

NATURAL HERITAGE INVENTORY  
OF THE MAMMALS OCCURRING IN THE  
DOUDY DRAW OPEN SPACE,  
BOULDER AND JEFFERSON COUNTIES,  
COLORADO

FINAL REPORT

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## EXECUTIVE SUMMARY

In 1993, the Colorado Natural Heritage Program (CNHP) was contracted by the City of Boulder Open Space Department to conduct a Natural Heritage Inventory of the mammals occurring in the Doudy Draw area of Boulder and Jefferson Counties. The goals of the inventory were: 1) determine if any rare, threatened, or endangered mammalian species occupied the area, 2) determine if any critical habitats for mammals exist in the area, and 3) determine the mammal species composition of the County's Open Space. During the spring and summer of 1993 we concentrated our efforts on a search for Preble's Jumping Mouse (*Zapus hudsonius preblei*) and associated small mammals species. In addition we collected information on species composition of all habitat types, defined as vegetative cover.

The inventory was conducted in seven steps:

1. A review of aerial photographs, soil surveys, topographic maps, and geological maps.
2. Existing information was gathered, especially literature and Colorado Division of Wildlife data.
3. Areas with suitable habitat to support Preble's Jumping Mouse were selected from information gathered in steps 1 and 2 as well as interviews with experts. All suitable areas were designated as sampling sites, hereinafter called "potential natural areas" (PNAs).
4. Major vegetation types were determined and representative areas were selected as sampling sites.
5. Initial ground-truthing and walk-through surveys were conducted.
6. Systematic trapping and observation was conducted within all designated PNAs and all vegetation types.
7. The results were assimilated into a final report.

Five PNAs and nine major habitat types were identified during the preparatory stages and targeted for sampling. It was determined that the only federally recognized rare mammal species whose range coincided with the study area is *Zapus hudsonius preblei* (Preble's Jumping Mouse). *Z. h. preblei* prefers moist, lowland areas (Armstrong 1972 and personal communication) and preliminary surveys of aerial photos and in the field suggested that the Doudy Draw study area may contain suitable habitat. A recent report of *Z. h. preblei* at nearby Rocky Flats (Stoecker 1992) provided associated plant species to the general habitat description. These associated

plant species were found in most of the PNAs. We sampled for 3,133 trap days (a trap-day is the a 24 hour period for each individual trap). 3,133 trap days in all habitats, however, could not verify the occurrence of Preble's jumping mouse.

Twenty-two mammal species were documented by trapping, direct observation, or observation of various signs (scat, tracks, etc.). All of these species are considered to be relatively common and secure in their range, but their relative densities and the absence of *Z. h. preblei* may be illustrative.

The report includes a single recommendation for the Douidy Draw Open Space:

Additional inventory/survey efforts in the study area are warranted to adequately understand the composition of the resident mammal populations. This is particularly true for insectivores, bats, and medium-size species and of species at the highest elevations of the area.

## INTRODUCTION

In 1993, the Colorado Natural Heritage Program (CNHP) was contracted by the City of Boulder Open Space Department to conduct a mammal inventory of the site of a proposed pump storage facility at Doudy Draw and the surrounding area. The goals of this inventory were: 1) to systematically identify the localities containing rare threatened, or endangered mammals and their critical habitats, and 2) to compile and document a list of mammals occurring in the study area, their relative abundances, and their habitat preferences.

The determination of what occurs within a managed area is of primary importance to its protection and management (Soulé and Kohm 1989). Because this is often a daunting task, a strategic approach which identifies the most sensitive resources within a study area is considered the most prudent tactic. Predictive models of wildlife-habitat relationships are useful with mammalian species and communities (Morrison et al. 1992). Such relationships are the basis for GAP analyses being undertaken in many western states. Armstrong and Freeman (1982) combine the results of previous sampling studies to arrive at a potential mammalian fauna of the Boulder County area. However, the utility of a modeled approach depends on the questions being asked, the scale of the study area, the rarity of the species being studied, and the degree of validation that wildlife-habitat models have undergone (Morrison et al. 1992). Where conservation goals are concerned, the prediction of common species in an area will likely have few negative consequences if in error. However, should areas of small size or rare or endangered species be potentially involved, the potential costs of errors are much higher. In such cases, verification of presence and absence through field work is generally preferred.

The first phase of this inventory has been completed, and the results of it are presented herein. A brief overview of the natural condition of the study area is presented first. The results of the inventory are briefly discussed.

### Overview of the Study Area

The study area is restricted to part of the City of Boulder Open Space approximately contained in T1S R70W sec 29,30,31,32; T1S R71W sec 36; and T2S R70W sec 6. These properties contain Doudy Draw and extend west to Eldorado Mountain and south into Jefferson County (Figure 1). The study area is approximately 2,000 acres along the foothills of the Southern Rocky Mountains physiographic region. Elevations range from ca. 5,640' to 8,335', encompassing portions of the Piedmont and Montane life zones. Boulder and Jefferson Counties, and especially the foothills/prairie ecotone that characterizes the Doudy Draw area, are in general both physiographically and biologically diverse (Mutel and Emerick

1992).

