X	X	X
<i>Rumex salicifolius</i> var. <i>mexicanus</i>	Mexican dock	N							CAVO			X	X
<i>Salsola tragus</i>	prickly Russian thistle	I	X	X						X	X	X	X
<i>Salvia reflexa</i>	lanceleaf sage	N		X						X	X	X	X
<i>Selaginella densa</i>	lesser spikemoss	N			X	X				X	X		
<i>Senecio flaccidus</i> var. <i>flaccidus</i>	threadleaf ragwort	N				X				X		X	X
<i>Senecio multicapitatus</i>	ragwort groundsel	N		X		X				X	X	X	X
<i>Silene drummondii</i>	Drummond's campion	N			X					X	X		
<i>Solanum heterodoxum</i> var. <i>novomexicanum</i>	New Mexican nightshade	N		X						X	X		
<i>Solanum physalifolium</i>	hoe nightshade	N							CAVO			X	X
<i>Solanum rostratum</i>	buffalobur nightshade	N	X	X						X			X
<i>Solidago canadensis</i> var. <i>scabra</i>	Canada goldenrod	N							CAVO			X	X
<i>Solidago mollis</i>	velvety goldenrod	N		X	X	X	X	X		X	X		X
<i>Solidago velutina</i>	threenerve goldenrod	N							MSB				X
<i>Sphaeralcea coccinea</i>	scarlet globemallow	N		X						X	X	X	X
<i>Stellaria</i> spp.	starwort								CAVO			X	X
<i>Stephanomeria minor</i>	narrowleaf wirelettuce	N		X						X	X	X	X
<i>Symphotrichum eatonii</i>	Eaton's aster	N							CAVO			X	X
<i>Symphotrichum fendleri</i>	Fendler's aster	N							CAVO			X	X
<i>Thelesperma megapotamicum</i>	Hopi tea greenthread	N		X						X	X	X	X
<i>Thermopsis rhombifolia</i>	golden pea	N				X				X		X	X
<i>Tragia ramosa</i>	branched noseburn	N	X							X	X		
<i>Tragopogon dubius</i>	yellow salsify	I							CAVO			X	X

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Scientific Name	Common Name	Origin	DG	LG	CG	PJ	PO	GO	Source other than NMNHP	Observed by NMNHP	Vouched by NMNHP	Voucher at CAVO	On revised target list
<i>Tragopogon pratensis</i>	meadow salsify	I		X						X	X		
<i>Verbascum thapsus</i>	common mullein	I	X		X	X				X			X
<i>Verbena macdougalii</i>	MacDougal verbena	N		X						X	X	X	X
<i>Verbesina encelioides</i>	golden crownbeard	N		X		X				X	X	X	X
<i>Vicia americana</i>	american vetch	N			X			X		X			X
<i>Woodsia oregana</i> ssp. <i>cathcartiana</i>	Oregon cliff fern	N						X		X	X		
<i>Xanthium strumarium</i> var. <i>canadense</i>	Canada cocklebur	N							CAVO			X	X
<b>Total Counts: 234</b>			<b>35</b>	<b>84</b>	<b>32</b>	<b>53</b>	<b>24</b>	<b>22</b>	<b>88</b>	<b>146</b>	<b>123</b>	<b>166</b>	<b>187</b>

**Appendix 4**  
**CAVO Amphibians and Reptiles Original Target List**

Common Name	Scientific Name	Status	Source	Why Removed
Barred Tiger Salamander	<i>Ambystoma tigrinum mavortium</i>	Possible	CAVO checklist	
<b>Boreal Chorus Frog</b>	<b><i>Pseudacris triseriata maculata</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1996</b>	<b>habitat absent</b>
<b>Northern Leopard Frog</b>	<b><i>Rana pipiens</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1997</b>	<b>habitat absent</b>
Plains Spadefoot Toad	<i>Spea bombifrons</i>	Possible	CAVO checklist	
Couch's Spadefoot Toad	<i>Scaphiopus couchii</i>	Possible	CAVO checklist	
New Mexico Spadefoot Toad	<i>Spea multiplicatus</i>	Present	CAVO checklist	
Great Plains Toad	<i>Bufo cognatus</i>	Possible	CAVO checklist	
Red-spotted Toad	<i>Bufo punctatus</i>	Possible	CAVO checklist	
Rocky Mtn. Woodhouse's Toad	<i>Bufo woodhousei woodhousei</i>	Possible	CAVO checklist	
<b>Western Ornate Box Turtle</b>	<b><i>Terrapene ornata ornata</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1996</b>	<b>out of range</b>
<b>Snapping Turtle</b>	<b><i>Chelydra serpentina</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1997</b>	<b>out of range</b>
<b>Yellow Mud Turtle</b>	<b><i>Kinosternon flavescens</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1998</b>	<b>habitat absent</b>
Collared Lizard	<i>Crotaphytus collaris</i>	Possible	CAVO checklist	
Lesser Earless Lizard	<i>Holbrookia maculata</i>	Present	CAVO checklist	
<b>Texas Horned Lizard</b>	<b><i>Phrynosoma cornutum</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1996</b>	<b>out of range</b>
Mountain Short-horned Lizard	<i>Phrynosoma douglassi</i>	Possible	CAVO checklist	
Eastern Fence Lizard	<i>Sceloporus undulatus</i>	Possible	Gennaro et al., 1976	
<b>Red-lipped Eastern Fence Lizard</b>	<b><i>Sceloporus undulatus erythrocheilus</i></b>	<b>Not Present</b>	<b>CAVO checklist</b>	<b>subspecies</b>
<b>Desert Side-blotched Lizard</b>	<b><i>Uta stansburiana stejnegeri</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1996</b>	<b>out of range</b>
Southern Many-lined Skink	<i>Eumeces multivirgatus epipleurotus</i>	Possible	CAVO checklist	
Great Plains or Sonoran Skink	<i>Eumeces obsoletus</i>	Present	CAVO checklist	
Six-lined Racerunner	<i>Cnemidophorus sexlineatus</i>	Present	CAVO checklist	
Plateau Striped Whiptail	<i>Cnemidophorus velox</i>	Present	CAVO checklist	
Checkered Whiptail	<i>Cnemidophorus grahami</i>	Possible	CAVO checklist	changed to <i>C. tessellatus</i>
Kansas Glossy Snake	<i>Arizona elegans blanchardi</i>	Possible	CAVO checklist	
Eastern Yellowbelly Racer	<i>Coluber constrictor flaviventris</i>	Possible	CAVO checklist	
Prairie Ringneck Snake	<i>Diadophis punctatus arnyi</i>	Possible	CAVO checklist	
Corn Snake	<i>Elaphe guttata</i>	Possible	CAVO checklist	
Western Plains Hognose Snake	<i>Heterodon nasicus nasicus</i>	Possible	CAVO checklist	
Texas Night Snake	<i>Hypsiglena torquata texana</i>	Possible	CAVO checklist	

## CAVO Amphibians and Reptiles Original Target List A-70

Common Name	Scientific Name	Status	Source	Why Removed
Central Plains Milk Snake	<i>Lampropeltis triangulum gentilis</i>	Present	CAVO checklist	
Desert King Snake	<i>Lampropeltis getula splendida</i>	Possible	G. Carpenter pers. comm.	
Western Coachwhip	<i>Masticophis flagellum testaceus</i>	Possible	CAVO checklist	
<b>Northern Water Snake</b>	<b><i>Natrix sipedon sipedon</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1996</b>	<b>out of range</b>
<b>Smooth Green Snake</b>	<b><i>Opheodrys vernalis blanchardi</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1996</b>	<b>habitat absent</b>
Bullsnake/Gopher Snake	<i>Pituophis melanoleucus sayi</i>	Present	CAVO checklist	changed to <i>P. catenifer</i>
Ground Snake	<i>Sonora epsicopa</i>	Possible	CAVO checklist	changed to <i>S. semiannulata</i>
Plains Black-headed Snake	<i>Tantilla nigriceps</i>	Possible	CAVO checklist	
Lined Snake	<i>Tropidoclonion lineatum</i>	Possible	CAVO checklist	
<b>Western Diamondback Rattler</b>	<b><i>Crotalus atrox</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1996</b>	<b>out of range</b>
<b>Northern Blacktailed Rattlesnake</b>	<b><i>Crotalus molossus molossus</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1996</b>	<b>out of range</b>
Western Prairie Rattlesnake	<i>Crotalus viridis viridis</i>	Possible	CAVO checklist	

**Appendix 5**  
**CAVO Amphibians and Reptiles Revised Target List**

Common Name	Scientific Name	Species on original target list?	Observed?
Tiger Salamander	<i>Ambystoma tigrinum</i>	X	
Plains Spadefoot Toad	<i>Spea bombifrons</i>	X	
Couch's Spadefoot Toad	<i>Scaphiopus couchii</i>	X	
New Mexico Spadefoot Toad	<i>Spea multiplicatus</i>	X	X
Great Plains Toad	<i>Bufo cognatus</i>	X	
Red-spotted Toad	<i>Bufo punctatus</i>	X	
Woodhouse's Toad	<i>Bufo woodhousii</i>	X	
Ornate Box Turtle	<i>Terrapene ornata</i>	X	
Collared Lizard	<i>Crotaphytus collaris</i>	X	
Lesser Earless Lizard	<i>Holbrookia maculata</i>	X	X
Texas Horned Lizard	<i>Phrynosoma cornutum</i>	X	
Short-horned Lizard	<i>Phrynosoma douglassi</i>	X	
Eastern Fence Lizard	<i>Sceloporus undulatus</i>	X	X
Southern Many-lined Skink	<i>Eumeces multivirgatus</i>	X	X
Great Plains Skink	<i>Eumeces obsoletus</i>	X	
Six-lined Racerunner	<i>Cnemidophorus sexlineatus</i>	X	X
Plateau Striped Whiptail	<i>Cnemidophorus velox</i>	X	X
Checkered Whiptail	<i>Cnemidophorus grahami</i>	X	
Kansas Glossy Snake	<i>Arizona elegans</i>	X	
Eastern Yellowbelly Racer	<i>Coluber constrictor</i>	X	
Prairie Ringneck Snake	<i>Diadophis punctatus</i>	X	
Corn Snake	<i>Elaphe guttata</i>	X	
Western Plains Hognose Snake	<i>Heterodon nasicus</i>	X	
Texas Night Snake	<i>Hypsiglena torquata</i>	X	
Central Plains Milk Snake	<i>Lampropeltis triangulum</i>	X	X
Desert King Snake	<i>Lampropeltis getula</i>	X	
Western Coachwhip	<i>Masticophis flagellum</i>	X	
Bullsnake/Gopher Snake	<i>Pituophis catenifer</i>	X	X
Ground Snake	<i>Sonora semiannulata</i>	X	
Plains Black-headed Snake	<i>Tantilla nigriceps</i>	X	
Wandering Garter Snake	<i>Thamnophis elegans</i>		
Plains Garter Snake	<i>Thamnophis radix</i>		
Lined Snake	<i>Tropidoclonion lineatum</i>	X	
Western Prairie Rattlesnake	<i>Crotalus viridis</i>	X	

