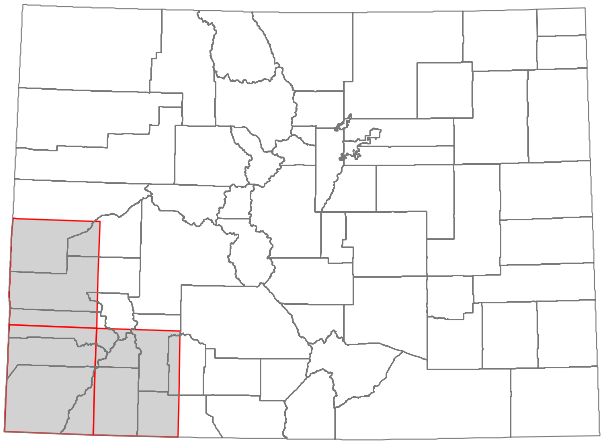
Distributional Survey of Rare Small Mammals (Orders Insectivora, Chiroptera, and Rodentia) in Colorado: Year Three



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Abstract

As part of a multi-year project to inventory the entire state, we trapped mammals in the orders Insectivora, Chiroptera, and Rodentia in three latilong blocks in southwest Colorado during the Spring and Summer of 2005, and the Spring of 2006. We placed Sherman traps in 66, gopher traps in 11, pitfall traps in 19, and mistnetted 44 locations with the goals of confirming the presence of and better delineating the rages of rare species. Notable findings included the capture of two state-historic subspecies of pocket mice (*Perognathus* spp.) that had not been documented in Colorado for over 20 years, and the confirmation of the presence of other taxa in numerous locations. These additional targets that were documented included: *Neotoma albigula brevicauda, Myotis californicus, M. thysanodes, M. yumanensis,* and *Antrozous pallidus.* Significant effort was put forth to document two species, Stephens' woodrat (*Neotoma stephensi*) and Allen's big-eared bat (*Idionycteris phyllotis*), that have not yet been confirmed in Colorado as well as the dwarf shrew (*Sorex nanus*) which is a rare shrew in Colorado. We were unsuccessful in documenting these species, but possible locations of *Idionycteris phyllotis* were documented based upon audible vocalizations.

Introduction

As a group, the distributions of small mammals have been well studied in Colorado (Warren 1910, 1942; Lechleitner 1969; Armstrong 1972; Fitzgerald *et al.* 1994), yet the geographic ranges of some species are not well understood. Gaps in information exist because many mammalian groups are understudied. Because the ecology and distribution of some species are poorly understood, it is difficult to determine the best strategies for conservation. A better understanding of small mammal distributions throughout Colorado will allow for the development of more comprehensive and successful conservation strategies.

The goals of this project are twofold. Of primary interest is the understanding of distributions of rare small mammals in Colorado. This includes evaluating what species occur in the State as well as better defining their ranges. Secondly, we would like to address the lack of surveys for small mammals in general. Aside from those focused on federally listed species (*e.g.*, *Zapus hudsonius preblei*), distributional surveys for small mammals are rare.

The mammalian taxonomic orders addressed in this study are Insectivora (shrews and moles), Chiroptera (bats), and Rodentia (mice, rats, voles, gophers, squirrels, prairie dogs, *etc*.). These orders are often underrepresented in survey efforts. The less-common species and subspecies have been prioritized to better focus survey effort as well as inform conservation strategies, but it is expected that this survey effort will help to clarify the ranges of many small mammals.

In order to meet the primary objective of clarifying the distribution of lesser-known small mammals in Colorado, Schorr and Siemers (2001) developed a protocol that focuses on a prioritized list of species, but also allows for the sampling of mammals in major habitats throughout the State. This protocol focuses on rare or understudied species and surveys are focused on habitat types within latitude/longitude blocks. See Methods below for further discussion.

Methods

The methods outlined below follow those described by Schorr and Siemers (2001) with a few exceptions. The most notable exception is the use of Ecological Systems developed by NatureServe (Comer *et al.* 2003a; Comer *et al.* 2003b) as opposed to the habitat categories developed within the survey protocol (Schorr and Siemers 2001). While both classifications are based upon the Colorado Gap Analysis Project (GAP), the Ecological Systems, referred to as "habitats" throughout this report, have been developed for the entire state of Colorado and provide a consistent framework within which the mammal project can be based. Fieldwork for this project occurred during Spring and Summer 2005, and Spring 2006. This timeframe is referred to as a "year" of effort throughout the report to reflect the protocol established previously (Schorr and Siemers 2001; Siemers *et al.* 2003; Siemers and Schorr 2006).

Study Area

Using latitude/longitude (latilong) blocks (1^{o} latitude by 1^{o} longitude), Colorado was sectioned into ten approximately-equal parts (Schorr and Siemers 2001). The study area for the current effort includes three latilong blocks in the southwest corner of Colorado (Southwest Group) (Figure 1).