Climate. The climate of the area is varied, being exposed to typical high plains weather but severely modified by the nearby mountains. In general, precipitation here is greater than to the east but less than in the mountains to the west, and temperatures are higher than those either east or west of the Doudy Draw area. Precipitation in nearby Boulder averages 18.5 inches per year with frequent periods of drought in the fall and winter. Average temperatures range from 32.7 F in January to 73.6 F in the summer. Winds in some areas are buffered by the mountains, but at the mouths of the larger canyons can be locally intense and create significant damage (U.S.D.A. 1975).

Soils. The soils of the area are comprised of two types of associations. The mountainous portions to the west are composed of a rock outcrop-Juget-Baller association describable as rock outcrop and shallow, very gravelly and stony soils. The rest of the area is dominated by the Nederland-Valmont association, typified by nearly level to moderately steep, deep, and cobbly soils on old high terraces, alluvial fans, and benches (U.S.D.A. 1975)

Geology. The geology of the area is typical of the boundary between the Front Range (of the Southern Rocky Mountain Province) and the Piedmont area. The foothills along the western edge of the Piedmont are characterized by a series of folded and faulted sedimentary strata, the more resistant beds of which form the striking hogback ridges. East of this margin the area consists of broad, gently sloping surfaces that form steplike levels above modern stream valleys. The high level surfaces of the study area usually occur as fan-shaped pediments mantled by coarse alluvial deposits (U.S.D.A. 1975).

Current Vegetation. The vegetation of the study area is typical of the foothills/prairie ecotone in Boulder County. Coniferous forests dominated by Ponderosa pine are found on the mountainous western portion, and extending eastward on the higher mesas. The cooler microhabitats of north slopes of the mountains are dominated by Douglas-fir. Most of the remainder of the area is covered by grasslands whose pre-settlement composition is unclear but is currently dominated by a wide range of native grasses in some areas, grading into various proportions of introduced grasses and other exotics. The northern slopes of some mesas have patchy to large areas which are shrub-dominated. Riparian areas are dominated by dense shrubs, especially Hawthorne and Coyote willow, with some stands of small Cottonwoods. Wetlands comprise a small but important portion of the study area and are dominated grass/sedge mixtures (Marr 1961). Descriptions of the vegetation are documented in Hogan's (1993) floristic survey of the Boulder Mountain Parks.

Faunal Composition. The fauna of the Doudy Draw area is a

mixture typical of both the foothills of the Southern Rocky Mountains and the western edge of the high plains. Typically, no vertebrates and few invertebrates at the species level are endemic to the area (Andrews and Righter 1992, Ferris and Brown 1981, Woodling 1985, Armstrong 1972, Hammerson 1982, McCafferty et al., 1993, Evans 1988, Kippenhan 1990). Mule deer, Coyotes, and Black bear and a variety of other common species are all well known in the area, as are a large number of breeding passerines and several species of raptors.

**Review of mammalogy of the study area.** The vicinity of Boulder is known to have high species richness of mammals (Armstrong and Freeman 1982), a fact that is due to a diversity of habitats and to the juxtaposition of two biological regions: the Great Plains and the Southern Rocky Mountains. There are potentially 88 species of mammals that have inhabited the Boulder Mountain Parks area (Armstrong and Freeman 1982). Of these, eight have been extirpated in historic times. In spite of the importance of the area to the understanding of Colorado's natural history, relatively few studies have been undertaken. This is particularly interesting given that several major universities are within an hours drive.

Early mammalogists such as M. Cary (1911) and E. R. Warren (1942) collected specimens from the Boulder area. Although additional information is now available, these early works are still important references. Lechleitner's (1968) semi-technical report on the ecology of Colorado's mammals also considered Boulder County material. Armstrong (1972) reviewed the biogeography and distribution of mammals in Colorado, including all available study material from Boulder County. He noted the significance of the geographic interdigitation of the Piedmont and Front Range habitats to mammalian biogeography.

Armstrong and Freeman (1982) reported on the results of a mammalogy class study that determined the potential mammals of the Boulder Mountain Parks. By incorporating field study and literature reviews, their study provided a relatively thorough review of the mammals of the Boulder vicinity. We note that one of the recommendations of the Armstrong and Freeman study was a call for, "broad baseline research and detailed community- or species-specific studies".