**Appendix 6**  
**CAVO Amphibians and Reptiles Final Species List**

Common Name	Scientific Name	Habitat	Observer, if other than NMNHP staff	On revised target list?
New Mexico Spadefoot Toad	<i>Spea multiplicatus</i>	grassland		X
Lesser Earless Lizard	<i>Holbrookia maculata</i>	grassland		X
Eastern Fence Lizard	<i>Sceloporus undulatus</i>	all habitat types		X
Great Plains Skink	<i>Eumeces obsoletus</i>	grassland		X
Six-lined Racerunner	<i>Cnemidophorus sexlineatus</i>	pinon-juniper scrub		X
Plateau Striped Whiptail	<i>Cnemidophorus velox</i>	pinon-juniper scrub		X
Central Plains Milk Snake	<i>Lampropeltis triangulum</i>	rocky outcrops		X
Bullsnake/Gopher Snake	<i>Pituophis catenifer</i>	grassland		X
Wandering Garter Snake	<i>Thamnophis elegans</i>	rocky outcrops	CAVO staff	X
Western Prairie Rattlesnake	<i>Crotalus viridis</i>	grassland	CAVO staff	X



## Appendix 7

### CAVO Birds Original Target List

Common Name	Scientific Name	Status	Source	Reason for removal
Turkey Vulture	<i>Cathartes aura</i>	Possible	CAVO bird checklist	
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Possible	CAVO bird checklist	
<b>Swainson's Hawk</b>	<b><i>Buteo swainsoni</i></b>	<b>Possible</b>	<b>Capulin BBS survey</b>	<b>limited habitat</b>
Prairie Falcon	<i>Falco mexicanus</i>	Possible	CAVO bird checklist	
American Kestrel	<i>Falco sparverius</i>	Possible	CAVO bird checklist	
Wild Turkey	<i>Meleagris gallopavo</i>	Possible	CAVO bird checklist	
<b>Killdeer</b>	<b><i>Charadrius vociferus</i></b>	<b>Possible</b>	<b>CAVO bird checklist</b>	<b>limited habitat</b>
<b>Long-billed Curlew</b>	<b><i>Numenius americanus</i></b>	<b>Possible</b>	<b>Capulin BBS survey</b>	<b>limited habitat</b>
<b>Rock Dove</b>	<b><i>Columba livia</i></b>	<b>Possible</b>	<b>Capulin BBS survey</b>	<b>non-urban</b>
Mourning Dove	<i>Zenaidura macroura</i>	Possible	CAVO bird checklist	
Great Horned Owl	<i>Bubo virginianus</i>	Possible	CAVO bird checklist	
<b>Burrowing Owl</b>	<b><i>Athene cunicularia</i></b>	<b>Possible</b>	<b>Capulin BBS survey</b>	<b>limited habitat</b>
Common Nighthawk	<i>Chordeiles minor</i>	Possible	CAVO bird checklist	
Common Poorwill	<i>Phalaenoptilus nuttallii</i>	Possible	CAVO bird checklist	
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	Possible	CAVO bird checklist	
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	Possible	CAVO bird checklist	
Hairy Woodpecker	<i>Picoides villosus</i>	Possible	CAVO bird checklist	
Downy Woodpecker	<i>Picoides pubescens</i>	Possible	CAVO bird checklist	
Northern Flicker	<i>Colaptes auratus</i>	Possible	CAVO bird checklist	
Western Wood-pewee	<i>Contopus sordidulus</i>	Possible	CAVO bird checklist	
<b>Eastern Phoebe</b>	<b><i>Sayornis phoebe</i></b>	<b>Possible</b>	<b>CAVO bird checklist</b>	<b>edge of range, rare</b>
Say's Phoebe	<i>Sayornis saya</i>	Possible	CAVO bird checklist	
Cassin's Kingbird	<i>Tyrannus vociferans</i>	Possible	CAVO bird checklist	
Plumbeous Vireo	<i>Vireo plumbeus</i>	Possible	CAVO bird checklist	
Western Scrub-jay	<i>Aphelocoma californica</i>	Possible	CAVO bird checklist	
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	Possible	CAVO bird checklist	
<b>Chihuahuan Raven</b>	<b><i>Corvus cryptoleucus</i></b>	<b>Possible</b>	<b>Capulin BBS survey</b>	<b>edge of range</b>

## CAVO Birds Original Target List A-74

Common Name	Scientific Name	Status	Source	Reason for removal
Common Raven	<i>Corvus corax</i>	Possible	CAVO bird checklist	
Juniper Titmouse	<i>Baeolophus griseus</i>	Possible	B.H. Smith pers. comm.	
Mountain Chickadee	<i>Poecile gambeli</i>	Possible	CAVO bird checklist	
Rock Wren	<i>Salpinctes obsoletus</i>	Possible	CAVO bird checklist	
Canyon Wren	<i>Catherpes mexicanus</i>	Possible	CAVO bird checklist	
Bewick's Wren	<i>Thyromanes bewickii</i>	Possible	CAVO bird checklist	
House Wren	<i>Troglodytes aedon</i>	Possible	CAVO bird checklist	
Mountain Bluebird	<i>Sialia currucoides</i>	Possible	Capulin BBS survey	
American Robin	<i>Turdus migratorius</i>	Possible	CAVO bird checklist	
Northern Mockingbird	<i>Mimus polyglottos</i>	Possible	CAVO bird checklist	
Virginia's Warbler	<i>Vermivora virginiae</i>	Possible	CAVO bird checklist	
<b>Yellow-rumped Warbler</b>	<b><i>Dendroica coronata</i></b>	<b>Possible</b>	<b>CAVO bird checklist</b>	<b>limited habitat, migrant</b>
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>	Possible	CAVO bird checklist	
McGillivray's Warbler	<i>Oporornis tolmiei</i>	Possible	CAVO bird checklist	
Western Tanager	<i>Piranga ludoviciana</i>	Possible	CAVO bird checklist	
Green-tailed Towhee	<i>Pipilo chlorurus</i>	Possible	CAVO bird checklist	
Spotted Towhee	<i>Pipilo maculatus</i>	Possible	CAVO bird checklist	
Canyon Towhee	<i>Pipilo fuscus</i>	Possible	CAVO bird checklist	
Cassin's Sparrow	<i>Aimophila cassinii</i>	Possible	Capulin BBS survey	
Chipping Sparrow	<i>Spizella passerina</i>	Possible	CAVO bird checklist	
Brewer's Sparrow	<i>Spizella breweri</i>	Possible	B.H. Smith pers. comm.	
Vesper Sparrow	<i>Pooecetes gramineus</i>	Possible	CAVO bird checklist	
Lark Sparrow	<i>Chondestes grammacus</i>	Possible	CAVO bird checklist	
<b>Lark Bunting</b>	<b><i>Calamospiza melanocorys</i></b>	<b>Possible</b>	<b>B.H. Smith pers. comm.</b>	<b>rare and sporadic, migrant</b>
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	Possible	CAVO bird checklist	
Western Meadowlark	<i>Sturnella neglecta</i>	Possible	CAVO bird checklist	
Common Grackle	<i>Quiscalus quiscula</i>	Possible	Capulin BBS survey	
Brown-headed Cowbird	<i>Molothrus ater</i>	Possible	CAVO bird checklist	
Bullock's Oriole	<i>Icterus bullockii</i>	Possible	CAVO bird checklist	
House Finch	<i>Carpodacus mexicanus</i>	Possible	CAVO bird checklist	

## CAVO Birds Original Target List A-75

Common Name	Scientific Name	Status	Source	Reason for removal
Lesser Goldfinch	<i>Carduelis psaltria</i>	Possible	CAVO bird checklist	

**Appendix 8**  
**CAVO Birds Revised Target List**

Common Name	Scientific Name	Species on original target list?	Observed?
Turkey Vulture	<i>Cathartes aura</i>	X	X
Red-tailed Hawk	<i>Buteo jamaicensis</i>	X	X
American Kestrel	<i>Falco sparverius</i>	X	X
Prairie Falcon	<i>Falco mexicanus</i>	X	
Wild Turkey	<i>Meleagris gallopavo</i>	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X
Great Horned Owl	<i>Bubo virginianus</i>	X	X
Common Nighthawk	<i>Chordeiles minor</i>	X	X
Common Poorwill	<i>Phalaenoptilus nuttallii</i>	X	X
White-throated Swift	<i>Aeronautes saxatalis</i>		X
Calliope Hummingbird	<i>Stellula calliope</i>		X
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	X	
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	X	X
Lewis's Woodpecker	<i>Melanerpes lewis</i>		X
Northern Flicker, Red Shafted	<i>Colaptes auratus</i>	X	X
Hairy Woodpecker	<i>Picoides villosus</i>	X	
Downy Woodpecker	<i>Picoides pubescens</i>	X	
Western Wood-pewee	<i>Contopus sordidulus</i>	X	X
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>		X
Say's Phoebe	<i>Sayornis saya</i>	X	X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>		X
Cassin's Kingbird	<i>Tyrannus vociferans</i>	X	X
Western Kingbird	<i>Tyrannus verticalis</i>		X
Plumbeous Vireo	<i>Vireo plumbeus</i>	X	X
Western Scrub-jay	<i>Aphelocoma californica</i>	X	X
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	X	X
Common Raven	<i>Corvus corax</i>	X	X
Cliff Swallow	<i>Hirundo pyrrhonota</i>		X
Violet-green Swallow	<i>Tachycineta thalassina</i>		X
Juniper Titmouse	<i>Baeolophus griseus</i>	X	X
Mountain Chickadee	<i>Parus gambeli</i>	X	X
Black-capped Chickadee	<i>Parus atricapillus</i>		X