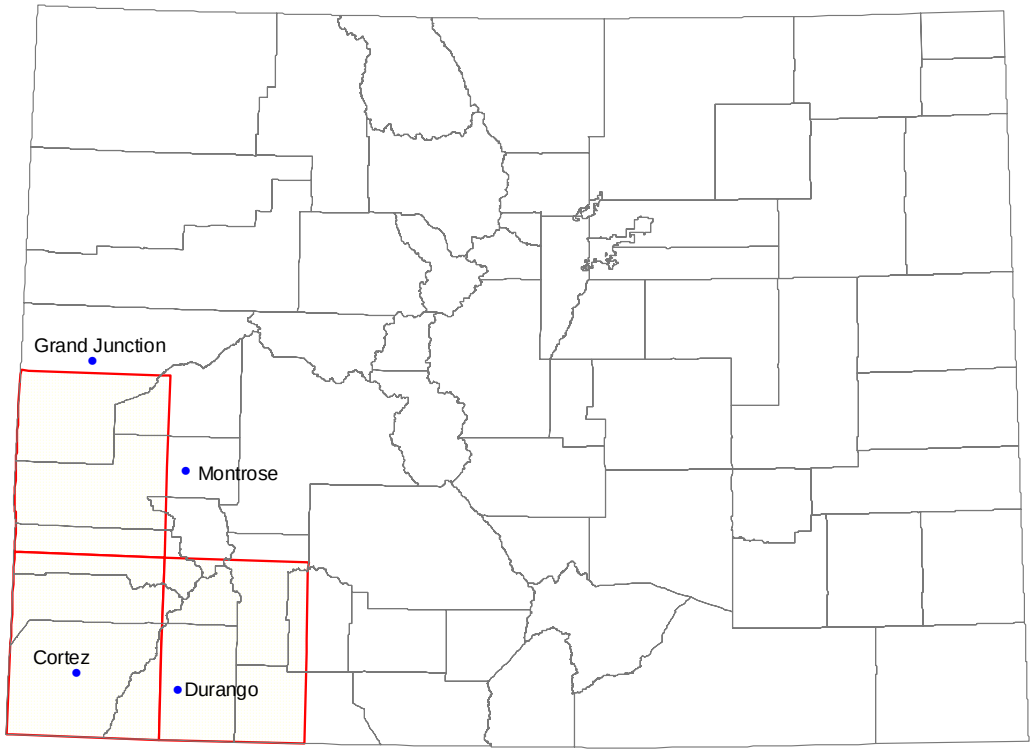


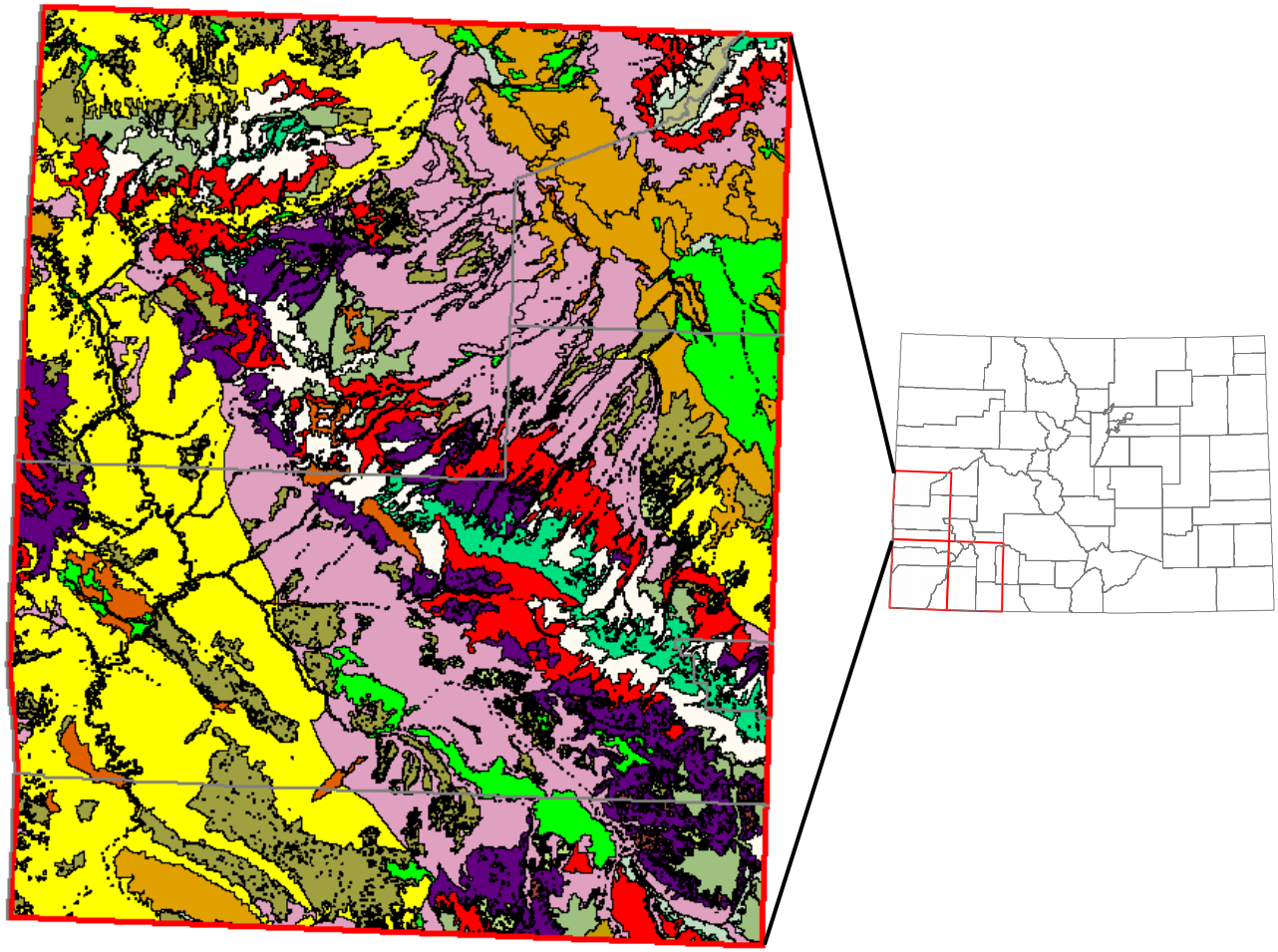
Figure 1. Three latilong blocks of Year 3 (Southwest) study area.

The study area was further broken down into 33 habitat types based on Ecological Systems. Nine of these 33 habitats (bolded in Table 1 below) represented over 80% of the total study area. Each of these nine habitats made up greater than 5% of the study area. (Table 1; Figures 2-4).

Table 1. Area and percent of total area of each Ecological System (habitat) in the study area.

Ecological System	Acres	Percent of total
Colorado Plateau Mixed Bedrock and Tableland	12578	<1
Colorado Plateau Pinyon-Juniper Woodland	**1318852**	**18**
Herbaceous Planted/Cultivated	**560141**	**8**
High Intensity Residential	9151	<1
Inter-Mountain Basins Big Sagebrush Shrubland	**404515**	**6**
Inter-Mountain Basins Big Sagebrush Steppe	76805	1
Inter-Mountain Basins Greasewood Flat	12071	<1
Inter-Mountain Basins Mixed Salt Desert Scrub	**406898**	**6**
Inter-Mountain Basins Montane Sagebrush Steppe	98344	1
North American Arid West Emergent Marsh	8949	<1
Open Water	10175	<1
Rocky Mountain Alpine Bedrock and Scree	36315	<1
Rocky Mountain Alpine Dwarf - Shrubland	84668	1
Rocky Mountain Aspen Forest and Woodland	**415398**	**6**
Rocky Mountain Cliff and Canyon	93835	1
Rocky Mountain Dry Tundra	325302	4
Rocky Mountain Foothill Grassland	13947	<1
Rocky Mountain Gambel Oak - Mixed Montane Shrubland	**448184**	**6**
Rocky Mountain Juniper Woodland and Savanna	165046	2
Rocky Mountain Lodgepole Pine Forest	1442	<1
Rocky Mountain Lower Montane - Foothill Shrubland	61842	<1
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	17199	<1
Rocky Mountain Montane Dry - Mesic Mixed Conifer Forest and Woodland	134013	2
Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland	570	<1
Rocky Mountain Ponderosa Pine Savanna	59633	1
Rocky Mountain Ponderosa Pine Woodland	**900578**	**12**
Rocky Mountain Subalpine - Montane Riparian Woodland and Shrubland	107936	1
Rocky Mountain Subalpine Dry - Mesic Spruce-Fir Forest and Woodland	**709770**	**10**
Rocky Mountain Subalpine Mesic - Spruce-Fir Forest and Woodland	106863	1
Rocky Mountain Subalpine Mesic Meadow	79061	1
Southern Rocky Mountain Montane Grassland	71176	1
Southern Rocky Mountain Pinyon - Juniper Woodland	**607159**	**8**
Western Great Plains Closed Depression	<1	<1

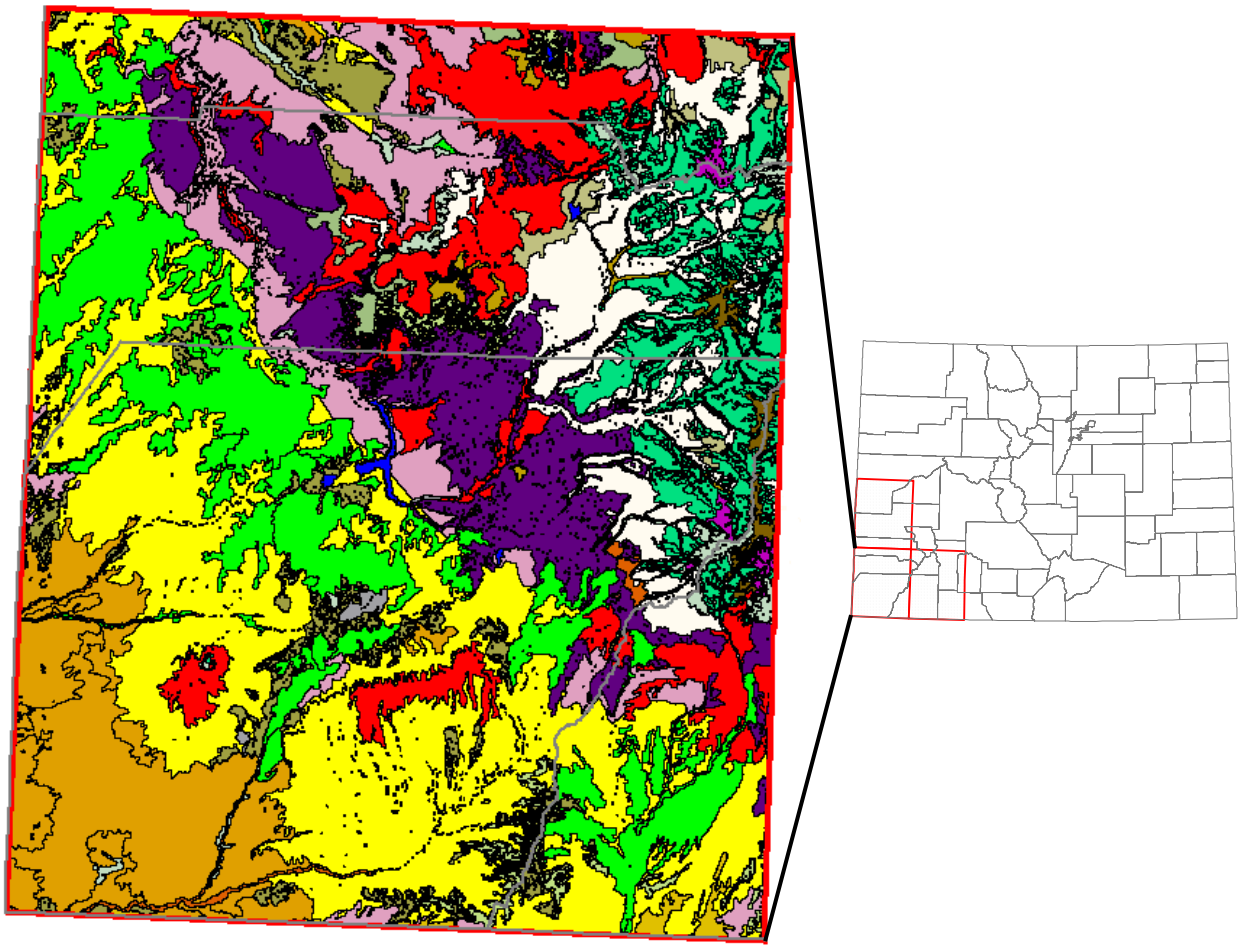
Figure 2. Ecological Systems of the study area's Northwestern latilong block. The 6 primary Ecological Systems in this block are Colorado Plateau Pinyon-Juniper Woodland, Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Mixed Salt Desert Scrub, Herbaceous Planted/Cultivated, Rocky Mountain Ponderosa Pine Woodland, and Rocky Mountain Gambel Oak - Mixed Montane Shrubland.