#### METHODS

We conducted this inventory in six stages:

1. Review aerial photographs. Aerial photographs of the entire survey area were reviewed in detail to identify "potential natural areas" (PNAs) as well as general habitat types to be studied in the following stages. A total of five PNAs were identified based upon

habitat affinities of *Zapus hudsonius preblei*. In addition a qualitative effort identified nine major habitat types that were believed to be significant to mammals. Aerial photographs were compared to topographic maps, wetland maps, soil maps, and geological maps to enhance our ability to detect significant habitats and habitat types.

2. Gather existing information. The mammal collections of the University of Colorado were visited by Natural Heritage scientists where label information from specimens pertaining to the study area was recorded. We reviewed published and unpublished information and included maps, reviewing the Natural Heritage Biological and Conservation Database (BCD) and manual data, and consulting experts.

3. Refinement of PNA numbers and boundaries. From information gathered in steps 1 and 2, map the "potential natural areas" and representative vegetation types with ecosystem boundaries.

4. Perform initial ground surveys. Walk-through surveys were conducted in all habitat types. Most of the Doudy Draw area was hiked over in conducting preliminary inventory and in surveying for mammal species. Particular efforts were made to hike into all major habitat types. We also participated in a group visit to the site by City of Boulder representatives and researchers.

5. Conduct an inventory of the PNAs and identified habitats. Sampling efforts were carried out to determine the presence and status of rare species, the extent of the population (if found), and the area that needs to be protected to preserve the populations. Threats and past or present disturbances are also noted. As part of the comprehensive survey employed by this study, sites representing the best examples of the identified habitats are also inventoried.

The amount of variation within each type was visually assessed and traps were placed at sites that best represented the "typical" composition of the type. Where variation within a type was especially large, such as in the riparian shrub habitat, sampling took place at several sites in hopes of including the range of variation. Figure 2 shows locations of the sampling sites and Table 1 lists dominant vegetation at each site. Observations regarding the floral composition were also relevant and recorded.

Field surveys included small mammal trapping and the observations of the animals themselves as well as their various signs. We trapped for 3,133 trap days using mostly Sherman live traps. Sampling sites are indicated in Figure 1. At some sites, snap traps and/or the larger sized "rat traps" were used.

Traps were usually set in two parallel rows of 25 traps. Each row

was 10 meters apart and individual traps within the row were placed at 5 meter intervals. In a few areas, traps were placed in a 5 x 5 grid with traps at 10 meter intervals. In a few riparian sites where the riparian vegetation was less than ten meters in width, traps were placed in a single row. Sherman traps were baited with a few rolled oats; snap traps were baited with peanut butter. Traps were checked two times per day. All live specimens were identified and released at the trap site except where laboratory identification was necessary. Voucher material was deposited in the University of Colorado Museum.

At all times in this study, attempts were made to visually identify all mammal species observed. Actual sightings, but also scat and sign, were used to identify mammals. Finally, a bat detector was used to get a preliminary assessment of the bat diversity and density in the area. Sampling sites for the bat detector were ponds and riparian habitats near existing trap sites.

6. Compilation of results and preparation of final report. Results of all mammal sampling are compiled, entered into the Colorado Natural Heritage Program databases, and analyzed. This information is then combined into a report to the contracting agency/organization.

## RESULTS

The first phase of the inventory for mammals of the Doudy Draw Open Space is complete. During the 1993 field season (April-October), Natural Heritage staff and volunteers concentrated on completing field surveys of the designated PNAs and the best representatives of each of the described habitats. Although no rare, threatened, endangered, or significant mammalian were found in the Doudy Draw area, a list of mammals found in this study in the study area, and the habitat where each was found, was compiled.

### Rare, threatened, or endangered species.

Five rare, threatened, or endangered species were found to potentially occur within the study area: *Zapus hudsonius preblei*, *Sorex nanus*, *Sorex merriami*, *Plecotus townsendii*, and *Vulpes velox*. All are state rare, but *Zapus hudsonius preblei* and *Vulpes velox* are federal candidates for listing and considered of special concern by the Colorado Division of Wildlife. For the first phase of this inventory, *Zapus hudsonius preblei* was targeted for investigations.

Five areas within the study area were determined to be suitable habitat for *Zapus hudsonius preblei*. The jumping mouse is known from Boulder and Jefferson counties (Armstrong 1972, CDOW unpublished data, U.S.F.W.S unpublished data, Stoecker 1992). The Colorado

Natural Heritage Program currently has historic records of *Z. h. preblei* within the general vicinity of Doudy Draw in its databases, but precise location data is lacking in the source information.

*Zapus hudsonius preblei* prefers moist, lowland habitats. Warren (1942) describes its habitat as meadows, shrubby fields, edges of wood, and dense vegetation along cold streams. Whitaker (1972) reports this species in moist abandoned fields and along streams, ponds, and marshes with thick vegetation, noting a preference for moist soils. It is believed that *Z. h. preblei* inhabited a former humid grassland and savanna in eastern Colorado, but is now considered a relict of that bygone environment (Armstrong 1972).