Common Name	Scientific Name	Species on original target list?	Observed?
White-breasted Nuthatch	<i>Sitta carolinensis</i>		X
Rock Wren	<i>Salpinctes obsoletus</i>	X	X
Bewick's Wren	<i>Thryomanes bewickii</i>	X	
Canyon Wren	<i>Catherpes mexicanus</i>	X	X
House Wren	<i>Troglodytes aedon</i>	X	X
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>		X
Mountain Bluebird	<i>Sialia currucoides</i>	X	X
Hermit Thrush	<i>Catharus guttatus</i>		X
American Robin	<i>Turdus migratorius</i>	X	X
Northern Mockingbird	<i>Mimus polyglottos</i>	X	X
Virginia's Warbler	<i>Vermivora virginiae</i>	X	X
McGillivray's Warbler	<i>Oporornis tolmiei</i>	X	X
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>	X	
Hepatic Tanager	<i>Piranga flava</i>		X
Western Tanager	<i>Piranga ludoviciana</i>	X	X
Green-tailed Towhee	<i>Pipilo chlorurus</i>	X	X
Spotted Towhee	<i>Pipilo maculatus</i>	X	X
Canyon Towhee	<i>Pipilo fuscus</i>	X	X
Chipping Sparrow	<i>Spizella passerina</i>	X	X
Brewer's Sparrow	<i>Spizella breweri</i>	X	X
Vesper Sparrow	<i>Poocetes gramineus</i>	X	X
Lark Sparrow	<i>Chondestes grammacus</i>	X	X
Cassin's Sparrow	<i>Aimophila cassinii</i>	X	
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	X	X
Western Meadowlark	<i>Sturnella neglecta</i>	X	X
Common Grackle	<i>Quiscalus quiscula</i>	X	X
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X
Bullock's Oriole	<i>Icterus bullockii</i>	X	X
House Finch	<i>Carpodacus mexicanus</i>	X	X
Lesser Goldfinch	<i>Carduelis psaltria</i>	X	X
House Sparrow	<i>Passer domesticus</i>		X

## Appendix 9

### CAVO Birds Final Species List

Common Name	Scientific Name	Habitats			Observer, if other than NMNHP staff	Observed on point?	On revised target list?
		Grass-land	Pinyon-Juniper	Human			
Turkey Vulture	<i>Cathartes aura</i>		X				X
Red-tailed Hawk	<i>Buteo jamaicensis</i>		X				X
American Kestrel	<i>Falco sparverius</i>	X			B. Quigley, NPS		X
Wild Turkey	<i>Meleagris gallopavo</i>	X					X
Mourning Dove	<i>Zenaidura macroura</i>	X	X			X	X
Great Horned Owl	<i>Bubo virginianus</i>	X				X	X
Common Nighthawk	<i>Chordeiles minor</i>	X				X	X
Common Poorwill	<i>Phalaenoptilus nuttallii</i>	X	X			X	X
White-throated Swift	<i>Aeronautes saxatalis</i>		X				X
Calliope Hummingbird	<i>Stellula calliope</i>		X		B. Gallagher, NMBBA		X
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	X	X	X		X	X
Rufous Hummingbird	<i>Selasphorus rufus</i>		X	X	B. Quigley, NPS		
Lewis Woodpecker	<i>Melanerpes lewis</i>		X		B. Quigley, NPS		X
Northern Flicker	<i>Colaptes auratus</i>		X	X			X
Western Wood-pewee	<i>Contopus sordidulus</i>		X			X	X
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>		X			X	X
Say's Phoebe	<i>Sayornis saya</i>		X	X			X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>		X			X	X
Cassin's Kingbird	<i>Tyrannus vociferans</i>	X	X			X	X
Western Kingbird	<i>Tyrannus verticalis</i>		X				X
Plumbeous Vireo	<i>Vireo plumbeus</i>		X				X
Western Scrub-jay	<i>Aphelocoma californica</i>	X	X			X	X
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	X	X			X	X
Common Raven	<i>Corvus corax</i>		X	X		X	X
Cliff Swallow	<i>Hirundo pyrrhonota</i>			X	B. Gallagher, NMBBA		X
Violet-green Swallow	<i>Tachycineta thalassina</i>		X				X
Juniper Titmouse	<i>Baeolophus griseus</i>		X		B. Quigley, NPS		X
Mountain Chickadee	<i>Parus gambeli</i>		X			X	X
Black-capped Chickadee	<i>Parus atricapillus</i>		X				X
White-breasted Nuthatch	<i>Sitta carolinensis</i>		X				X
Rock Wren	<i>Salpinctes obsoletus</i>		X				X
Canyon Wren	<i>Catherpes mexicanus</i>		X		B. Quigley, NPS		X

Common Name	Scientific Name	Habitats			Observer, if other than NMNHP staff	Observed on point?	On revised target list?
		Grass-land	Pinyon-Juniper	Human			
House Wren	<i>Troglodytes aedon</i>	X	X	X		X	X
Blue-gray Gnatcatcher	<i>Poliopitila caerulea</i>	X	X			X	X
Mountain Bluebird	<i>Sialia currucoides</i>	X	X			X	X
Hermit Thrush	<i>Catharus guttatus</i>		X		B. Gallagher, NMBBA		X
American Robin	<i>Turdus migratorius</i>		X	X		X	X
Northern Mockingbird	<i>Mimus polyglottos</i>	X	X	X		X	X
Virginia's Warbler	<i>Vermivora virginiae</i>		X			X	X
Yellow-rumped Warbler	<i>Dendroica coronata</i>		X		B. Quigley, NPS		
MacGillivray's Warbler	<i>Oporornis tolmiei</i>		X				X
Hepatic Tanager	<i>Piranga flava</i>		X				X
Western Tanager	<i>Piranga ludoviciana</i>	X	X			X	X
Green-tailed Towhee	<i>Pipilo chlorurus</i>	X	X			X	X
Spotted Towhee	<i>Pipilo maculatus</i>	X	X	X		X	X
Canyon Towhee	<i>Pipilo fuscus</i>	X	X		B. Quigley, NPS		X
Chipping Sparrow	<i>Spizella passerina</i>	X	X	X		X	X
Brewer's Sparrow	<i>Spizella breweri</i>	X				X	X
Vesper Sparrow	<i>Poocetes gramineus</i>	X				X	X
Lark Sparrow	<i>Chondestes grammacus</i>	X				X	X
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	X	X			X	X
Western Meadowlark	<i>Sturnella neglecta</i>	X				X	X
Common Grackle	<i>Quiscalus quiscula</i>		X				X
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X			X	X
Bullock's Oriole	<i>Icterus bullockii</i>		X	X			X
House Finch	<i>Carpodacus mexicanus</i>		X	X			X
Pine Siskin	<i>Carduelis pinus</i>		X	X			
Lesser Goldfinch	<i>Carduelis psaltria</i>		X			X	X
House Sparrow	<i>Passer domesticus</i>		X	X	B. Quigley, NPS		X

**Appendix 10**  
**CAVO Mammals Original Target List**

Common Name	Scientific Name	Status	Source	Reason for Removal
Dwarf Shrew	<i>Sorex nanus</i>	Possible	BISON-M	
Merriam's Shrew	<i>Sorex merriami</i>	Possible	BISON-M	
Desert Shrew	<i>Notiosorex crawfordi</i>	Possible	CAVO checklist	
Yuma Myotis	<i>Myotis yumanensis yumanensis</i>	Possible	Findley et al. 1975	Bats not targeted
Long-legged Myotis	<i>Myotis volans interior</i>	Possible	Findley et al. 1975	Bats not targeted
California Myotis	<i>Myotis californicus</i>	Possible	Parmenter et al. 2000	Bats not targeted
Western Small-footed Myotis	<i>Myotis ciliolabrum</i>	Possible	Parmenter et al. 2000	Bats not targeted
Small-footed Myotis	<i>Myotis leibii</i>	Possible	CAVO checklist	Bats not targeted
Little Brown Myotis	<i>Myotis lucifugus</i>	Possible	CAVO checklist	Bats not targeted
Fringed Myotis	<i>Myotis thysanodes</i>	Possible	CAVO checklist	Bats not targeted
Big Brown Bat	<i>Eptesicus fuscus</i>	Possible	CAVO checklist	Bats not targeted
Hoary Bat	<i>Lasiurus cinereus</i>	Possible	CAVO checklist	Bats not targeted
Pallid Bat	<i>Antrozous pallidus</i>	Possible	CAVO checklist	Bats not targeted
Brazilian Free-tailed Bat	<i>Tadarida brasiliensis</i>	Possible	Parmenter et al. 2000	Bats not targeted
Desert Cottontail	<i>Sylvilagus audubonii</i>	Possible	CAVO checklist	
Eastern Cottontail	<i>Sylvilagus floridanus</i>	Possible	CAVO checklist	Outside distribution
Nuttall's Cottontail	<i>Sylvilagus nuttallii pinetis</i>	Possible	Findley et al. 1975	
Blacktail Jackrabbit	<i>Lepus californicus</i>	Possible	CAVO checklist	
Least Chipmunk	<i>Eutamias minimus</i>	Possible	CAVO checklist	
Colorado Chipmunk	<i>Eutamias quadrivittatus</i>	Possible	CAVO checklist	Synonym
Colorado Chipmunk	<i>Tamias quadrivittatus</i>	Possible	Findley et al. 1975	
Thirteen-lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>	Possible	Findley et al. 1975	
Spotted Ground Squirrel	<i>Spermophilus spilosoma</i>	Possible	CAVO checklist	
Rock Squirrel	<i>Spermophilus variegatus</i>	Possible	CAVO checklist	
Botta's Pocket Gopher	<i>Thomomys bottae</i>	Possible	CAVO checklist	
Silky Pocket Mouse	<i>Perognathus flavus</i>	Possible	CAVO checklist	
Hispid Pocket Mouse	<i>Perognathus hispidus</i>	Possible	CAVO checklist	
Ord's Kangaroo Rat	<i>Dipodomys ordii</i>	Possible	CAVO checklist	
Banner-tailed Kangaroo Rat	<i>Dipodomys spectabilis</i>	Possible	CAVO checklist	Outside distribution
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	Possible	CAVO checklist	
Brush Mouse	<i>Peromyscus boylii</i>	Possible	CAVO checklist	
Rock Mouse	<i>Peromyscus nasutus</i>	Possible	CAVO checklist	
White-footed Mouse	<i>Peromyscus leucopus</i>	Possible	CAVO checklist	
Deer Mouse	<i>Peromyscus maniculatus</i>	Possible	CAVO checklist	
Piñon Mouse	<i>Peromyscus truei</i>	Possible	CAVO checklist	
Northern Grasshopper Mouse	<i>Onychomys leucogaster</i>	Possible	CAVO checklist	
White-throated Woodrat	<i>Neotoma albigula</i>	Possible	CAVO checklist	
Mexican Woodrat	<i>Neotoma mexicana</i>	Possible	CAVO checklist	
Southern Plains Woodrat	<i>Neotoma micropus</i>	Possible	CAVO checklist	
Mexican Vole	<i>Microtus mexicanus</i>	Possible	Gennaro et al.,	