Ecological Systems

- Colorado Plateau Mixed Bedrock and Tableland
- Colorado Plateau Pinyon-Juniper Woodland
- Herbaceous Planted/Cultivated
- High Intensity Residential
- Inter-Mountain Basins Big Sagebrush Shrubland
- Inter-Mountain Basins Big Sagebrush Steppe
- Inter-Mountain Basins Greasewood Flat
- Inter-Mountain Basins Mixed Salt Desert Scrub
- Inter-Mountain Basins Montane Sagebrush Steppe
- North American Arid West Emergent Marsh
- Open Water
- Rocky Mountain Alpine Bedrock and Scree
- Rocky Mountain Alpine Dwarf - Shrubland
- Rocky Mountain Aspen Forest and Woodland
- Rocky Mountain Cliff and Canyon
- Rocky Mountain Dry Tundra
- Rocky Mountain Foothill Grassland
- Rocky Mountain Gambel Oak - Mixed Montane Shrubland
- Rocky Mountain Juniper Woodland and Savanna
- Rocky Mountain Lodgepole Pine Forest
- Rocky Mountain Lower Montane - Foothill Shrubland
- Rocky Mountain Lower Montane Riparian Woodland and Shrubland
- Rocky Mountain Montane Dry - Mesic Mixed Conifer Forest and Woodland
- Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
- Rocky Mountain Ponderosa Pine Savanna
- Rocky Mountain Ponderosa Pine Woodland
- Rocky Mountain Subalpine - Montane Riparian Woodland and Shrubland
- Rocky Mountain Subalpine Dry - Mesic Spruce-Fir Forest and Woodland
- Rocky Mountain Subalpine Mesic - Spruce-Fir Forest and Woodland
- Rocky Mountain Subalpine Mesic Meadow
- Southern Rocky Mountain Montane Grassland
- Southern Rocky Mountain Pinyon - Juniper Woodland
- Western Great Plains Closed Depression

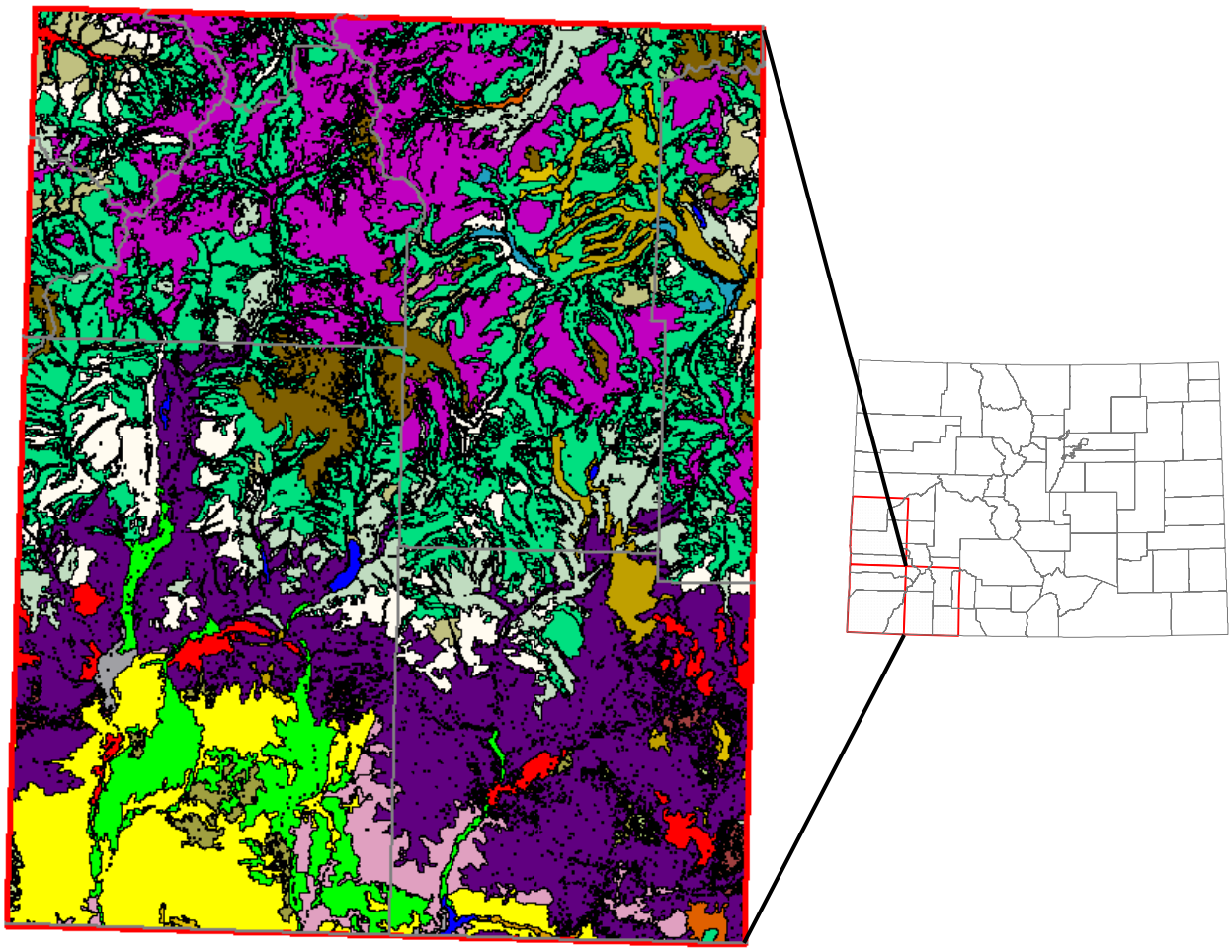
Figure 3. Ecological Systems of the study area's Southwestern latilong block. The 9 primary Ecological Systems in this block are the same as those highlighted on page 3 with Colorado Plateau Pinyon-Juniper Woodland making up the largest percentage (27%) of the study area.



Ecological Systems

- Colorado Plateau Mixed Bedrock and Tableland
- Colorado Plateau Pinyon-Juniper Woodland
- Herbaceous Planted/Cultivated
- High Intensity Residential
- Inter-Mountain Basins Big Sagebrush Shrubland
- Inter-Mountain Basins Big Sagebrush Steppe
- Inter-Mountain Basins Greasewood Flat
- Inter-Mountain Basins Mixed Salt Desert Scrub
- Inter-Mountain Basins Montane Sagebrush Steppe
- North American Arid West Emergent Marsh
- Open Water
- Rocky Mountain Alpine Bedrock and Scree
- Rocky Mountain Alpine Dwarf - Shrubland
- Rocky Mountain Aspen Forest and Woodland
- Rocky Mountain Cliff and Canyon
- Rocky Mountain Dry Tundra
- Rocky Mountain Foothill Grassland
- Rocky Mountain Gambel Oak - Mixed Montane Shrubland
- Rocky Mountain Juniper Woodland and Savanna
- Rocky Mountain Lodgepole Pine Forest
- Rocky Mountain Lower Montane - Foothill Shrubland
- Rocky Mountain Lower Montane Riparian Woodland and Shrubland
- Rocky Mountain Montane Dry - Mesic Mixed Conifer Forest and Woodland
- Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
- Rocky Mountain Ponderosa Pine Savanna
- Rocky Mountain Ponderosa Pine Woodland
- Rocky Mountain Subalpine - Montane Riparian Woodland and Shrubland
- Rocky Mountain Subalpine Dry - Mesic Spruce-Fir Forest and Woodland
- Rocky Mountain Subalpine Mesic - Spruce-Fir Forest and Woodland
- Rocky Mountain Subalpine Mesic Meadow
- Southern Rocky Mountain Montane Grassland
- Southern Rocky Mountain Pinyon - Juniper Woodland
- Western Great Plains Closed Depression

Figure 4. Ecological Systems of the study area's Southeastern latilong block. The 3 primary Ecological Systems in this block are Rocky Mountain Subalpine Dry - Mesic Spruce-Fir Forest and Woodland, Rocky Mountain Ponderosa Pine Woodland, and Rocky Mountain Dry Tundra.