Almost the entire length of Doudy Draw along the stream (PNA 1) was identified as likely habitat, as were the less mesic ravines to the west (PNA 2), the two grass/sedge wetlands in the study area (PNAs 3 and 4), and a mixture of grass wetland and riparian shrub along Spring Brook (PNA 5). Figure 1 illustrates these locations. It was assumed that sampling of these various types of lowland habitat would encompass all possibilities for its occurrence in the area. *Z. h. preblei* was not found in any of the PNAs.

#### Species composition of Doudy Draw.

Twenty-two species of mammals were captured or observed within the Doudy Draw Open Space. Small mammal trapping for 3,133 trap days resulted in the capture of 348 individuals of ten species. None of the captures or observations were of rare, threatened, or endangered species. No critical habitat was found. Trapping results are summarized in Table 1.

We systematically surveyed the major habitat types of the study area to estimate the species composition of the area. Nine distinguishable types were identified: prairie grasslands; foothills meadows (or ecotone); wetlands; riparian shrub; foothills shrub; rocks, cliffs, and talus; ponderosa savanna; ponderosa woodland; and Douglas-fir forest (see the Methods). As an estimate of relative abundance, the number of captures per trap day was computed. The highest observed capture rate was in the foothill shrub habitat followed by the grassland and riparian shrub habitats (Table 4). The lowest captures per trap day were in the ponderosa pine sites (woodlands and savanna are combined for analysis) and the ecotone.

The grassland sites exhibited the greatest species richness (for trapped species) with five species. Four species were captured in the riparian shrub and talus habitats, followed by the mixed conifer (n=3), the ecotone, wetlands, foothills shrub, and pine habitats with two species each. However, when trapped and observed species were combined, the three most speciose habitats are riparian shrub (n=10), pine woodland (n=9), and grasslands (n=9).

*Peromyscus maniculatus* was the most frequently captured species, comprising 80 percent of all captures (Table 5). The percentage composition of all other species varied from 0.3-6.0 percent of the total captures.

Table 2 lists all mammal species captured or observed directly or by sign in each habitat type, the relative abundance of trapped animals, the total number of species in each type, and the number of trap days in each habitat. No estimations of relative abundance were made for species that were not trapped. All habitats were dominated by the ubiquitous *Peromyscus maniculatus*. Only in the talus was the abundance of *P. maniculatus* approached by another species, *P. nasutus*.

Bat sampling was restricted to observations except for several forays in late summer using an electronic bat detector. This device uses a sensitive microphone to detect the sounds of an appropriate frequency for bats. The bat sounds are converted into an audible sound for the researcher. Using this device, we determined that there was significant bat activity in the vicinity of ponds and riparian zones. Further survey for bats is warranted and are recommended for phase two of this study.

#### Species-specific trends.

Table 2 indicates the relative abundances of the small mammal species that were trapped on the Doudy Draw Open Space. *Peromyscus maniculatus* was captured most frequently in the foothills shrub, riparian shrub, and grassland sites. This species was found least frequently in the wetlands sites (a habitat dominated by graminoids). This mouse is a very tolerant species and is often found in high numbers, even in disturbed habitats (Lechleitner 1969). This species is a significant component of the open space ecosystem. It most certainly plays a pivotal role in the food web.

*Peromyscus nasutus* was found in only three of the habitats of Doudy Draw. The highest relative abundance was revealed in the talus habitat. The species is known to have a preference for this environment. Several individuals were captured in a mixed conifer forest, a habitat not typical for the species. This is explained in that the talus is a type III -- talus that is covered by a nearly closed canopy of trees.

The vole, *Microtus ochrogaster*, was found only in habitats that are dominated by graminoids -- grasslands, wetlands, and meadows (ecotone). Nowhere common, this species was most abundant in the ecotonal meadows.

*Perognathus hispidus* was captured only four times and only in the grassland habitat. Grasslands are the only suitable habitat for

the species.

*Reithrodontomys megalotis* was found sparsely in grasslands and in riparian shrub habitats. The single capture of *Zapus princeps* was made in the riparian shrub habitat as were the only captures of *Sorex vagrans*.

In contrast, the Least chipmunk, *Eutamias minimus*, was found only in forested sites at higher elevations. It was most abundant in the mixed conifer forests followed by the talus habitat. Similarly, *Eutamias quadrivittatus* was found locally in the pine forest and on the talus.

Table 1. Summary of the trap sites and results from 3133 total trap nights.