## CAVO Mammals Original Target List A-81

Common Name	Scientific Name	Status	Source	Reason for Removal
			1976	
Porcupine	<i>Erethizon dorsatum</i>	Possible	CAVO checklist	
Coyote	<i>Canis latrans</i>	Possible	CAVO checklist	
Red Fox	<i>Vulpes vulpes</i>	Possible	CAVO checklist	Rare, prefer different habitat
Gray Fox	<i>Urocyon cinereoargenteus</i>	Possible	CAVO checklist	
Black Bear	<i>Ursus americanus</i>	Possible	CAVO checklist	
Ringtail / Civet Cat	<i>Bassariscus astutus</i>	Possible	CAVO checklist	
Raccoon	<i>Procyon lotor</i>	Possible	CAVO checklist	
Long tailed Weasel	<i>Mustela frenata</i>	Possible	CAVO checklist	
Badger	<i>Taxidea taxus</i>	Possible	CAVO checklist	
Western Spotted Skunk	<i>Spilogale gracilis</i>	Possible	CAVO checklist	
Striped Skunk	<i>Mephitis mephitis</i>	Possible	CAVO checklist	
Hognosed Skunk	<i>Conepatus leuconotus</i>	Possible	CAVO checklist	
Mountain Lion	<i>Felis concolor</i>	Possible	CAVO checklist	
Bobcat	<i>Lynx rufus</i>	Possible	CAVO checklist	
Elk	<i>Cervus elaphus</i>	Possible	CAVO checklist	
Mule Deer	<i>Odocoileus hemionus</i>	Possible	CAVO checklist	
Pronghorn Antelope	<i>Antilocarpa americana</i>	Possible	CAVO checklist	

**Appendix 11**  
**CAVO Mammals Revised Target List**

Common Name	Scientific Name	Species on original target list?	Observed?
Dwarf Shrew	<i>Sorex nanus</i>	X	
Merriam's Shrew	<i>Sorex merriami</i>	X	
<b>Masked Shrew</b>	<b><i>Sorex cinereus</i></b>		X
Desert Shrew	<i>Notiosorex crawfordi</i>	X	
Desert Cottontail	<i>Sylvilagus audubonii</i>	X	
Yuma Myotis	<i>Myotis yumanensis yumanensis</i>	X	Not surveyed
Long-legged Myotis	<i>Myotis volans interior</i>	X	Not surveyed
California Myotis	<i>Myotis californicus</i>	X	Not surveyed
Western Small-footed Myotis	<i>Myotis ciliolabrum</i>	X	Not surveyed
Small-footed Myotis	<i>Myotis leibii</i>	X	Not surveyed
Little Brown Myotis	<i>Myotis lucifugus</i>	X	Not surveyed
Fringed Myotis	<i>Myotis thysanodes</i>	X	Not surveyed
Big Brown Bat	<i>Eptesicus fuscus</i>	X	Not surveyed
Hoary Bat	<i>Lasiurus cinereus</i>	X	Not surveyed
Pallid Bat	<i>Antrozous pallidus</i>	X	Not surveyed
Brazilian Free-tailed Bat	<i>Tadarida brasiliensis</i>	X	Not surveyed
Mountain Cottontail	<i>Sylvilagus nuttallii</i>	X	X
Blacktail Jackrabbit	<i>Lepus californicus</i>	X	
Least Chipmunk	<i>Tamias minimus</i>	X	
Colorado Chipmunk	<i>Tamias quadrivittatus</i>	X	X
Thirteen-lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>	X	
Spotted Ground Squirrel	<i>Spermophilus spilosoma</i>	X	
Rock Squirrel	<i>Spermophilus variegatus</i>	X	X
Botta's Pocket Gopher	<i>Thomomys bottae</i>	X	X
Silky Pocket Mouse	<i>Perognathus flavus</i>	X	
Hispid Pocket Mouse	<i>Perognathus hispidus</i>	X	X
Ord's Kangaroo Rat	<i>Dipodomys ordii</i>	X	X
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	X	X
Brush Mouse	<i>Peromyscus boylii</i>	X	X
Rock Mouse	<i>Peromyscus nasutus</i>	X	X
White-footed Mouse	<i>Peromyscus leucopus</i>	X	
Deer Mouse	<i>Peromyscus maniculatus</i>	X	X
Piñon Mouse	<i>Peromyscus truei</i>	X	X
Northern Grasshopper Mouse	<i>Onychomys leucogaster</i>	X	X
White-throated Woodrat	<i>Neotoma albigula</i>	X	
Mexican Woodrat	<i>Neotoma mexicana</i>	X	X
Southern Plains Woodrat	<i>Neotoma micropus</i>	X	
<b>Hispid Cotton Rat</b>	<b><i>Sigmodon hispidus</i></b>		
Mexican Vole	<i>Microtus mexicanus</i>	X	
<b>Long-tailed Vole</b>	<b><i>Microtus longicaudatus</i></b>		
<b>Meadow Vole</b>	<b><i>Microtus pennsylvanicus</i></b>		
Porcupine	<i>Erethizon dorsatum</i>	X	X
Coyote	<i>Canis latrans</i>	X	X

Common Name	Scientific Name	Species on original target list?	Observed?
Gray Fox	<i>Urocyon cinereoargenteus</i>	X	X
Black Bear	<i>Ursus americanus</i>	X	X
Ringtail / Civet Cat	<i>Bassariscus astutus</i>	X	
Raccoon	<i>Procyon lotor</i>	X	
Long-tailed Weasel	<i>Mustela frenata</i>	X	
Badger	<i>Taxidea taxus</i>	X	X
Western Spotted Skunk	<i>Spilogale gracilis</i>	X	
Striped Skunk	<i>Mephitis mephitis</i>	X	
Eastern Hognosed Skunk	<i>Conepatus mesoleucus</i>	X	
Mountain Lion	<i>Felis concolor</i>	X	X
Bobcat	<i>Lynx rufus</i>	X	
Elk	<i>Cervus elaphus</i>	X	X
Mule Deer	<i>Odocoileus hemionus</i>	X	X
Pronghorn Antelope	<i>Antilocapra americana</i>	X	X

**Appendix 12**  
**CAVO Mammals Final Species List**

Common Name	Scientific Name	Habitat	Observer, if other than NMNHP staff	On revised target list?
Masked Shrew	<i>Sorex cinereus</i>	Grassland/PJ transition		X
California Myotis	<i>Myotis californicus</i>		Parmenter et al. 2000	
Western Small-footed Myotis	<i>Myotis ciliolabrum</i>		Parmenter et al. 2000	
Little Brown Myotis	<i>Myotis lucifugus</i>		Parmenter et al. 2000	
Fringed Myotis	<i>Myotis thysanodes</i>		Parmenter et al. 2000	
Big Brown Bat	<i>Eptesicus fuscus</i>		Parmenter et al. 2000	
Townsend's Big-eared Bat	<i>Corynorhinus (Plecotus) townsendii</i>	Roosting in small cave		
Mexican Free-tailed Bat	<i>Tadarida brasiliensis</i>		Parmenter et al. 2000	
Mountain Cottontail	<i>Sylvilagus nuttallii</i>		Observed near park	X
Colorado Chipmunk	<i>Tamias quadrivittatus</i>	Oak/PJ on boca		X
Rock Squirrel	<i>Spermophilus variegatus</i>	Rocky outcrop		X
Botta's Pocket Gopher	<i>Thomomys bottae</i>	Grassland		X
Hispid Pocket Mouse	<i>Perognathus hispidus</i>	Grassland		X
Ord's Kangaroo Rat	<i>Dipodomys ordii</i>	Grassland		X
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	PJ woodland		X
Brush Mouse	<i>Peromyscus boylii</i>	Oak/PJ scrub		X
Rock Mouse	<i>Peromyscus nasutus</i>	Oak/PJ scrub, PJ/mixed conifer		X
Deer Mouse	<i>Peromyscus maniculatus</i>	Grassland/PJ transition		X
Piñon Mouse	<i>Peromyscus truei</i>	Oak/PJ scrub		X
Northern Grasshopper Mouse	<i>Onychomys leucogaster</i>	Grassland		X
Mexican Woodrat	<i>Neotoma mexicana</i>	PJ woodland		X
Porcupine	<i>Erethizon dorsatum</i>	PJ woodland		X
Coyote	<i>Canis latrans</i>	Grassland/PJ woodland	CAVO staff	X
Gray Fox	<i>Urocyon cinereoargenteus</i>	Grassland/PJ woodland		X
Black Bear	<i>Ursus americanus</i>			X
Badger	<i>Taxidea taxus</i>	Grassland/PJ woodland		X
Mountain Lion	<i>Felis concolor</i>		CAVO staff	X
Elk	<i>Cervus elaphus</i>		CAVO staff	X
Mule Deer	<i>Odocoileus hemionus</i>	Grassland/PJ woodland		X
Pronghorn Antelope	<i>Antilocapra americana</i>	Grassland	Observed near park	X

### Appendix 13

#### FOUN Birds Original Target List

Common Name	Scientific Name	Status	Source	Reason for removal
Turkey Vulture	<i>Cathartes aura</i>	Possible	FOUN checklist	
Canada Goose	<i>Branta canadensis</i>	Possible	FOUN checklist	
<b>Blue-winged Teal</b>	<i>Anas discors</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat</b>
<b>Northern Harrier</b>	<i>Circus cyaneus</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>wintering</b>
<b>Cooper's Hawk</b>	<i>Accipiter cooperii</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat</b>
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Possible	FOUN checklist	
<b>Ferruginous Hawk</b>	<i>Buteo regalis</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>rare</b>
Golden Eagle	<i>Aquila chrysaetos</i>	Possible	FOUN checklist	
American Kestrel	<i>Falco sparverius</i>	Possible	FOUN checklist	
Prairie Falcon	<i>Falco mexicanus</i>	Possible	FOUN checklist	
<b>Wild Turkey</b>	<i>Meleagris gallopavo</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>absent after early spring</b>
Scaled Quail	<i>Callipepla squamata</i>	Possible	FOUN checklist	
Killdeer	<i>Charadrius vociferus</i>	Possible	FOUN checklist	
<b>Long-billed Curlew</b>	<i>Numenius americanus</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat</b>
<b>Rock Dove</b>	<i>Columba livia</i>	<b>Possible</b>	<b>BBS Wagon Mound</b>	<b>non-urban</b>
Mourning Dove	<i>Zenaidura macroura</i>	Possible	FOUN checklist	
<b>Greater Roadrunner</b>	<i>Geococcyx californianus</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat</b>
Great Horned Owl	<i>Bubo virginianus</i>	Possible	FOUN checklist	
<b>Burrowing Owl</b>	<i>Athene culicularia</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat</b>
Common Nighthawk	<i>Chordeiles minor</i>	Possible	FOUN checklist	
Common Poorwill	<i>Phalaenoptilus nuttallii</i>	Possible	FOUN checklist	
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	Possible	FOUN checklist	
<b>Downy Woodpecker</b>	<i>Picoides pubescens</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat</b>
<b>Hairy Woodpecker</b>	<i>Picoides villosus</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat</b>
Northern Flicker	<i>Colaptes auratus</i>	Possible	FOUN checklist	
<b>Olive-sided Flycatcher</b>	<i>Contopus cooperi</i>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat</b>
Say's Phoebe	<i>Sayornis saya</i>	Possible	FOUN checklist	
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	Possible	FOUN checklist	
Cassin's Kingbird	<i>Tyrannus vociferans</i>	Possible	FOUN checklist	
Western Kingbird	<i>Tyrannus verticalis</i>	Possible	FOUN checklist	
Loggerhead Shrike	<i>Lanius ludovicianus</i>	Possible	FOUN checklist	