Ecological Systems
- Colorado Plateau Mixed Bedrock and Tableland
- Colorado Plateau Pinyon-Juniper Woodland
- Herbaceous Planted/Cultivated
- High Intensity Residential
- Inter-Mountain Basins Big Sagebrush Shrubland
- Inter-Mountain Basins Big Sagebrush Steppe
- Inter-Mountain Basins Greasewood Flat
- Inter-Mountain Basins Mixed Salt Desert Scrub
- Inter-Mountain Basins Montane Sagebrush Steppe
- North American Arid West Emergent Marsh
- Open Water
- Rocky Mountain Alpine Bedrock and Scree
- Rocky Mountain Alpine Dwarf - Shrubland
- Rocky Mountain Aspen Forest and Woodland
- Rocky Mountain Cliff and Canyon
- Rocky Mountain Dry Tundra
- Rocky Mountain Foothill Grassland
- Rocky Mountain Gambel Oak - Mixed Montane Shrubland
- Rocky Mountain Juniper Woodland and Savanna
- Rocky Mountain Lodgepole Pine Forest
- Rocky Mountain Lower Montane - Foothill Shrubland
- Rocky Mountain Lower Montane Riparian Woodland and Shrubland
- Rocky Mountain Montane Dry - Mesic Mixed Conifer Forest and Woodland
- Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
- Rocky Mountain Ponderosa Pine Savanna
- Rocky Mountain Ponderosa Pine Woodland
- Rocky Mountain Subalpine - Montane Riparian Woodland and Shrubland
- Rocky Mountain Subalpine Dry - Mesic Spruce-Fir Forest and Woodland
- Rocky Mountain Subalpine Mesic - Spruce-Fir Forest and Woodland
- Rocky Mountain Subalpine Mesic Meadow
- Southern Rocky Mountain Montane Grassland
- Southern Rocky Mountain Pinyon - Juniper Woodland
- Western Great Plains Closed Depression

Selection and Prioritization of Small Mammal Taxa

To assess which small mammals are valid taxonomic entities, we used the *Suggested Interpretation of Mammalian Taxonomy in Colorado for Use in Ranking and Tracking* (Wunder *et al.* 1998). From this assessment, species and subspecies were selected based on their relative rarity and the amount of information known about them. The two rarity scales used in assessing a species' or subspecies' rarity were the Colorado Division of Wildlife's (CDOW) Colorado Vertebrate Ranking System (COVERS) and the Colorado Natural Heritage Program's (CNHP) Biodiversity Tracking and Conservation System.

All taxa that are currently tracked by CNHP from Insectivora, Chiroptera, and Rodentia were included in the study. CNHP zoologists have determined species or subspecies tracking status based on several factors. Those factors include: 1. the animal's rarity based on its geographic range, habitat specificity, and local population size [based on Rabinowitz (1981)]; 2. whether the animal is evolutionarily distinct or isolated; 3. whether the animal is endemic to Colorado; and 4. whether there is sufficient information to document declining population trends (CNHP 1999). For this year's survey effort, twenty species and subspecies were determined to be of greatest conservation concern and information need (Table 2).

Table 2. Small mammal taxa addressed in Year 2.

Scientific name	Common name	CNHP Rank*	Fine-filter (F), Coarse-filter (C), or Opportunistic (O)	Years to be surveyed
Order Insectivora				
Sorex nanus	dwarf shrew	G4 S2	C	1 – 5, 7, 8
Order Chiroptera				
Antrozous pallidus	pallid bat	G5 S4	C	1 – 7, 10
Corynorhinus townsendii	Townsend's big-eared bat	G4 S2	C	1 – 8
Idionycteris phyllotis	Allen's big-eared bat	G3G4 S?	C	3
Myotis californicus	California myotis	G5 S3	C	2, 3, 7
Myotis thysanodes	fringed myotis	G5 S3	C	1 – 9
Myotis velifer	cave myotis	unconfirmed in CO	C	all
Myotis volans	long-legged myotis	G5 S5	C	1 – 8
Myotis yumanensis	Yuma myotis	G5 S3	C	1 – 7, 10
Nyctinomops macrotis	big free-tailed bat	G5 S1?	C	1 – 8, 10
Tadarida brasiliensis	Mexican free-tailed bat	G5 S1	C	2 – 7
Order Rodentia				
Cynomys gunnisoni	Gunnison's prairie dog	G5 S5	O	1, 3 – 5, 7, 8
Cynomys leucurus	white-tailed prairie dog	G4 S4	O	2 – 4, 7, 8
Neotoma albigula brevicauda	white-throated woodrat	G5 T2 S2	F	3
Neotoma stephensi	Stephens' woodrat	unconfirmed in CO	F	3

Table 2 (continued)

Scientific name	Common name	CNHP Rank*	Fine-filter (F), Coarse-filter (C), or Opportunistic (O)	Years to be surveyed
Order Rodentia (continued)				
Perognathus flavescens caryi	plains pocket mouse	G5 T4 SH	F	2, 3, 7
Perognathus flavus hopiensis	silky pocket mouse	G5 T4 SH	F	3
Spermophilus spilosoma cryptospilotus	spotted ground squirrel	G5 T4 S1	F	3
Tamias rufus	Hopi chipmunk	G5 S5	F	2 – 4, 7
Thomomys bottae howelli	valley pocket gopher	G5 T4 S3	F	2, 3

*Colorado Natural Heritage Program Biodiversity Tracking and Conservation System.

Inventory methods

1. Field survey techniques:

a. Rodent live-trapping: Small mammal fauna were sampled using Sherman live traps (approximately 8cm x 8cm x 24 cm). Traps were baited with rolled oats and a ball of polyfil (polyester fiberfill) was placed in each trap to provide warmth. Traps were set in the evening (after 5 pm) and checked the following morning before 11 am. Traps were set out of direct sunlight to prevent overheating. All animals were identified immediately during the checking of traps. Sometimes measurements of external physical features, such as weights and lengths, were taken. Individuals that were not new or notable location records or needed for positive identification were released.

b. Pitfall trapping: Pitfall traps were used to capture insectivores and other small mammals, which are frequently under-sampled in live trapping. Pitfall traps are 4-liter, number-10 coffee cans or similar-sized plastic paint buckets buried flush in the ground along natural features in the area. These traps were inspected to retrieve and identify any animals that were captured. Individuals that were not new or notable location records or needed for positive identification were released.

c. Mist netting: Mist nets were used to capture bats. Mist nets are the most effective means of capturing flying bats in open areas. Mist nets are constructed of fine synthetic fibers supported by a lattice-work of braided nylon. The frame and trammels of the net are supported to form a capture area perpendicular to the ground with 4 or 5 long horizontal pockets of fine mesh (Wilson *et al.* 1996). The nets were monitored constantly to prevent bats from becoming completely ensnared and to prevent damage to the nets. Bats were removed, identified, and measurements of key features are taken. Individuals that were not new or notable location records or needed for positive identification were released. Before being released, bats were allowed to recover from stress imposed during handling.

d. Fossorial mammal trapping: Pocket gophers (*Thomomys, Geomys,* and *Cratogeomys*) were captured using Victor gopher traps. These traps are commonly used for gopher

control throughout the state of Colorado. Gopher sign (active mounds, tunnels) dictated how many and where traps were set.

e. Visual identification: Not all species or subspecies required the collection of voucher specimens to document their presence in an area. Visual observations of mammals or their sign can assist in delineating a species or subspecies range. For instance, prairie dogs can be identified to species without taking specimens and documentation of the extent of the mounds seen in an area can be used to delineate prairie dog colonies.

2. Survey protocol:

Each mammal on the prioritized list for year three of the survey (Table 2) was evaluated to determine how its distribution could be delineated most appropriately. We used a method based on scale-dependent (fine or coarse) surveying. We used the following characteristics to determine which mammals would be surveyed using coarse-filter methods and which would be surveyed using fine-filter methods: 1. the size of the animal's distribution in Colorado [based on Fitzgerald *et al.* (1994)]; 2. how well-defended this distribution is (how many locations have been documented to determine the current distribution). A third category for surveying (opportunistic) was included for taxa that are not of the highest priority for this project, but additional information would be beneficial for assessing conservation action.

i. Fine-filter surveying: For mammals that have a fairly restricted distribution in Colorado (*e.g.*, pocket gopher subspecies), we used a targeted effort to better determine their distribution and their presence within that distribution. This involved surveying within and at select limits of their current known distribution. As the mammals were detected at the outer limits of the distribution, additional survey took place further and further from the edge of the distribution until the species or subspecies of interest could no longer be detected.

ii. Coarse-filter surveying: The distributions of some of the small mammals on the prioritized list are difficult to assess. For some taxa there are few data on their current distribution (*e.g., Perognathus flavus*), while others are more widely distributed, but there are relatively few records within their distributions (*e.g.*, most shrews and bats). Logistically, it would be difficult to adequately delineate the distribution of these species or subspecies. For these taxa (and others that may not be apparent), surveys were conducted in major habitat types within the study area in an attempt to obtain new location records. For the coarse-filter animals that have better-described habitat associations (*e.g., Perognathus flavus*), we conducted coarse-filter surveys in similar habitat types throughout the study area.

iii. Opportunistic surveying: Several rare taxa have well-delineated distributions (*e.g., Cynomys leucurus*) and this project did not focus its efforts on these mammals. However, data regarding distribution were collected as these species were encountered.

Results & Discussion

Fossorial Mammal Trapping

Trapping for pocket gophers took place in 11 locations and in 7 different Ecological Systems (Table 3; Figure 5). Locations represent 2-10 gopher traps set for one day. Detailed information on museum specimens can be found in Appendix I.