Site no.	Habitat type	Aspect	Dominant Vegetation	Trap Nights	Total Captures
1	Prairie Grassland	0	<u>Stipa</u> sp., other grasses and forbes, <u>Lepidium</u> sp.	100	6 <u>P. maniculatus</u> 2 <u>Perognathus hispidus</u>
2	Prairie Grassland	0	<u>Schizachyrium scoparium</u> , <u>Koeleria macrantha</u> , forbes	100	9 <u>P. maniculatus</u> 1 <u>Perognathus hispidus</u>
3	Prairie Grassland	S	<u>Yucca glauca</u> , <u>Stipa</u> sp., other grasses and forbes	30	3 <u>P. maniculatus</u> 1 <u>Perognathus hispidus</u>
4	Prairie Grassland	E	exotic grasses, sparse <u>Salix exigua</u> and <u>Crataegus</u> sp.	192	34 <u>P. maniculatus</u> 1 <u>P. nasutus</u> 4 <u>Microtus</u> sp. 3 <u>Reithrodontomys megalotis</u>
5	Foothills Meadow	N	<u>Poa</u> spp., forbes	200	3 <u>P. maniculatus</u> 3 <u>Microtus</u> sp.
6	Foothills Meadow	S	<u>Symphoricarpos occidentalis</u> , <u>Poa</u> sp., exotic grasses	25	2 <u>P. maniculatus</u>
7	Wetland	0	<u>Carex</u> spp., grasses	200	1 <u>P. maniculatus</u> 2 <u>Microtus</u> sp.
8	Wetland	N	grasses	250	5 <u>P. maniculatus</u>
9	Wetland	W	<u>Symphoricarpos occidentalis</u> , <u>Carex</u> spp., grasses,	20	0
10	Riparian Shrub	0	<u>Crataegus</u> sp., <u>Toxicodendron rydbergii</u> , grasses	250	25 <u>P. maniculatus</u> 2 <u>Microtus</u> sp. 3 <u>Sorex vagrans</u>
11	Riparian Shrub	0	<u>Crataegus</u> sp., <u>Amorpha fruticosa</u> , grasses	150	14 <u>P. maniculatus</u>
12	Riparian Shrub	0	<u>Crataegus</u> sp., <u>Symphoricarpos occidentalis</u> , grasses	350	58 <u>P. maniculatus</u> 1 <u>Zapus princeps</u>
13	Riparian Shrub	0	<u>Salix exigua</u> , <u>Symphoricarpos occidentalis</u> , grasses	80	8 <u>P. maniculatus</u>

Site no.	Habitat type	Aspect	Dominant Vegetation	Trap Nights	Total Captures
14	Riparian Shrub	0	<u>Crataegus</u> sp., <u>Salix exigua</u> , <u>Symphoricarpos occidentalis</u> , grasses	188	35 <u>P. maniculatus</u> 3 <u>Reithrodontomys megalotis</u>
15	Foothills Shrubland	W	<u>Rhus aromatica</u> , grasses	200	30 <u>P. maniculatus</u> 2 <u>Sylvilagus audubonii</u> .
16	Rocks, Cliffs, Talus	0	lichens, sparse <u>Pinus ponderosa</u>	150	10 <u>P. maniculatus</u> 13 <u>P. nasutus</u> 4 <u>Eutamias minimus</u>
17	Rocks, Cliffs, Talus	E	lichens	105	7 <u>P. maniculatus</u> 2 <u>P. nasutus</u> 2 <u>Eutamias minimus</u>
18	Rocks, Cliffs, Talus	E	lichens, sparse <u>Sabina scopulorum</u>	10	1 <u>Eutamias quadrivittatus</u>
19	Rocks, Cliffs, Talus	S	lichens, sparse <u>Pinus ponderosa</u>	20	1 <u>P. maniculatus</u> 1 <u>P. nasutus</u> 2 <u>Eutamias quadrivittatus</u>
20	Ponderosa Savanna	0	<u>Pinus ponderosa</u> , grasses	150	3 <u>P. maniculatus</u> 1 <u>Eutamias minimus</u>
21	Ponderosa Woodland	0	<u>Pinus ponderosa</u> , grasses	100	0
22	Ponderosa Woodland	0	<u>Pinus ponderosa</u> , sparse <u>Crataegus</u> sp. and <u>Pseudotsuga menziesii</u> , grasses	60	4 <u>P. maniculatus</u> 3 <u>Eutamias quadrivittatus</u>
23	Douglas-fir Forest	E	<u>Pseudotsuga menziesii</u> , <u>Mahonia repens</u>	200	19 <u>P. maniculatus</u> 4 <u>P. nasutus</u> 10 <u>Eutamias minimus</u>

Table 2. Mammal species captured (X), observed (O), or leaving sign (S) and associated habitats in Doudy Draw, Boulder and Jefferson Counties, Colorado. Numbers in parentheses represent relative abundances (captures/trap nights).