## FOUN Birds Original Target List A-86

Common Name	Scientific Name	Status	Source	Reason for removal
Black-billed Magpie	<i>Pica pica</i>	Possible	FOUN checklist	
American Crow	<i>Corvus brachyrhynchos</i>	Possible	FOUN checklist	
Common Raven	<i>Corvus corax</i>	Possible	FOUN checklist	
Horned Lark	<i>Eremophila alpestris</i>	Possible	FOUN checklist	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	Possible	FOUN checklist	
Barn Swallow	<i>Hirundo rustica</i>	Possible	FOUN checklist	
Rock Wren	<i>Salpinctes obsoletus</i>	Possible	FOUN checklist	
<b>Western Bluebird</b>	<b><i>Sialia mexicana</i></b>	<b>Possible</b>	<b>BBS Wagon Mound</b>	<b>edge of range</b>
Mountain Bluebird	<i>Sialia currucoides</i>	Possible	FOUN checklist	
American Robin	<i>Turdus migratorius</i>	Possible	FOUN checklist	
<b>Curve-billed Thrasher</b>	<b><i>Toxostoma curvirostre</i></b>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat</b>
European Starling	<i>Sturnus vulgaris</i>	Possible	FOUN checklist	
<b>Yellow Warbler</b>	<b><i>Dendroica petechia</i></b>	<b>Possible</b>	<b>FOUN checklist</b>	<b>limited habitat, migrant</b>
<b>Yellow-rumped Warbler</b>	<b><i>Dendroica coronata</i></b>	<b>Possible</b>	<b>FOUN checklist</b>	<b>wintering, migrant</b>
<b>Wilson's Warbler</b>	<b><i>Wilsonia pusilla</i></b>	<b>Possible</b>	<b>FOUN checklist</b>	<b>migrant</b>
Canyon Towhee	<i>Pipilo fuscus</i>	Possible	FOUN checklist	
Cassin's Sparrow	<i>Aimophila cassinii</i>	Possible	BBS Wagon Mound	
Chipping Sparrow	<i>Spizella passerina</i>	Possible	FOUN checklist	
Brewer's Sparrow	<i>Spizella breweri</i>	Possible	FOUN checklist	
Vesper Sparrow	<i>Poocetes gramineus</i>	Possible	BBS Wagon Mound	
Lark Sparrow	<i>Chondestes grammacus</i>	Possible	FOUN checklist	
<b>Lark Bunting</b>	<b><i>Calamospiza melanocorys</i></b>	<b>Possible</b>	<b>FOUN checklist</b>	<b>rare and sporadic, migrant</b>
<b>Savannah Sparrow</b>	<b><i>Passerculus sandwichensis</i></b>	<b>Possible</b>	<b>BBS Wagon Mound</b>	<b>edge of range</b>
<b>White-crowned Sparrow</b>	<b><i>Zonotrichia leucophrys</i></b>	<b>Possible</b>	<b>FOUN checklist</b>	<b>wintering</b>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Possible	FOUN checklist	
Western Meadowlark	<i>Sturnella neglecta</i>	Possible	FOUN checklist	
House Finch	<i>Carpodacus mexicanus</i>	Possible	FOUN checklist	
House Sparrow	<i>Passer domesticus</i>	Possible	FOUN checklist	

**Appendix 14**  
**FOUN Birds Revised Target List**

Common Name	Scientific Name	Species on original target list?	Observed?
Turkey Vulture	<i>Cathartes aura</i>	X	X
Canada Goose	<i>Branta canadensis</i>	X	X
Mallard	<i>Anas platyrhynchos</i>		X
Red-tailed Hawk	<i>Buteo jamaicensis</i>	X	X
Swainson's Hawk	<i>Buteo swainsoni</i>		X
American Kestrel	<i>Falco sparverius</i>	X	X
<u>Golden Eagle</u>	<i>Aquila chrysaetos</i>	X	
Prairie Falcon	<i>Falco mexicanus</i>	X	X
<u>Scaled Quail</u>	<i>Callipepla squamata</i>	X	
Killdeer	<i>Charadrius vociferus</i>	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X
Great Horned Owl	<i>Bubo virginianus</i>	X	X
Common Nighthawk	<i>Chordeiles minor</i>	X	X
<u>Common Poorwill</u>	<i>Phalaenoptilus nuttallii</i>	X	
Black-chinned Hummingbird	<i>Archilochus alexandri</i>		X
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	X	X
Northern Flicker	<i>Colaptes auratus</i>	X	X
Say's Phoebe	<i>Sayornis saya</i>	X	X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	X	X
Cassin's Kingbird	<i>Tyrannus vociferans</i>	X	X
Western Kingbird	<i>Tyrannus verticalis</i>	X	X
Loggerhead Shrike	<i>Lanius ludovicianus</i>	X	X
Black-billed Magpie	<i>Pica pica</i>	X	X
American Crow	<i>Corvus brachyrhynchos</i>	X	X
Common Raven	<i>Corvus corax</i>	X	X
Horned Lark	<i>Eremophila alpestris</i>	X	X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	X	X
Barn Swallow	<i>Hirundo rustica</i>	X	X
Cliff Swallow	<i>Hirundo pyrrhonota</i>		X
House Wren	<i>Troglodytes aedon</i>		X
Rock Wren	<i>Salpinctes obsoletus</i>	X	X
Mountain Bluebird	<i>Sialia currucoides</i>	X	X
American Robin	<i>Turdus migratorius</i>	X	X
Northern Mockingbird	<i>Mimus polyglottos</i>		X

Common Name	Scientific Name	Species on original target list?	Observed?
European Starling	<i>Sturnus vulgaris</i>	X	X
Common Yellowthroat	<i>Geothlypis trichas</i>		X
Blue Grosbeak	<i>Guiraca caerulea</i>		X
Canyon Towhee	<i>Pipilo fuscus</i>	X	X
Cassin's Sparrow	<i>Aimophila cassinii</i>	X	X
Chipping Sparrow	<i>Spizella passerina</i>	X	X
Brewer's Sparrow	<i>Spizella breweri</i>	X	X
Vesper Sparrow	<i>Pooecetes gramineus</i>	X	X
Lark Sparrow	<i>Chondestes grammacus</i>	X	X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>		X
Great-tailed Grackle	<i>Quiscalus mexicanus</i>		X
Brown-headed Cowbird	<i>Molothrus ater</i>		X
Bullock's Oriole	<i>Icterus bullockii</i>		X
Western Meadowlark	<i>Sturnella neglecta</i>	X	X
House Finch	<i>Carpodacus mexicanus</i>	X	X
Lesser Goldfinch	<i>Carduelis psaltria</i>		X
<u>House Sparrow</u>	<i>Passer domesticus</i>	X	



**Appendix 15**  
**FOUN Birds Final Species List**

Common Name	Scientific Name	Habitats			Observer, if other than NMNHP staff	Observed on point?	On revised target list?
		Grass-land	Pinyon-Juniper	Riparian			
Turkey Vulture	<i>Cathartes aura</i>	X				X	X
Canada Goose	<i>Branta canadensis</i>			X			X
Mallard	<i>Anas platyrhynchos</i>			X			X
Red-tailed Hawk	<i>Buteo jamaicensis</i>	X					X
Swainson's Hawk	<i>Buteo swainsoni</i>	X					X
American Kestrel	<i>Falco sparverius</i>	X					X
Prairie Falcon	<i>Falco mexicanus</i>		X				X
Killdeer	<i>Charadrius vociferus</i>	X					X
Mourning Dove	<i>Zenaida macroura</i>	X	X	X		X	X
Great Horned Owl	<i>Bubo virginianus</i>	X			S. Bustos, NPS		X
Common Nighthawk	<i>Chordeiles minor</i>	X	X	X		X	X
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	X					X
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	X					X
Northern Flicker	<i>Colaptes auratus</i>		X				X
Western Wood-Pewee	<i>Contopus sordidulus</i>		X	X			
Say's Phoebe	<i>Sayornis saya</i>	X					X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>		X			X	X
Cassin's Kingbird	<i>Tyrannus vociferans</i>		X				X
Western Kingbird	<i>Tyrannus verticalis</i>	X	X	X		X	X
Loggerhead Shrike	<i>Lanius ludovicianus</i>	X			B. Gallagher, NMBBA		X
Western Scrub Jay	<i>Aphelocoma californica</i>		X				
Black-billed Magpie	<i>Pica pica</i>	X					X
American Crow	<i>Corvus brachyrhynchos</i>			X			X
Common Raven	<i>Corvus corax</i>	X					X
Horned Lark	<i>Eremophila alpestris</i>	X				X	X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>			X		X	X
Barn Swallow	<i>Hirundo rustica</i>			X		X	X
Cliff Swallow	<i>Hirundo pyrrhonota</i>	X	X			X	X
House Wren	<i>Troglodytes aedon</i>			X			X
Rock Wren	<i>Salpinctes obsoletus</i>	X	X			X	X
Canyon Wren	<i>Catherpes mexicanus</i>		X				
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>		X				
Mountain Bluebird	<i>Sialia currucoides</i>	X					X
American Robin	<i>Turdus migratorius</i>			X		X	X