Table 3. Gopher trapping results. UTM coordinates fall within or have been converted to Zone 13, NAD83

Date	Species	Location	Ecological System
5/10/2005	*Thomomys talpoides*	Montezuma County Easting: 213987 Northing: 4148462	Rocky Mountain Ponderosa Pine Savanna
5/12/2005	*Thomomys talpoides*	Dolores County Easting: 163270 Northing: 4190714	Southern Rocky Mountain Pinyon-Juniper Woodland
5/14/2005	*Thomomys bottae*	San Miguel County Easting: 150695 Northing: 4203623	Colorado Plateau Pinyon-Juniper Woodland
6/1/2005	*Thomomys talpoides*	San Miguel County Easting: 157554 Northing: 4203007	Rocky Mountain Ponderosa Pine Woodland
6/1/2005	none	San Miguel County Easting: 155216 Northing: 4203195	Herbaceous Planted/Cultivated
6/5/2005	none	Dolores County Easting: 166026 Northing: 4191056	Southern Rocky Mountain Pinyon-Juniper Woodland
6/5/2005	none	Dolores County Easting: 167178 Northing: 4185941	Southern Rocky Mountain Pinyon-Juniper Woodland
8/20/2005	none	Hinsdale County Easting: 311356 Northing: 4189346	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
8/27/2005	*Thomomys* sp.	Archuleta County Easting: 307666 Northing: 4131419	Rocky Mountain Ponderosa Pine Woodland
8/27/2005	*Thomomys* sp.	Archuleta County Easting: 307551 Northing: 4131162	Rocky Mountain Ponderosa Pine Woodland
9/28/2005	none	Mesa County Easting: 171926 Northing: 4307457	Rocky Mountain Aspen Forest and Woodland

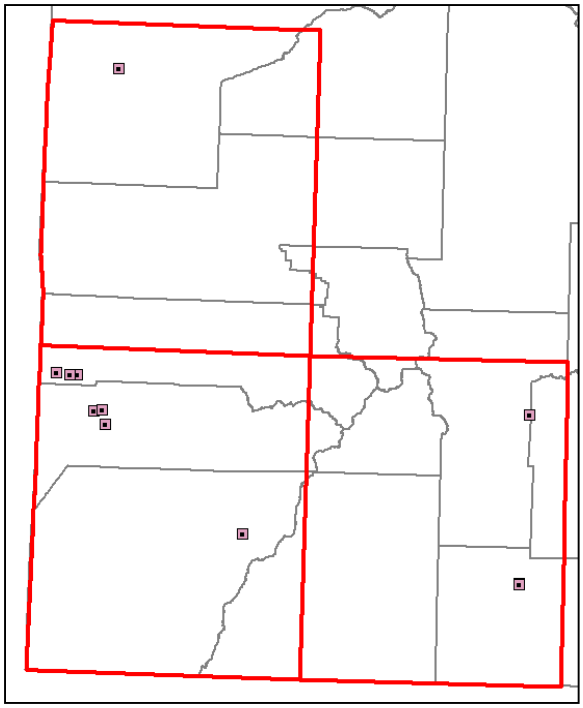


Figure 5. Gopher trapping localities.

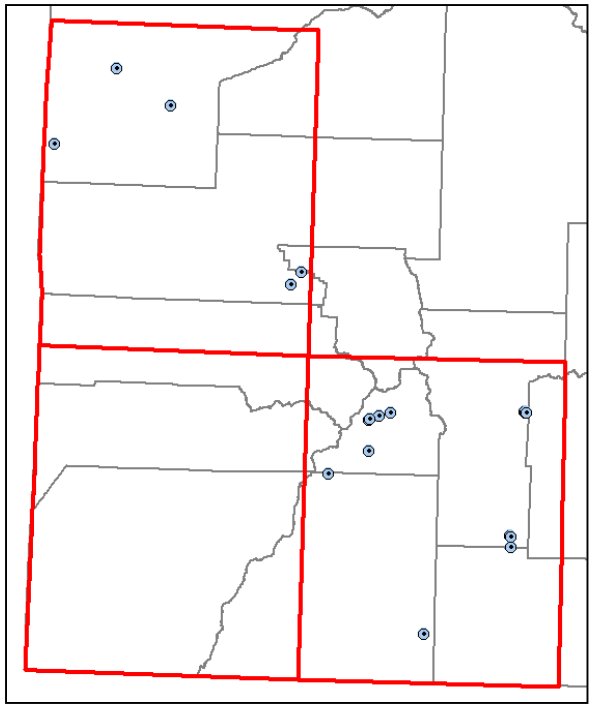


Figure 6. Pitfall trapping localities.

Pitfall Trapping

Pitfall traps were set in 19 locations and in 6 different Ecological Systems (Table 4; Figure 6). Locations represent 5 to 22 pitfall traps set for at least one night. Detailed information on museum specimens can be found in Appendix I.

Table 4. Pitfall trapping results. UTM coordinates fall within or have been converted to Zone 13, NAD83

Date	Species	Location	Ecological System
6/30/2005	*Sorex* sp.	Montrose County Easting: 231047 Northing: 4233689	Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland
7/25/2005	*Sorex cinereus, S. monticolus*	Montrose County Easting: 234473 Northing: 4238166	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
7/25/2005	*Sorex cinereus*	Mesa County Easting: 190329 Northing: 4294969	Inter-Mountain Basins Big Sagebrush Shrubland
8/19/2005	none	Hinsdale County Easting: 310465 Northing: 4190743	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
8/21/2005	*Sorex cinereus*	Hinsdale County Easting: 310865 Northing: 4190382	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
8/21/2005 & 8/22/2005	*Sorex* sp.	Hinsdale County Easting: 311144 Northing: 4190180	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland

Table 4 (continued). Pitfall trapping results.

Date	Species	Location	Ecological System
8/23/2005	none	Hinsdale County Easting: 305952 Northing: 4144286	Southern Rocky Mountain Montane Grassland
8/23/2005	none	Hinsdale County Easting: 305818 Northing: 4147786	Southern Rocky Mountain Montane Grassland
8/25/2005	*Sorex monticolus*	Hinsdale County Easting: 305542 Northing: 4148326	Southern Rocky Mountain Montane Grassland
9/7/2005	none	San Juan County Easting: 264848 Northing: 4190340	Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland
9/8/2005 – 9/10/2005	*Sorex monticolus, S. preblei*	San Juan County Easting: 264882 Northing: 4190192	Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland
9/10/2005	*Sorex monticolus*	San Juan County Easting: 260860 Northing: 4189335	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
9/28/2005 & 9/29/2005	*Sorex monticolus Microtus longicaudus*	Mesa County Easting: 171899 Northing: 4307754	Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland
5/26/2006	none	La Plata County Easting: 243762 Northing: 4169319	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
5/27/2006	none	La Plata County Easting: 276322 Northing: 4114443	Rocky Mountain Juniper Woodland and Savanna
5/28/2006	none	San Juan County Easting: 257315 Northing: 4177237	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
6/10/2006	none	Mesa County Easting: 150560 Northing: 4281986	Colorado Plateau Pinyon-Juniper Woodland
6/12/2006	none	San Juan County Easting: 257399 Northing: 4187891	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
6/12/2006	none	San Juan County Easting: 257725 Northing: 4188248	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland

Mistnetting

Mistnetting for bats was performed at 44 different locations and in 13 different habitats (Table 5; Figure 7). Most locations represent a single mistnetting effort (night) using multiple (2 or 3) nets. Detailed information on museum specimens can be found in Appendix I.

T able 5. Mistnetting results. UTM coordinates fall within or have been converted to Zone 13. NAD83

Date(s)	Species	Location	Ecological System
5/9/2005	none	Montezuma County Easting: 213875 Northing: 4148601	Rocky Mountain Ponderosa Pine Woodland
5/11/2005	none	Dolores County Easting: 163220 Northing: 4190921	Southern Rocky Mountain Pinyon-Juniper Woodland
5/13/2005-5/14/2005 & 5/29/2005-5/30/2005	*Eptesicus fuscus, Myotis ciliolabrum, M. evotis*	San Miguel County Easting: 150600 Northing: 4204438	Colorado Plateau Pinyon-Juniper Woodland
5/24/2005 thru 5/26/2005	*Myotis ciliolabrum, M. evotis, M. thysanodes*	Montezuma County Easting: 159482 Northing: 4145482	Colorado Plateau Pinyon-Juniper Woodland
5/28/2005	*Antrozous pallidus, Myotis thysanodes*	Montezuma County Easting: 143185 Northing: 4135395	Inter-Mountain Basins Mixed Salt Desert Scrub
5/31/2005	none	San Miguel County Easting: 155166 Northing: 4203402	Herbaceous Planted/Cultivated
6/1/2005	none	San Miguel County Easting: 155885 Northing: 4203331	Herbaceous Planted/Cultivated
6/6/2005	none	Dolores County Easting: 167128 Northing: 4186147	Southern Rocky Mountain Pinyon-Juniper Woodland
6/8/2005	*Eptesicus fuscus, Myotis evotis*	Dolores County Easting: 167141 Northing: 4186346	Southern Rocky Mountain Pinyon-Juniper Woodland
6/14/2005 thru 6/16/2005	*Eptesicus fuscus, Lasionycteris noctivagans, Myotis evotis, M. lucifugus, M. thysanodes, M. volans*	Montrose County Easting: 147557 Northing: 4258274	Colorado Plateau Pinyon-Juniper Woodland
6/17/2005 & 6/18/2005	*Eptesicus fuscus, Myotis ciliolabrum, M. evotis*	Montrose County Easting: 171906 Northing: 4232221	Inter-Mountain Basins Big Sagebrush Shrubland
6/19/2005 & 6/20/2005	*Antrozous pallidus, Myotis ciliolabrum*	San Miguel County Easting: 169441 Northing: 4219725	Inter-Mountain Basins Big Sagebrush Shrubland

Table 5 (continued). Mistnetting results.