	Prairie Grasslands	Foothills Meadows	Wetlands	Riparian shrub	Foothills shrubland	Rocks, Cliffs, Talus	Ponderosa Savanna	Ponderosa Woodland	Douglas-fir Forest
<u>Sorex vagrans</u>				X (0.003)					
Vespertilionid sp.		O		O,S (pond)					
<u>Sylvilagus audubonii</u>				O,S	X,O,S (0.013)				
<u>Peromyscus maniculatus</u>	X (0.120)	X (0.022)	X (0.013)	X (0.138)	X (0.150)	X (0.063)	X (0.020)	X (0.031)	X (0.095)
<u>Peromyscus nasutus</u>	X (0.002)					X (0.056)			X (0.020)
<u>Microtus ochrogaster</u>	X,S (0.009)	X (0.013)	X (0.004)						
<u>Perognathus hispidus</u>	X (0.009)								
<u>Reithrodontomys megalotis</u>	X (0.007)			X (0.003)					
<u>Zapus princeps</u>				X (0.001)					
<u>Eutamias minimus</u>						X,O (0.025)	X (0.007)		X,O (0.049)
<u>Eutamias quadrivittatus</u>						X,O (0.007)		X,O (0.019)	
<u>Tamiasciurus hudsonicus</u>									O,S
<u>Spermophilus variegatus</u>						O			
<u>Marmota flaviventris</u>						O			
<u>Sciurus aberti</u>								O	

	Prairie Grasslands	Foothills Meadows	Wetlands	Riparian shrub	Foothills shrubland	Rocks, Cliffs, Talus	Ponderosa Savanna	Ponderosa Woodland	Douglas-fir Forest
<u>Thomomys talpoides</u>	S			S					
<u>Ondatra zibethicus</u>			S						
Mustelid sp.								S	
<u>Canis latrans</u>	0,S	S		0	0		S	S	000
<u>Ursus americanus</u>	S	S		S				S	S
<u>Felis concolor</u>								S	
<u>Procyon lotor</u>	S			S				S	
<u>Odocoileus hemionus</u>	0,S	0,S	S	S	0,S		S	0,S	0,S
NUMBER OF SPECIES TOTAL = 23	9	6	4	10	4	6	4	9	6
TRAP NIGHTS TOTAL = 3133	422	225	470	1018	200	285	150	160	203

Table 3. Small mammal captures in eight sampled habitats in the Douidy Draw study area.

HABITAT/VEGETATION TYPE	CAPTURES	TRAP DAYS	CAPTURES/TRAP DAY
Grassland	64	422	0.152
Ecotone	8	225	0.036
Wetland	8	470	0.017
Riparian shrub	149	1018	0.146
Foothills shrub	32	200	0.160
Talus	43	285	0.151
Pine	11	310	0.035
Mixed conifer	33	203	0.163
TOTAL	348	3133	0.111

Table 4. Species composition of total small mammal captures in the Douidy Draw study area.

SPECIES	CAPTURES	% TOTAL CAPTURES	CAPTURES/TRAP DAY
<u>Sorex monticolous</u>	3	0.9	0.001
<u>Peromyscus maniculatus</u>	277	79.6	0.088
<u>Peromyscus nasutus</u>	21	6.0	0.007
<u>Perognathus hispidus</u>	4	1.1	0.001
<u>Microtus ochrogaster</u>	11	3.2	0.003
<u>Reithrodontomy megalotis</u>	6	1.7	0.002
<u>Eutamias quadrivittatus</u>	6	1.7	0.002
<u>Eutamias minimus</u>	17	4.9	0.005
<u>Zapus princeps</u>	1	0.3	0.0003
<u>Sylvilagus audubonii</u>	2	0.6	0.0006

## DISCUSSION

Armstrong and Freeman (1982) suggested that 88 species of mammals occurred in historical times within the area of the Boulder Mountain Parks. Of these, 8 have been extirpated in the county. Of the remaining species, approximately 60 species are likely to be found in the vicinity of the Doudy Draw Open Space parcel Armstrong and Freeman (1982). We captured or observed only 23 species after 3,133 trap days and many field days of observations. This is approximately 37% of the possible total according to Armstrong and Freeman. That more species were not located in this study was not surprising since bats, medium-sized mammals, and shrews were susceptible to observation or trapping methods.

All of the species observed or captured were expected. Most are common in the area (e.g. Abert's squirrels, Deer mouse, Mule deer). Others are less well known (e.g. Hispid's pocket mouse, Western harvest mouse). A rare species known to occur in the County, Preble's jumping mouse, was not captured or observed. Although apparently suitable habitat is present on the Open Space parcel, heavy trapping did not reveal *Zapus hudsonius preblei*.

Some of the habitats of Doudy Draw are similar or the same as those of the Rocky Flats area (Jefferson County) and only a short straight-line distance away. *Zapus hudsonius preblei* is known to occur at Rocky Flats and at lower elevations within the Boulder Creek drainage of Boulder (Stoecker 1992, Armstrong, pers. comm.). There are several reasons that the Jumping mouse may not have been captured in the Doudy Draw study area. First, *Zapus* may have been eliminated from the area at some earlier time and has not yet reinvaded. Second, the habitat may not be suitable (it is somewhat higher in elevation). Finally, the jumping mouse may occur at the site, but was simply not taken. We feel that the trapping effort was conducted in the most suitable habitats for *Zapus hudsonius*. We also feel that the trapping effort was sufficient to determine if *Zapus* occurred on the site.