FOUN Birds Final Species List A-90

Common Name	Scientific Name	Habitats			Observer, if other than NMNHP staff	Observed on point?	On revised target list?
		Grass-land	Pinyon-Juniper	Riparian			
Northern Mockingbird	<i>Mimus polyglottos</i>	X	X				X
European Starling	<i>Sturnus vulgaris</i>	X					X
Yellow Warbler	<i>Dendroica petechia</i>	X			C. Norton, NPS		
Virginia's Warbler	<i>Vermivora virginiae</i>		X				
Common Yellowthroat	<i>Geothlypis trichas</i>			X			X
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>		X				
Blue Grosbeak	<i>Guiraca caerulea</i>			X			X
Spotted Towhee	<i>Pipilo maculatus</i>		X			X	
Green-tailed Towhee	<i>Pipilo chlorurus</i>		X				
Canyon Towhee	<i>Pipilo fuscus</i>				C. Norton, NPS		X
Cassin's Sparrow	<i>Aimophila cassinii</i>	X					X
Chipping Sparrow	<i>Spizella passerina</i>	X	X			X	X
Brewer's Sparrow	<i>Spizella breweri</i>	X					X
Vesper Sparrow	<i>Pooecetes gramineus</i>	X	X	X		X	X
Lark Sparrow	<i>Chondestes grammacus</i>	X				X	X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X			X	X
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>			X		X	X
Common Grackle	<i>Quiscalus quiscula</i>			X			
Great-tailed Grackle	<i>Quiscalus mexicanus</i>			X			X
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X	X		X	X
Bullock's Oriole	<i>Icterus bullockii</i>	X	X			X	X
Western Meadowlark	<i>Sturnella neglecta</i>	X	X	X		X	X
House Finch	<i>Carpodacus mexicanus</i>			X			X
Lesser Goldfinch	<i>Carduelis psaltria</i>	X	X				X

**Appendix 16**  
**PECO Amphibians and Reptiles Original Target List**

Scientific Name	Status	Source	Reason for Removal
<i>Ambystoma tigrinum</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Scaphiopus bombifrons</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Scaphiopus multiplicatus</i>	Present	Parmenter and Lightfoot, 1996	
<i>Bufo cognatus</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Bufo punctatus</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Bufo woodhousei</i>	Present	Parmenter and Lightfoot, 1996	
<i>Hyla arenicolor</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Pseudacris triseriata</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Rana catesbeiana</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Rana pipiens</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Rana blairi</i>	Present	G. Carpenter pers. Comm.	
<b><i>Chelydra serpentina</i></b>	<b>Not Present</b>	<b>This study</b>	<b>out of range</b>
<b><i>Terrapene ornata</i></b>	<b>Not Present</b>	<b>T.Brown pers. Comm</b>	<b>out of range</b>
<i>Crotaphytus colaris</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Holbrookia maculata</i>	Possible	Parmenter and Lightfoot, 1996	
<b><i>Phrynosoma cornutum</i></b>	<b>Not Present</b>	<b>T.Brown pers. Comm</b>	<b>out of range</b>
<i>Phrynosoma douglassii</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Sceloporus undulatus</i>	Present	Parmenter and Lightfoot, 1996	
<b><i>Urosaurus ornatus</i></b>	<b>Possible</b>	<b>Parmenter and Lightfoot, 1996</b>	<b>out of range</b>
<b><i>Uta stansburiana</i></b>	<b>Not Present</b>	<b>This study</b>	<b>out of range</b>
<i>Cnemidophorus exsanguis</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Cnemidophorus grahamii</i>	Possible	Parmenter and Lightfoot, 1996	changed to <i>C. tessellatus</i>
<i>Cnemidophorus inornatus</i>	Present	Parmenter and Lightfoot, 1996	
<i>Cnemidophorus velox</i>	Present	Parmenter and Lightfoot, 1996	
<i>Eumeces multivirgatus</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Eumeces obsoletus</i>	Possible	Parmenter and Lightfoot, 1996	
<b><i>Coluber constrictor</i></b>	<b>Not Present</b>	<b>G. Carpenter pers. comm.</b>	<b>habitat absent</b>
<i>Diadophis punctatus regalis</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Elaphe guttata</i>	Possible	G. Carpenter pers. comm.	
<b><i>Heterodon nasicus</i></b>	<b>Possible</b>	<b>G. Carpenter pers. comm.</b>	<b>habitat absent</b>
<i>Hypsiglena torquata</i>	Possible	Parmenter and Lightfoot, 1996	
<b><i>Lampropeltis getulus splendida</i></b>	<b>Not Present</b>	<b>T.Brown pers. Comm</b>	<b>out of range</b>
<i>Lampropeltis triangulum celaenops</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Leptotyphlops dulcis</i>	Possible	G. Carpenter pers. comm.	
<i>Liochlorophis vernalis</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Masticophis flagellum</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Masticophis taeniatus</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Pituophis melanoleucus (catenifer)</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Salvadora grahamiae</i>	Possible	Parmenter and Lightfoot, 1996	
<b><i>Sirtalis dorsalis</i></b>	<b>Not Present</b>	<b>Degenhardt et al. 1996</b>	<b>out of range - should be <i>Thamnophis sirtalis</i></b>

## PECO Amphibians and Reptiles Original Target List A-92

Scientific Name	Status	Source	Reason for Removal
<i>Sonora semiannulata</i>	Not Present	G. Carpenter pers. comm.	out of range
<i>Tantilla nigriceps</i>	Not Present	Parmenter and Lightfoot, 1996	out of range
<i>Thamnophis cyrtopsis</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Thamnophis elegans vagrans</i>	Present	Parmenter and Lightfoot, 1996	
<i>Thamnophis marcianus</i>	Not Present	T.Brown pers. Comm	out of range
<i>Tropidoclonion lineatum</i>	Possible	G. Carpenter pers. comm.	
<i>Crotalus viridis viridis</i>	Possible	Parmenter and Lightfoot, 1996	
<i>Crotalus atrox</i>	Not Present	Degenhardt et al. 1996	out of range

**Appendix 17**  
**PECO Amphibians and Reptiles Revised Target List**

Common Name	Scientific Name	Species on original target list?	Observed?
Tiger Salamander	<i>Ambystoma tigrinum</i>	X	
Plains Spadefoot Toad	<i>Scaphiopus bombifrons</i>	X	
New Mexico Spadefoot Toad	<i>Scaphiopus multiplicata</i>	X	X
Great Plains Toad	<i>Bufo cognatus</i>	X	
Red-spotted Toad	<i>Bufo punctatus</i>	X	
Woodhouse toad	<i>Bufo woodhousii</i>	X	X
Canyon Tree Frog	<i>Hyla arenicolor</i>	X	
Striped Chorus Frog	<i>Pseudacris triseriata</i>	X	
Bullfrog	<i>Rana catesbeiana</i>	X	
Leopard Frog	<i>Rana pipiens</i>	X	
Plains leopard Frog	<i>Rana blairi</i>	X	X
Collared Lizard	<i>Crotaphytus collaris</i>	X	
Lesser Earless Lizard	<i>Holbrookia maculata</i>	X	
Short-horned Lizard	<i>Phrynosoma douglassii</i>	X	
Eastern Fence Lizard	<i>Sceloporus undulatus</i>	X	X
Chihuahuan Spotted Whiptail Lizard	<i>Cnemidophorus exsanguis</i>	X	
Checkered Whiptail Lizard	<i>Cnemidophorus tesselatus</i>	X	
Little Striped Whiptail Lizard	<i>Cnemidophorus inornatus</i>	X	
Plateau Striped Whiptail Lizard	<i>Cnemidophorus velox</i>	X	X
Many-lined Skink	<i>Eumeces multivirgatus</i>	X	
Great Plains Skink	<i>Eumeces obsoletus</i>	X	
Regal Ringneck Snake	<i>Diadophis punctatus</i>	X	
Corn Snake	<i>Elaphe guttata</i>	X	
Night Snake	<i>Hypsiglena torquata</i>	X	
New Mexico Milksnake	<i>Lampropeltis triangulum</i>	X	
Texas Blind Snake	<i>Leptotyphlops dulcis</i>	X	
Smooth Green Snake	<i>Liochlorophis vernalis</i>	X	
Coachwhip Snake	<i>Masticophis flagellum</i>	X	
Striped Coachwhip Snake	<i>Masticophis taeniatus</i>	X	
Gopher Snake, Bull Snake	<i>Pituophis catenifer</i>	X	
Graham Patch-nosed Snake	<i>Salvadora grahamiae</i>	X	
Black-necked Garter Snake	<i>Thamnophis cyrtopsis</i>	X	
Wandering Garter Snake	<i>Thamnophis elegans</i>	X	X
Lined Snake	<i>Tropidoclonion lineatum</i>	X	
Prairie Rattlesnake	<i>Crotalus viridis</i>	X	X

**Appendix 18**  
**PECO Amphibians and Reptiles Final Species List**

Common Name	Scientific Name	Habitat	Observer, if other than NMNHP staff	On revised target list?
Tiger Salamander	<i>Ambystoma tigrinum</i>		PECO staff	X
New Mexico Spadefoot Toad	<i>Spea multiplicata</i>	grassland		X
Woodhouse toad	<i>Bufo woodhousii</i>	riparian		X
Plains leopard Frog	<i>Rana blairi</i>	marsh		X
Collard Lizard	<i>Crotaphytus collaris</i>		PECO staff	X
Eastern Fence Lizard	<i>Sceloporus undulatus</i>	all habitat types within park		X
Plateau Striped Whiptail Lizard	<i>Cnemidophorus velox</i>	pinon-juniper scrub		X
Gopher Snake, Bull Snake	<i>Pituophis catenifer</i>		PECO staff	X
Wandering Garter Snake	<i>Thamnophis elegans</i>	riparian		X
Prairie Rattlesnake	<i>Crotalus viridis</i>	pinon-juniper scrub		X

## Appendix 19

### PECO Birds Original Target List

Common Name	Scientific Name	Status	Source	Reason for removal
Great Blue Heron	<i>Ardea herodias</i>	Possible	Mukai, 1989	
Turkey Vulture	<i>Cathartes aura</i>	Possible	Mukai, 1989	
Mallard	<i>Anas platyrhynchos</i>	Possible	Mukai, 1989	
Common Merganser	<i>Mergus merganser</i>	Possible	Mukai, 1989	
<b>Northern Harrier</b>	<i>Circus cyaneus</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>wintering, migrant</b>
<b>Sharp-shinned Hawk</b>	<i>Accipiter striatus</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>wintering, migrant</b>
Cooper's Hawk	<i>Accipiter cooperii</i>	Possible	Mukai, 1989	
<b>Northern Goshawk</b>	<i>Accipiter gentilis</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat, wintering, migrant</b>
<b>Swainson's Hawk</b>	<i>Buteo swainsoni</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat, migrant</b>
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Possible	Mukai, 1989	
American Kestrel	<i>Falco sparverius</i>	Possible	Mukai, 1989	
<b>Peregrine Falcon</b>	<i>Falco peregrinus</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat, migrant</b>
Scaled Quail	<i>Callipepla squamata</i>	Possible	BBS Pecos	
Killdeer	<i>Charadrius vociferus</i>	Possible	Mukai, 1989	
Spotted Sandpiper	<i>Actitis macularia</i>	Possible	Mukai, 1989	
<b>Long-billed Curlew</b>	<i>Numenius americanus</i>	<b>Possible</b>	<b>BBS Pecos</b>	<b>migrant</b>
<b>Rock Dove</b>	<i>Columba livia</i>	<b>Possible</b>	<b>BBS Pecos</b>	<b>non-urban</b>
Mourning Dove	<i>Zenaida macroura</i>	Possible	Mukai, 1989	
Greater Roadrunner	<i>Geococcyx californianus</i>	Possible	Mukai, 1989	
Great Horned Owl	<i>Bubo virginianus</i>	Possible	Mukai, 1989	
Common Nighthawk	<i>Chordeiles minor</i>	Possible	Mukai, 1989	
<b>White-throated Swift</b>	<i>Aeronautes saxatalis</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat</b>
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	Possible	Mukai, 1989	
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	Possible	Mukai, 1989	
Belted Kingfisher	<i>Ceryle alcyon</i>	Possible	Mukai, 1989	
Lewis's Woodpecker	<i>Melanerpes lewis</i>	Possible	Mukai, 1989	
<b>Williamson's Sapsucker</b>	<i>Sphyrapicus thyroideus</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat, wintering</b>