Date(s)	Species	Location	Ecological System
6/26/2005 thru 6/29/2005	*Eptesicus fuscus, Lasionycteris noctivagans, Lasiurus cinereus, Myotis volans*	Montrose County Easting: 231190 Northing: 4233576	Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland
6/30/2005 & 7/1/2005	*Lasionycteris noctivagans, Lasiurus cinereus, Myotis volans*	Montrose County Easting: 217948 Northing: 4246886	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
7/3/2005 & 7/4/2005	*Eptesicus fuscus, Lasionycteris noctivagans, Lasiurus cinereus, Myotis lucifugus, M. volans*	Mesa County Easting: 191477 Northing: 4294608	Rocky Mountain Ponderosa Pine Woodland
7/15/2005 & 7/17/2005-7/18/2005	*Eptesicus fuscus, Myotis evotis, M. thysanodes, M. volans*	Dolores County Easting: 168518 Northing: 4185383	Rocky Mountain Ponderosa Pine Woodland
7/17/2005 & 7/18/2005	*Antrozous pallidus, Myotis lucifugus*	Dolores County Easting: 163218 Northing: 4190917	Southern Rocky Mountain Pinyon-Juniper Woodland
7/19/2005 & 7/20/2005	*Myotis evotis*	Montezuma County Easting: 216473 Northing: 4165619	Rocky Mountain Aspen Forest and Woodland
7/22/2005 thru 7/24/2005	*Myotis evotis, M. thysanodes, M. volans*	San Miguel County Easting: 240615 Northing: 4209176	Rocky Mountain Subalpine Mesic Meadow
7/31/2005 thru 8/3/2005	*Eptesicus fuscus, Lasionycteris noctivagans, Lasiurus cinereus, Myotis ciliolabrum, M. evotis, M. lucifugus, M. volans*	La Plata County Easting: 257245 Northing: 4137601	Rocky Mountain Ponderosa Pine Woodland
8/21/2005	none	Hinsdale County Easting: 310949 Northing: 4187943	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
8/23/2005	none	Archuleta County Easting: 307392 Northing: 4130746	Rocky Mountain Ponderosa Pine Savanna
8/24/2005	*Myotis evotis*	Archuleta County Easting: 310362 Northing: 4133434	Rocky Mountain Ponderosa Pine Woodland
8/25/2005	*Lasionycteris noctivagans, Myotis lucifugus*	Archuleta County Easting: 305874 Northing: 4143688	Rocky Mountain Lower Montane Riparian Woodland and Shrubland
9/2/2005	none	Archuleta County Easting: 294389 Northing: 4115264	Rocky Mountain Gambel Oak – Mixed Montane Shrubland
9/3/2005	*Eptesicus fuscus, Myotis evotis*	Archuleta County Easting: 299117 Northing: 4114937	Rocky Mountain Ponderosa Pine Woodland

Table 5 (continued). Mistnetting results.

Date(s)	Species	Location	Ecological System
9/4/2005 & 9/5/2005	*Eptesicus fuscus, Lasionycteris noctivagans, Lasiurus cinereus, Myotis ciliolabrum, M. evotis*	Archuleta County Easting: 296163 Northing: 4120673	Rocky Mountain Ponderosa Pine Woodland
9/18/2005 & 9/19/2005	*Antrozous pallidus, Myotis californicus, Pipistrellus hesperus*	Montezuma County Easting: 145910 Northing: 4135437	Inter-Mountain Basins Mixed Salt Desert Scrub
9/20/2005 thru 9/22/2005	none	Dolores County Easting: 163247 Northing: 4190928	Southern Rocky Mountain Pinyon-Juniper Woodland
9/23/2005 thru 9/25/2005	*Antrozous pallidus, Myotis ciliolabrum, M. evotis, M. lucifugus, M. thysanodes, M. volans, Pipistrellus hesperus*	San Miguel County Easting: 169444 Northing: 4219723	Inter-Mountain Basins Big Sagebrush Shrubland
9/28/2005	none	Mesa County Easting: 175460 Northing: 4312742	Rocky Mountain Aspen Forest and Woodland
5/23/2006	*Myotis volans*	San Juan County Easting: 257523 Northing: 4188035	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
5/25/2006	none	La Plata County Easting: 243658 Northing: 4169029	Rocky Mountain Subalpine Mesic Meadow
5/26/2006	*Eptesicus fuscus, Lasionycteris noctivagans, Myotis evotis, M. volans*	Archuleta County Easting: 280354 Northing: 4119355	Rocky Mountain Ponderosa Pine Woodland
5/27/2006	*Lasionycteris noctivagans*	La Plata County Easting: 276591 Northing: 4126805	Rocky Mountain Ponderosa Pine Woodland
6/7/2006	none	Delta County Easting: 222920 Northing: 4305851	Southern Rocky Mountain Pinyon-Juniper Woodland
6/8/2006	*Myotis ciliolabrum, M. evotis*	Mesa County Easting: 208085 Northing: 4305695	Inter-Mountain Basins Mixed Salt Desert Scrub
6/9/2006	*Eptesicus fuscus, Myotis californicus, M. evotis, M. volans*	Mesa County Easting: 150070 Northing: 4282145	Colorado Plateau Pinyon-Juniper Woodland
6/10/2006	none	Montrose County Easting: 176857 Northing: 4236185	Inter-Mountain Basins Big Sagebrush Shrubland
6/11/2006	*Myotis ciliolabrum, M. yumanensis*	San Miguel County Easting: 160030 Northing: 4227956	Colorado Plateau Pinyon-Juniper Woodland
6/12/2006	*Lasionycteris noctivagans, Myotis evotis, M. lucifugus*	San Miguel County Easting: 209909 Northing: 4210768	Rocky Mountain Ponderosa Pine Woodland

Table 5 (continued). Mistnetting results.

Date(s)	Species	Location	Ecological System
6/20/2006	*Pipistrellus hesperus*	Montezuma County Easting: 142415 Northing: 4138727	Inter-Mountain Basins Mixed Salt Desert Scrub
6/21/2006	*Myotis evotis*	Dolores County Easting: 145271 Northing: 4190287	Colorado Plateau Pinyon-Juniper Woodland
6/22/2006	none	Montezuma County Easting: 209830 Northing: 4149076	Rocky Mountain Ponderosa Pine Woodland

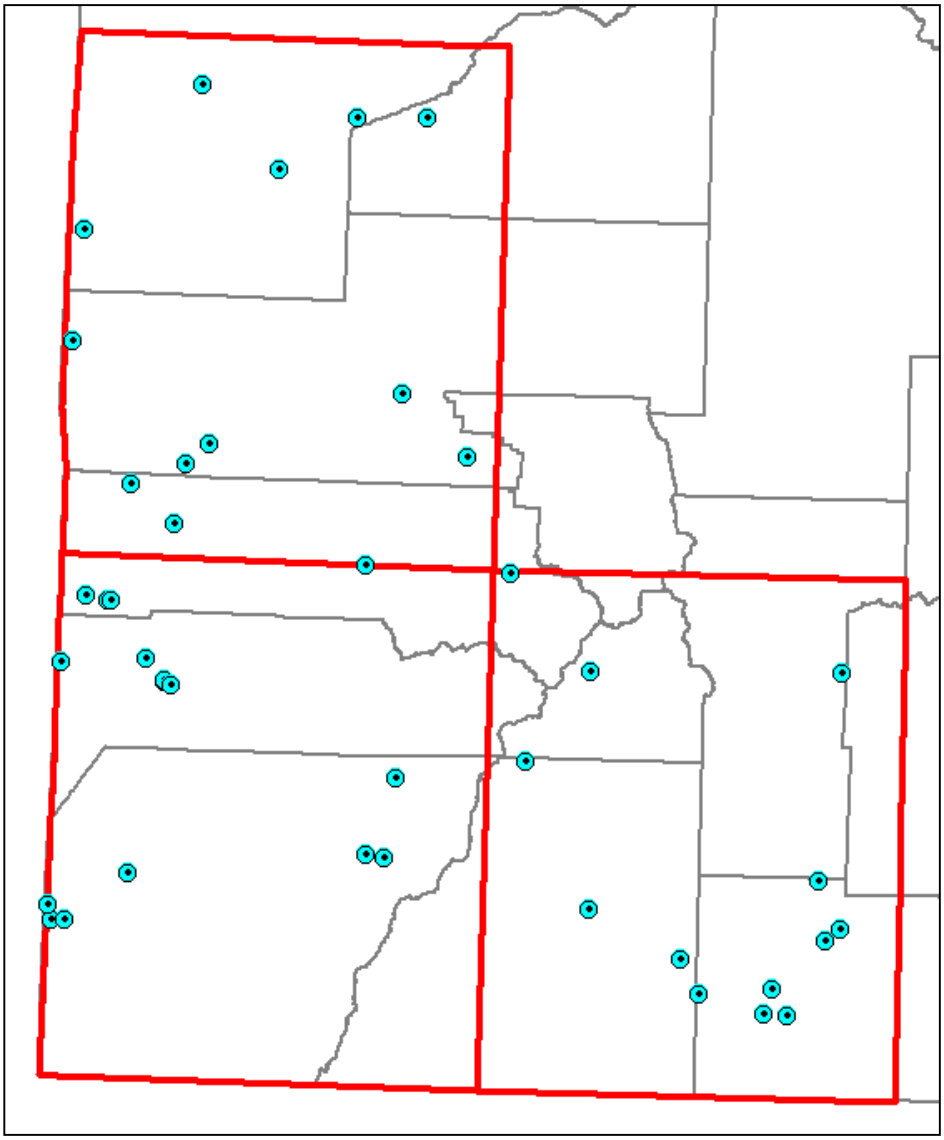


Figure 7. Bat mistnetting localities.