Although few comparable studies have been conducted in the foothills of Boulder County, Armstrong and Freeman (1982) reported on trapping results in the same habitats on the north side of South Boulder Creek. Table 5 compares the results of their trapping and ours. We collected ten species in the study area while Armstrong and Freeman reported seven species.

As in the present study, *Peromyscus maniculatus* dominated the trapping results of the 1982 survey. Interestingly, the former study reported captures of *Microtus pennsylvanicus* and *Neotoma mexicanus*. Neither of these species were observed in our study. Similarly, we captured *Sorex monticolous*, *Reithrodontomys megalotis*, *Sylvilagus audubonii*, and two species of *Eutamias*. Since similar trapping methods were used in both studies, we suspect that trap placement (microhabitat selection), trapping tenure, and variations in population abundance explain the differences observed.

Of interest is the capture, in 1982, of *Peromyscus nasutus* in the plains riparian habitat. Extensive trapping in this habitat in the Doudy Draw area did not result in captures of *P. nasutus*. Sixteen percent of the Armstrong and Freeman (1982) captures were of this species. Whereas there could be significant population

fluctuations in the area in the years 1982 and 1993, we suspect that the plains riparian site(s) surveyed by Armstrong and Freeman (1982) were along South Boulder Creek. Due to the dynamic history of that stream, the banks of the creek have crevices, boulders, and some vegetation that structurally resemble talus habitat. In contrast, our sampling sites in riparian shrub areas did not have boulders and large trees.

Table 5. A comparison of the trapping results of Armstrong and Freeman (1982) and this study. We have considered all of their results except those from aspen woodlands. Significant stands of aspen were not sampled in the 1993 survey. The former efforts were conducted a few miles north and in similar habitats.

SPECIES	1993 CAPTURES	% 1993 CAPTURES	1982 CAPTURES	% 1982 CAPTURES
<u>Sorex monticolous</u>	3	0.9	-	-
<u>Peromyscus maniculatus</u>	277	79.6	136	74.3
<u>Peromyscus nasutus</u>	21	6.0	30	16.4
<u>Perognathus hispidus</u>	4	1.1	1	0.5
<u>Neotoma mexicanus</u>	-	-	7	3.8
<u>Microtus pennsylvanicus</u>	-	-	1	0.5
<u>Microtus ochrogaster</u>	11	3.2	8	4.4
<u>Reithrodontomys megalotis</u>	6	1.7	-	-
<u>Eutamias quadrivittatus</u>	6	1.7	-	-
<u>Eutamias minimus</u>	17	4.9	-	-
<u>Zapus princeps</u>	1	0.3	-	-
<u>Sylvilagus audubonii</u>	2	0.6	-	-

## Status of the mammalian fauna.

Historical and present land use at Doudy Draw has significantly altered the landscape. Visible impacts include the diversion and impoundment of water sources for both urban and livestock uses, mining activity at several sites, fragmentation of continuous habitat by roads, construction of a power line and the associated reseeding, and the maintenance of livestock that results in the trampling of lowlands and the alteration of native plant communities. The extensive use of the City of Boulder Open Space almost certainly has demonstrable effects on the behavior and perhaps the habitats of the mammal species that inhabit the area. The effects of such alterations and circumstances on the mammalian fauna are not clear, but the results of this study should be interpreted with past and present disturbances in mind. It is likely that the composition of species differs in substantial ways from pre-historic times (Armstrong 1972).

The observed mammalian diversity at Doudy Draw was less than anticipated. Armstrong and Freeman (1982) used observed and predicted data to estimate that 88 species of mammals occurred within Boulder Mountain Parks. Of these, 8 have been extirpated in historic times. We positively identified twenty-two species as occurring in the area. Some of this variance is no doubt explained by sampling methods used. The methods were selected to optimize the capture of small mammals, targeting *Zapus hudsonius preblei*, at the same time excluding some very small (shrews) as well as medium and large mammal species. Other species are secretive enough to go unnoticed even by trained observers. The habitats available in the Doudy Draw area are not as broad as are found in the entire Boulder Mountain Parks, partially accounting for the reduced number of species we observed. Almost no effort was made to capture bats in the Doudy Draw area; although, bats were observed. We did use a bat detector to determine areas of highest potential for additional work. Identifying the shrews and bats that potentially inhabit the area could add an additional 14 species to the known fauna.