Common Name	Scientific Name	Status	Source	Reason for removal
Hairy Woodpecker	<i>Picoides villosus</i>	Possible	Mukai, 1989	
Northern Flicker	<i>Colaptes auratus</i>	Possible	Mukai, 1989	
Western Wood-pewee	<i>Contopus sordidulus</i>	Possible	Mukai, 1989	
<b>Hammond's Flycatcher</b>	<b><i>Empidonax hammondi</i></b>	<b>Possible</b>	<b>BBS Pecos</b>	<b>limited habitat, migrant</b>
Gray Flycatcher	<i>Empidonax wrightii</i>	Possible	Mukai, 1989	
<b>Dusky Flycatcher</b>	<b><i>Empidonax oberholseri</i></b>	<b>Possible</b>	<b>B.H. Smith pers. comm.</b>	<b>limited habitat, migrant</b>
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>	Possible	BBS Pecos	
Black Phoebe	<i>Sayornis nigricans</i>	Possible	Mukai, 1989	
<b>Eastern Phoebe</b>	<b><i>Sayornis phoebe</i></b>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>edge of range, migrant</b>
Say's Phoebe	<i>Sayornis saya</i>	Possible	Mukai, 1989	
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	Possible	Mukai, 1989	
Cassin's Kingbird	<i>Tyrannus vociferans</i>	Possible	Mukai, 1989	
Western Kingbird	<i>Tyrannus verticalis</i>	Possible	Mukai, 1989	
Gray Vireo	<i>Vireo vicinior</i>	Possible	Mukai, 1989	limited habitat
Plumbeous Vireo	<i>Vireo plumbeus</i>	Possible	Mukai, 1989	
Warbling Vireo	<i>Vireo gilvus</i>	Possible	Mukai, 1989	
Steller's Jay	<i>Cyanocitta stelleri</i>	Possible	Mukai, 1989	
Western Scrub-jay	<i>Aphelocoma californica</i>	Possible	Mukai, 1989	
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	Possible	Mukai, 1989	
<b>Clark's Nutcracker</b>	<b><i>Nucifraga columbiana</i></b>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat</b>
<b>Black-billed Magpie</b>	<b><i>Pica pica</i></b>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat, edge of range</b>
American Crow	<i>Corvus brachyrhynchos</i>	Possible	Mukai, 1989	
Common Raven	<i>Corvus corax</i>	Possible	Mukai, 1989	
<b>Horned Lark</b>	<b><i>Eremophila alpestris</i></b>	<b>Possible</b>	<b>BBS Pecos</b>	<b>local in summer</b>
Violet-green Swallow	<i>Tachycineta thalassina</i>	Possible	Mukai, 1989	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	Possible	Mukai, 1989	
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	Possible	Mukai, 1989	
Barn Swallow	<i>Hirundo rustica</i>	Possible	Mukai, 1989	
Mountain Chickadee	<i>Poecile gambeli</i>	Possible	Mukai, 1989	



Common Name	Scientific Name	Status	Source	Reason for removal
Juniper Titmouse	<i>Baeolophus griseus</i>	Possible	Mukai, 1989	
Bushtit	<i>Psaltriparus minimus</i>	Possible	Mukai, 1989	
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Possible	BBS Pecos	
White-breasted Nuthatch	<i>Sitta carolinensis</i>	Possible	Mukai, 1989	
Pygmy Nuthatch	<i>Sitta pygmaea</i>	Possible	BBS Pecos	
Rock Wren	<i>Salpinctes obsoletus</i>	Possible	Mukai, 1989	
Canyon Wren	<i>Catherpes mexicanus</i>	Possible	Mukai, 1989	
Bewick's Wren	<i>Thryomanes bewickii</i>	Possible	Mukai, 1989	
House Wren	<i>Troglodytes aedon</i>	Possible	Mukai, 1989	
<b>American Dipper</b>	<i>Cinclus mexicanus</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat</b>
<b>Golden-crowned Kinglet</b>	<i>Regulus satrapa</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat, wintering</b>
Western Bluebird	<i>Sialia mexicana</i>	Possible	Mukai, 1989	
Mountain Bluebird	<i>Sialia currucoides</i>	Possible	Mukai, 1989	
<b>Townsend's Solitaire</b>	<i>Myadestes townsendi</i>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat, wintering</b>
Hermit Thrush	<i>Catharus guttatus</i>	Possible	Mukai, 1989	
American Robin	<i>Turdus migratorius</i>	Possible	Mukai, 1989	
Northern Mockingbird	<i>Mimus polyglottos</i>	Possible	Mukai, 1989	
European Starling	<i>Sturnus vulgaris</i>	Possible	Mukai, 1989	
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Possible	Mukai, 1989	
Virginia's Warbler	<i>Vermivora virginiae</i>	Possible	Mukai, 1989	
Yellow Warbler	<i>Dendroica petechia</i>	Possible	Mukai, 1989	
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>	Possible	Mukai, 1989	
Grace's Warbler	<i>Dendroica graciae</i>	Possible	Mukai, 1989	
MacGillivray's Warbler	<i>Oporornis tolmiei</i>	Possible	Mukai, 1989	
Yellow-breasted Chat	<i>Icteria virens</i>	Possible	Mukai, 1989	
Hepatic Tanager	<i>Piranga flava</i>	Possible	Mukai, 1989	
Western Tanager	<i>Piranga ludoviciana</i>	Possible	Mukai, 1989	
Spotted Towhee	<i>Pipilo maculatus</i>	Possible	Mukai, 1989	
Canyon Towhee	<i>Pipilo fuscus</i>	Possible	Mukai, 1989	
Chipping Sparrow	<i>Spizella passerina</i>	Possible	Mukai, 1989	

Common Name	Scientific Name	Status	Source	Reason for removal
Vesper Sparrow	<i>Pooecetes gramineus</i>	Possible	Mukai, 1989	
Lark Sparrow	<i>Chondestes grammacus</i>	Possible	Mukai, 1989	
<b>Lark Bunting</b>	<b><i>Calamospiza melanocorys</i></b>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>rare and sporadic, migrant</b>
Song Sparrow	<i>Melospiza melodia</i>	Possible	Mukai, 1989	
Dark-eyed Junco	<i>Junco hyemalis</i>	Possible	Mukai, 1989	
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	Possible	Mukai, 1989	
Blue Grosbeak	<i>Guiraca caerulea</i>	Possible	Mukai, 1989	
Lazuli Bunting	<i>Passerina amoena</i>	Possible	Mukai, 1989	
<b>Indigo Bunting</b>	<b><i>Passerina cyanea</i></b>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>rare (1 previous sighting)</b>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Possible	Mukai, 1989	
Western Meadowlark	<i>Sturnella neglecta</i>	Possible	Mukai, 1989	
Brewer's blackbird	<i>Euphagus cyanocephalus</i>	Possible	Mukai, 1989	
<b>Common Grackle</b>	<b><i>Quiscalus quiscula</i></b>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>edge of range, rare</b>
Brown-headed Cowbird	<i>Molothrus ater</i>	Possible	Mukai, 1989	
Bullock's Oriole	<i>Icterus bullockii</i>	Possible	Mukai, 1989	
House Finch	<i>Carpodacus mexicanus</i>	Possible	Mukai, 1989	
<b>Red Crossbill</b>	<b><i>Loxia curvirostra</i></b>	<b>Possible</b>	<b>Mukai, 1989</b>	<b>limited habitat, sporadic</b>
Pine Siskin	<i>Carduelis pinus</i>	Possible	Mukai, 1989	
Lesser Goldfinch	<i>Carduelis psaltria</i>	Possible	Mukai, 1989	
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Possible	Mukai, 1989	
House Sparrow	<i>Passer domesticus</i>	Possible	Mukai, 1989	

**Appendix 20**  
**PECO Birds Revised Target List**

Common Name	Scientific Name	Species on original target list?	Observed?
Great Blue Heron	<i>Ardea herodias</i>	X	X
Mallard	<i>Anas platyrhynchos</i>	X	X
Common Merganser	<i>Mergus merganser</i>	X	
Turkey Vulture	<i>Cathartes aura</i>	X	X
Cooper's Hawk	<i>Accipiter cooperii</i>	X	X
Red-tailed Hawk	<i>Buteo jamaicensis</i>	X	X
American Kestrel	<i>Falco sparverius</i>	X	X
Scaled Quail	<i>Callipepla squamata</i>	X	
Killdeer	<i>Charadrius vociferus</i>	X	X
Spotted Sandpiper	<i>Actitis macularia</i>	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	X
Greater Roadrunner	<i>Geococcyx californianus</i>	X	X
Great Horned Owl	<i>Bubo virginianus</i>	X	X
Common Nighthawk	<i>Chordeiles minor</i>	X	X
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	X	X
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	X	X
Belted Kingfisher	<i>Ceryle alcyon</i>	X	X
Lewis's Woodpecker	<i>Melanerpes lewis</i>	X	
Hairy Woodpecker	<i>Picoides villosus</i>	X	X
Northern Flicker	<i>Colaptes auratus</i>	X	X
Western Wood-pewee	<i>Contopus sordidulus</i>	X	X
Gray Flycatcher	<i>Empidonax wrightii</i>	X	X
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>	X	X
Black Phoebe	<i>Sayornis nigricans</i>	X	X
Say's Phoebe	<i>Sayornis saya</i>	X	X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	X	X
Cassin's Kingbird	<i>Tyrannus vociferans</i>	X	X
Western Kingbird	<i>Tyrannus verticalis</i>	X	
Gray Vireo	<i>Vireo vicinior</i>	X	
Plumbeous Vireo	<i>Vireo plumbeus</i>	X	X
Warbling Vireo	<i>Vireo gilvus</i>	X	X
Steller's Jay	<i>Cyanocitta stelleri</i>	X	X
Western Scrub-jay	<i>Aphelocoma californica</i>	X	X
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	X	X