Sherman Live-trapping

Sherman traps for rodents were set in 66 locations and in 16 different habitats (Table 6; Figure 8). Effort at each location varied from approximately 50 to 200 trapnights. The majority of locations represent an effort of 75-125 traps set for one night. Detailed information on museum specimens can be found in Appendix I.

Table 6. Sherman live-trapping results. UTM coordinates fall within or have been converted to Zone 13. NAD 83

Date	Species	Location	Ecological System
5/10/2005	*Microtus longicaudus, Peromyscus maniculatus*	Montezuma County Easting: 214090 Northing: 4148460	Rocky Mountain Ponderosa Pine Woodland
5/11/2005	*Peromyscus maniculatus*	Dolores County Easting: 163270 Northing: 4190714	Rocky Mountain Cliff and Canyon
5/12/2005	*Microtus longicaudus, Neotoma mexicana, Peromyscus maniculatus*	Dolores County Easting: 163321 Northing: 4190780	Rocky Mountain Cliff and Canyon
5/13/2005	*Microtus longicaudus, Neotoma albigula, Peromyscus maniculatus*	Dolores County Easting: 161278 Northing: 4189965	Southern Rocky Mountain Pinyon-Juniper Woodland
5/14/2005 & 5/15/2005	*Neotoma mexicana, Peromyscus maniculatus*	San Miguel County Easting: 149516 Northing: 4205612	Colorado Plateau Pinyon-Juniper Woodland
5/14/2005 & 5/15/2005	*Microtus spp., Neotoma albigula, Peromyscus boylii, P. maniculatus*	San Miguel County Easting: 150695 Northing: 4203622	Colorado Plateau Pinyon-Juniper Woodland
5/14/2005 & 5/15/2005	*Microtus spp., Peromyscus boylii, P. maniculatus*	San Miguel County Easting: 150727 Northing: 4203534	Colorado Plateau Pinyon-Juniper Woodland
5/14/2005	*Microtus* spp., *Peromyscus maniculatus*	San Miguel County Easting: 151006 Northing: 4203507	Colorado Plateau Pinyon-Juniper Woodland
5/17/2005 & 5/18/2005	*Microtus longicaudus, Peromyscus maniculatus*	Mesa County Easting: 175398 Northing: 4312460	Rocky Mountain Aspen Forest and Woodland
5/18/2005	*Microtus longicaudus*	Mesa County Easting: 163657 Northing: 4309483	Inter-Mountain Basins Big Sagebrush Shrubland
5/18/2005	*Peromyscus maniculatus*	Mesa County Easting: 175323 Northing: 4311449	Rocky Mountain Aspen Forest and Woodland
5/25/2005 thru 5/27/2005	*Peromyscus boylii, P. maniculatus*	Montezuma County Easting: 159535 Northing: 4145279	Colorado Plateau Pinyon-Juniper Woodland
5/28/2005	*Peromyscus maniculatus*	Montezuma County Easting: 143772 Northing: 4134777	Inter-Mountain Basins Mixed Salt Desert Scrub

Table 6 (continued). Sherman live-trapping results.

Date	Species	Location	Ecological System
5/29/2005	*Perognathus flavus*, *Peromyscus maniculatus*	Montezuma County Easting: 141997 Northing: 4137875	Inter-Mountain Basins Mixed Salt Desert Scrub
5/30/2005 & 5/31/2005	*Neotoma mexicana*, *Peromyscus boylii*, *P. crinitus*, *P. maniculatus*	San Miguel County Easting: 150650 Northing: 4204231	Colorado Plateau Pinyon-Juniper Woodland
6/1/2005 & 6/2/2005	*Microtus* spp., *Microtus longicaudus*, *Peromyscus boylii*, *P. maniculatus*	San Miguel County Easting: 155285 Northing: 4203420	Herbaceous Planted/Cultivated
6/4/2005 & 6/5/2005	*Microtus* sp., *Neotoma* sp., *Peromyscus maniculatus*, *Tamias minimus*	Dolores County Easting: 151044 Northing: 4190334	Herbaceous Planted/Cultivated
6/4/2005 & 6/5/2005	*Microtus longicaudus*, *Microtus* sp., *Neotoma mexicana*, *Peromyscus maniculatus*, *Tamias minimus*	Dolores County Easting: 151389 Northing: 4189130	Herbaceous Planted/Cultivated
6/4/2005 & 6/5/2005	*Microtus longicaudus*, *Microtus* sp., *Peromyscus maniculatus*, *Tamias minimus*	Dolores County Easting: 150867 Northing: 4189358	Herbaceous Planted/Cultivated
6/4/2005 & 6/5/2005	*Microtus longicaudus*, *Microtus* sp., *Peromyscus maniculatus*, *Reithrodontomys megalotis*	Dolores County Easting: 149894 Northing: 4182618	Herbaceous Planted/Cultivated
6/7/2005	*Peromyscus maniculatus*	Dolores County Easting: 156938 Northing: 4186431	Herbaceous Planted/Cultivated
6/9/2005	*Microtus longicaudus*, *Sorex* sp., *Sylvilagus* sp.	Montrose County Easting: 229974 Northing: 4233094	Rocky Mountain Ponderosa Pine Woodland
6/9/2005	*Microtus longicaudus*, *Tamias minimus*	Montrose County Easting: 229843 Northing: 4232620	Rocky Mountain Ponderosa Pine Woodland
6/15/2005 thru 6/17/2005	*Microtus longicaudus*, *Neotoma mexicana*, *Peromyscus maniculatus*, *Sylvilagus* sp., *Tamias minimus*	Montrose County Easting: 147606 Northing: 4258066	Colorado Plateau Pinyon-Juniper Woodland
6/18/2005	*Peromyscus maniculatus*	Montrose County Easting: 171754 Northing: 4235195	Inter-Mountain Basins Big Sagebrush Shrubland
6/18/2005 & 6/19/2005	*Microtus longicaudus*, *Peromyscus boylii*, *P. maniculatus*	Montrose County Easting: 171955 Northing: 4232014	Inter-Mountain Basins Big Sagebrush Steppe
6/20/2005 & 6/22/2005	*Ammospermophilus leucurus*, *Dipodomys ordii*, *Peromyscus maniculatus*, *Sylvilagus* sp.	San Miguel County Easting: 169157 Northing: 4220115	Inter-Mountain Basins Big Sagebrush Shrubland

Table 6 (continued). Sherman live-trapping results.

Date	Species	Location	Ecological System
6/21/2005	*Peromyscus maniculatus*	San Miguel County Easting: 169665 Northing: 4219839	Inter-Mountain Basins Big Sagebrush Shrubland
6/21/2005 & 6/22/2005	*Peromyscus maniculatus*	San Miguel County Easting: 165547 Northing: 4223577	Colorado Plateau Pinyon-Juniper Woodland
6/22/2005	*Onychomys leucogaster*	San Miguel County Easting: 168104 Northing: 4220256	Inter-Mountain Basins Big Sagebrush Shrubland
6/28/2005 & 6/30/2005	*Microtus longicaudus*, *Microtus* sp., *Neotoma albigula*, *Peromyscus maniculatus*	Montrose County Easting: 231238 Northing: 4233370	Inter-Mountain Basins Montane Sagebrush Shrubland
6/28/2005 & 6/30/2005	*Microtus longicaudus*, *Neotoma albigula*, *Peromyscus maniculatus*	Montrose County Easting: 231095 Northing: 4233482	Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland
7/1/2005 thru 7/3/2005	*Clethrionomys gapperi*, *Microtus longicaudus*, *Microtus* spp., *Peromyscus maniculatus*, *Sorex* spp., *Tamias minimus*	Montrose County Easting: 217997 Northing: 4246679	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
7/4/2005 & 7/5/2005	*Microtus longicaudus*, *Neotoma cinerea*, *Peromyscus maniculatus*	Mesa County Easting: 190170 Northing: 4294880	Rocky Mountain Ponderosa Pine Woodland
7/18/2005 & 7/19/2005	*Neotoma mexicana*, *Peromyscus boylii*	Dolores County Easting: 163213 Northing: 4190773	Southern Rocky Mountain Pinyon-Juniper Woodland
7/20/2005 thru 7/22/2005	*Microtus longicaudus*, *Peromyscus maniculatus*, *Sorex palustris*, *Sorex* spp.	Montezuma County Easting: 216523 Northing: 4165413	Rocky Mountain Aspen Forest and Woodland
7/24/2005 & 7/25/2005	*Microtus* spp., *Peromyscus maniculatus*	San Miguel County Easting: 240888 Northing: 4210074	Rocky Mountain Subalpine Mesic Meadow
7/24/2005 & 7/25/2005	*Peromyscus maniculatus*	San Miguel County Easting: 241144 Northing: 4208806	Rocky Mountain Subalpine Mesic Meadow
7/24/2005	*Microtus longicaudus*, *Peromyscus maniculatus*	San Miguel County Easting: 241120 Northing: 4208791	Rocky Mountain Subalpine Mesic Meadow
8/1/2005 thru 8/4/2005	*Microtus longicaudus*, *M. montanus*, *Microtus* sp., *Mustela frenata*, *Peromyscus maniculatus*	La Plata County Easting: 257245 Northing: 4137601	Rocky Mountain Ponderosa Pine Woodland
8/2/2005 thru 8/4/2005	*Microtus longicaudus*, *Peromyscus maniculatus*, *Tamias minimus*	La Plata County Easting: 257370 Northing: 4137033	Rocky Mountain Ponderosa Pine Woodland

Table 6 (continued). Sherman live-trapping results.