In conclusion, we did not locate any rare, threatened, or endangered mammal species on the Doudy Draw Open Space. We did identify 23 species within the ecosystem. Ten of these species were captured in small mammal traps. *Peromyscus maniculatus* dominated the observed mammals with nearly 80% of all captures. Armstrong and Freeman (1982) suggest that 88 mammal species could have occurred in the area of Boulder Mountain Parks. Although Doudy Draw has a somewhat more restricted area, at least 60 species may occur in the study area. Therefore, approximately 37% of the fauna is confirmed by way of this study. Additional efforts are needed to identify the remaining components of the fauna. Particular emphasis should be placed on surveys for bats, shrews, and medium-sized species such as weasels, skunks, and canids. Finally, although eight species that once occurred in the foothills of Boulder County no longer are extant, the mammalian species remain diverse. We found no evidence, in this partial survey, that the species composition was grossly altered. Continued surveys will providing additional needed information.

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FIGURE 1. Map of Doucy Draw study area and PNAs.

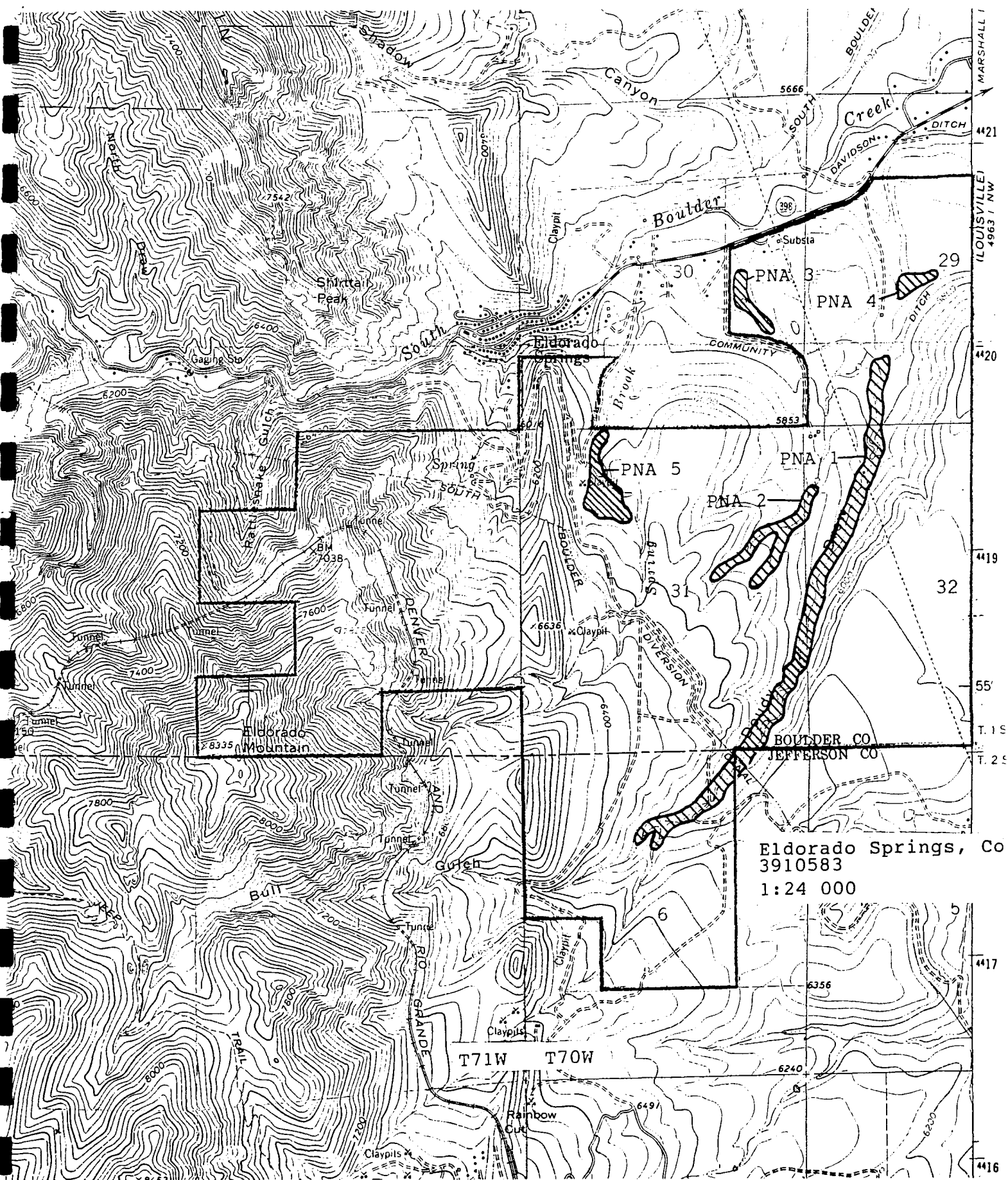


Figure 2. Map of Doudy Draw sample sites.