## PECO Birds Revised Target List A-100

Common Name	Scientific Name	Species on original target list?	Observed?
American Crow	<i>Corvus brachyrhynchos</i>	X	X
Common Raven	<i>Corvus corax</i>	X	X
Violet-green Swallow	<i>Tachycineta thalassina</i>	X	X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	X	X
Cliff Swallow	<i>Hirundo pyrrhonota</i>	X	X
Barn Swallow	<i>Hirundo rustica</i>	X	X
Mountain Chickadee	<i>Parus gambeli</i>	X	X
Juniper Titmouse	<i>Baeolophus griseus</i>	X	X
Bushtit	<i>Psaltriparus minimus</i>	X	X
Red-breasted Nuthatch	<i>Sitta canadensis</i>	X	X
White-breasted Nuthatch	<i>Sitta carolinensis</i>	X	X
Pygmy Nuthatch	<i>Sitta pygmaea</i>	X	
Rock Wren	<i>Salpinctes obsoletus</i>	X	X
Canyon Wren	<i>Catherpes mexicanus</i>	X	X
Bewick's Wren	<i>Thryomanes bewickii</i>	X	
House Wren	<i>Troglodytes aedon</i>	X	X
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>		X
Western Bluebird	<i>Sialia mexicana</i>	X	X
Mountain Bluebird	<i>Sialia currucoides</i>	X	X
Hermit Thrush	<i>Catharus guttatus</i>	X	
American Robin	<i>Turdus migratorius</i>	X	X
Northern Mockingbird	<i>Mimus polyglottos</i>	X	X
European Starling	<i>Sturnus vulgaris</i>	X	
Cedar Waxwing	<i>Bombycilla cedrorum</i>	X	X
Virginia's Warbler	<i>Vermivora virginiae</i>	X	X
Yellow Warbler	<i>Dendroica petechia</i>	X	X
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>	X	X
Yellow-rumped Warbler	<i>Dendroica coronata</i>		X
Grace's Warbler	<i>Dendroica graciae</i>	X	X
Common Yellowthroat	<i>Geothlypis trichas</i>		X
MacGillivray's Warbler	<i>Oporornis tolmiei</i>	X	X
Wilson's Warbler	<i>Wilsonia pusilla</i>		X
Yellow-breasted Chat	<i>Icteria virens</i>	X	X
Hepatic Tanager	<i>Piranga flava</i>	X	
Western Tanager	<i>Piranga ludoviciana</i>	X	X
Spotted Towhee	<i>Pipilo maculatus</i>	X	X

## PECO Birds Revised Target List A-101

Common Name	Scientific Name	Species on original target list?	Observed?
Canyon Towhee	<i>Pipilo fuscus</i>	X	X
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>		X
Chipping Sparrow	<i>Spizella passerina</i>	X	X
Vesper Sparrow	<i>Pooecetes gramineus</i>	X	X
Lark Sparrow	<i>Chondestes grammacus</i>	X	X
Song Sparrow	<i>Melospiza melodia</i>	X	X
Dark-eyed Junco	<i>Junco hyemalis</i>	X	X
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	X	X
Blue Grosbeak	<i>Guiraca caerulea</i>	X	X
Lazuli Bunting	<i>Passerina amoena</i>	X	
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X
Western Meadowlark	<i>Sturnella neglecta</i>	X	X
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	X	X
Great-tailed Grackle	<i>Quiscalus mexicanus</i>		X
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X
Bullock's Oriole	<i>Icterus bullockii</i>	X	X
House Finch	<i>Carpodacus mexicanus</i>	X	X
Pine Siskin	<i>Carduelis pinus</i>	X	X
Lesser Goldfinch	<i>Carduelis psaltria</i>	X	X
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	X	
House Sparrow	<i>Passer domesticus</i>		

## Appendix 21

### PECO Birds Final Species List

Common Name	Scientific Name	Habitats			Observer, if other than NMNHP staff	Observed on point?	On revised target list?
		Grass-land	Pinyon-Juniper	Riparian			
Great Blue Heron	<i>Ardea herodias</i>			X		X	X
Green Heron	<i>Butorides striatus</i>			X			
Canada Goose	<i>Branta canadensis</i>			X		X	
Mallard	<i>Anas platyrhynchos</i>			X			X
Turkey Vulture	<i>Cathartes aura</i>	X					X
Cooper's Hawk	<i>Accipiter cooperii</i>			X		X	X
Red-tailed Hawk	<i>Buteo jamaicensis</i>			X		X	X
Osprey	<i>Pandion haliaetus</i>			X	M. Schmitz, NPS		
American Kestrel	<i>Falco sparverius</i>			X		X	X
Killdeer	<i>Charadrius vociferus</i>			X	M. Schmitz, NPS		X
Willet	<i>Catoptrophorus semipalmatus</i>			X	M. Schmitz, NPS	X	
Spotted Sandpiper	<i>Actitis macularia</i>			X		X	X
Mourning Dove	<i>Zenaida macroura</i>		X	X		X	X
Greater Roadrunner	<i>Geococcyx californianus</i>		X		M. Schmitz, NPS		X
Great Horned Owl	<i>Bubo virginianus</i>			X		X	X
Common Nighthawk	<i>Chordeiles minor</i>			X		X	X
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	X					X
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>		X	X		X	X
Belted Kingfisher	<i>Ceryle alcyon</i>	X			B. Gallagher, NMBBA		X
Hairy Woodpecker	<i>Picoides villosus</i>			X		X	X
Northern Flicker	<i>Colaptes auratus</i>	X	X	X		X	X
Western Wood-pewee	<i>Contopus sordidulus</i>		X	X		X	X
Gray Flycatcher	<i>Empidonax wrightii</i>		X			X	X
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>			X		X	X
Willow Flycatcher	<i>Empidonax traillii</i>			X			
Black Phoebe	<i>Sayornis nigricans</i>			X		X	X
Say's Phoebe	<i>Sayornis saya</i>	X					X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	X	X	X		X	X
Cassin's Kingbird	<i>Tyrannus vociferans</i>	X		X		X	X
Plumbeous Vireo	<i>Vireo plumbeus</i>			X		X	X
Warbling Vireo	<i>Vireo gilvus</i>			X		X	X
Steller's Jay	<i>Cyanocitta stelleri</i>		X			X	X
Western Scrub-jay	<i>Aphelocoma californica</i>	X		X		X	X

Common Name	Scientific Name	Habitats			Observer, if other than NMNHP staff	Observed on point?	On revised target list?
		Grass-land	Pinyon-Juniper	Riparian			
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	X	X	X			X
American Crow	<i>Corvus brachyrhynchos</i>			X			X
Common Raven	<i>Corvus corax</i>	X	X	X		X	X
Violet-green Swallow	<i>Tachycineta thalassina</i>			X		X	X
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	X		X		X	X
Cliff Swallow	<i>Hirundo pyrrhonota</i>	X	X			X	X
Barn Swallow	<i>Hirundo rustica</i>			X			X
Mountain Chickadee	<i>Parus gambeli</i>		X	X		X	X
Juniper Titmouse	<i>Baeolophus griseus</i>		X			X	X
Bushtit	<i>Psaltriparus minimus</i>	X	X	X		X	X
Red-breasted Nuthatch	<i>Sitta canadensis</i>		X		B. Gallagher, NMBBA		X
White-breasted Nuthatch	<i>Sitta carolinensis</i>		X	X		X	X
Rock Wren	<i>Salpinctes obsoletus</i>			X		X	X
Canyon Wren	<i>Catherpes mexicanus</i>		X	X		X	X
House Wren	<i>Troglodytes aedon</i>			X		X	X
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>			X		X	X
Western Bluebird	<i>Sialia mexicana</i>			X		X	X
Mountain Bluebird	<i>Sialia currucoides</i>	X		X		X	X
American Robin	<i>Turdus migratorius</i>		X	X		X	X
Northern Mockingbird	<i>Mimus polyglottos</i>	X		X		X	X
Cedar Waxwing	<i>Bombycilla cedrorum</i>			X			X
Virginia's Warbler	<i>Vermivora virginiae</i>		X	X		X	X
Yellow Warbler	<i>Dendroica petechia</i>			X		X	X
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>		X	X		X	X
Yellow-rumped Warbler	<i>Dendroica coronata</i>			X		X	X
Grace's Warbler	<i>Dendroica graciae</i>		X				X
Common Yellowthroat	<i>Geothlypis trichas</i>			X			X
MacGillivray's Warbler	<i>Oporornis tolmiei</i>		X				X
Wilson's Warbler	<i>Wilsonia pusilla</i>			X		X	X
Yellow-breasted Chat	<i>Icteria virens</i>			X		X	X
Western Tanager	<i>Piranga ludoviciana</i>			X		X	X
Spotted Towhee	<i>Pipilo maculatus</i>	X	X	X		X	X
Canyon Towhee	<i>Pipilo fuscus</i>	X					X
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>		X				X
Chipping Sparrow	<i>Spizella passerina</i>	X	X	X		X	X
Vesper Sparrow	<i>Pooecetes gramineus</i>	X				X	X
Lark Sparrow	<i>Chondestes grammacus</i>	X				X	X

Common Name	Scientific Name	Habitats			Observer, if other than NMNHP staff	Observed on point?	On revised target list?
		Grass-land	Pinyon-Juniper	Riparian			
Song Sparrow	<i>Melospiza melodia</i>			X		X	X
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>			X		X	
Dark-eyed Junco	<i>Junco hyemalis</i>			X		X	X
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>		X	X		X	X
Blue Grosbeak	<i>Guiraca caerulea</i>			X		X	X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>			X		X	X
Western Meadowlark	<i>Sturnella neglecta</i>	X		X		X	X
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>			X		X	X
Great-tailed Grackle	<i>Quiscalus mexicanus</i>			X			X
Brown-headed Cowbird	<i>Molothrus ater</i>		X	X		X	X
Bullock's Oriole	<i>Icterus bullockii</i>			X		X	X
House Finch	<i>Carpodacus mexicanus</i>	X				X	X
American Goldfinch	<i>Carduelis tristis</i>			X			
Pine Siskin	<i>Carduelis pinus</i>	X			B. Gallagher, NMBBA		X
Lesser Goldfinch	<i>Carduelis psaltria</i>			X		X	X