Date	Species	Location	Ecological System
8/6/2005 & 8/7/2005	*Peromyscus maniculatus*	Archuleta County Easting: 284186 Northing: 4097848	Rocky Mountain Juniper Woodland and Savanna
8/7/2005 & 8/8/2005	*Neotoma mexicana*, *Peromyscus maniculatus*	Archuleta County Easting: 287311 Northing: 4100491	Colorado Plateau Pinyon-Juniper Woodland
8/21/2005 & 8/22/2005	*Peromyscus maniculatus*, *Sorex* sp.	Hinsdale County Easting: 310404 Northing: 4190752	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
8/21/2005 & 8/22/2005	*Peromyscus maniculatus*	Hinsdale County Easting: 311492 Northing: 4188793	Rocky Mountain Subalpine Dry – Mesic Spruce-Fir Forest and Woodland
8/25/2005 thru 8/27/2005	*Microtus longicaudus*, *Peromyscus maniculatus*, *Tamias minimus*	Archuleta County Easting: 307666 Northing: 4131419	Rocky Mountain Ponderosa Pine Woodland
8/25/2005 thru 8/27/2005	*Microtus longicaudus*, *Peromyscus maniculatus*, *Tamias minimus*	Archuleta County Easting: 307471 Northing: 4131254	Rocky Mountain Ponderosa Pine Woodland
9/3/2005 thru 9/6/2005	*Neotoma mexicana, Tamias quadrivittatus*	Archuleta County Easting: 295023 Northing: 4116780	Rocky Mountain Gambel Oak – Mixed Montane Shrubland
9/3/2005 thru 9/6/2005	*Neotoma mexicana*	Archuleta County Easting: 295015 Northing: 4116581	Rocky Mountain Gambel Oak – Mixed Montane Shrubland
9/3/2005 thru 9/6/2005	*Neotoma mexicana*, *Peromyscus maniculatus*	Archuleta County Easting: 294501 Northing: 4114407	Rocky Mountain Ponderosa Pine Savanna
9/8/2005 & 9/9/2005	*Clethrionomys gapperi*, *Microtus spp.*, *Peromyscus maniculatus, Tamias quadrivittatus*	Archuleta County Easting: 264873 Northing: 4190234	Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland
9/8/2005 & 9/9/2005	*Peromyscus maniculatus*	Archuleta County Easting: 264852 Northing: 4190368	Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland
9/18/2005 thru 9/20/2005	*Neotoma mexicana*, *Peromyscus maniculatus*, *P. truei*	Montezuma County Easting: 146733 Northing: 4135570	Inter-Mountain Basins Mixed Salt Desert Scrub
9/19/2005 & 9/20/2005	*Perognathus flavus*, *Peromyscus truei*	Montezuma County Easting: 141965 Northing: 4137833	Inter-Mountain Basins Mixed Salt Desert Scrub
9/25/2005 & 9/26/2005	*Perognathus flavescens*, *Peromyscus maniculatus*, *P. truei*	San Miguel County Easting: 167242 Northing: 4220792	Inter-Mountain Basins Big Sagebrush Shrubland
5/25/2006	*Microtus longicaudus*, *Peromyscus maniculatus*	La Plata County Easting: 277132 Northing: 4127757	Rocky Mountain Ponderosa Pine Woodland

Table 6 (continued). Sherman live-trapping results.

Date	Species	Location	Ecological System
5/25/2006	*Peromyscus maniculatus*	La Plata County Easting: 274603 Northing: 4124585	Inter-Mountain Basins Big Sagebrush Steppe
5/25/2006	*Microtus longicaudus*, *Peromyscus maniculatus*	La Plata County Easting: 276690 Northing: 4126913	Rocky Mountain Ponderosa Pine Woodland
5/27/2006	*Microtus longicaudus*, *Peromyscus maniculatus*, *Tamias quadrivittatus*	La Plata County Easting: 276319 Northing: 4114423	Rocky Mountain Juniper Woodland and Savanna
6/9/2006	*Dipodomys ordii*, *Peromyscus maniculatus*, *P. truei*	Delta County Easting: 222611 Northing: 4304618	Southern Rocky Mountain Pinyon-Juniper Woodland
6/9/2006	*Dipodomys ordii*, *Peromyscus maniculatus*	Delta County Easting: 220224 Northing: 4300243	Inter-Mountain Basins Mixed Salt Desert Scrub
6/10/2006	*Microtus montanus*, *Peromyscus maniculatus*, *Tamias minimus*	Mesa County Easting: 150708 Northing: 4282060	Colorado Plateau Pinyon-Juniper Woodland
6/10/2006	*Peromyscus truei*	Montrose County Easting: 176906 Northing: 4235978	Inter-Mountain Basins Big Sagebrush Shrubland
6/12/2006	*Neotoma albigula*, *Peromyscus maniculatus*	San Miguel County Easting: 160101 Northing: 4227790	Colorado Plateau Pinyon-Juniper Woodland
6/13/2006	none	San Miguel County Easting: 209957 Northing: 4210561	Rocky Mountain Gambel Oak – Mixed Montane Shrubland
6/21/2006	*Dipodomys ordii*, *Perognathus flavus*, *Peromyscus maniculatus*	Montezuma County Easting: 148276 Northing: 4137320	Inter-Mountain Basins Mixed Salt Desert Scrub

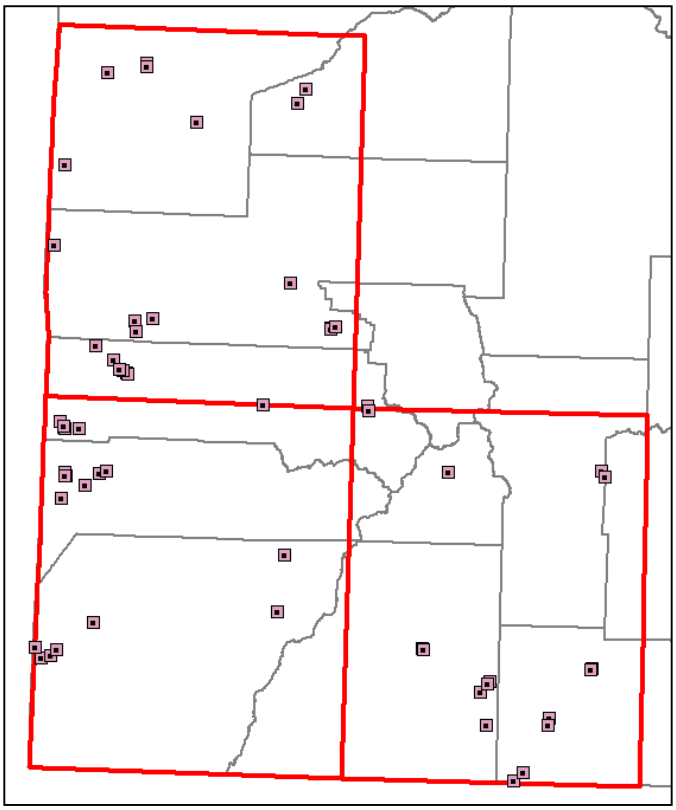


Figure 8. Sherman trapping localities.

Fine-filter Species

Plains pocket mouse (*Perognathus flavescens caryi*)

One subspecies of plains pocket mouse (*P. f. caryi*) occurs within the study area in the Dolores, San Miguel and Gunnison River Valleys and was formally known as *P. apache caryi* (Armstrong 1972). The Colorado Natural Heritage Program (CNHP) ranked this subspecies as a state-historic element (SH), indicating that this subspecies had not been observed for over 20 years. Prior to this study, the last specimen recorded in CNHP's database for this subspecies in Colorado was taken in 1982.

We found *Perognathus flavescens caryi* in one location in Inter-Mountain Basins Big Sagebrush Shrubland.

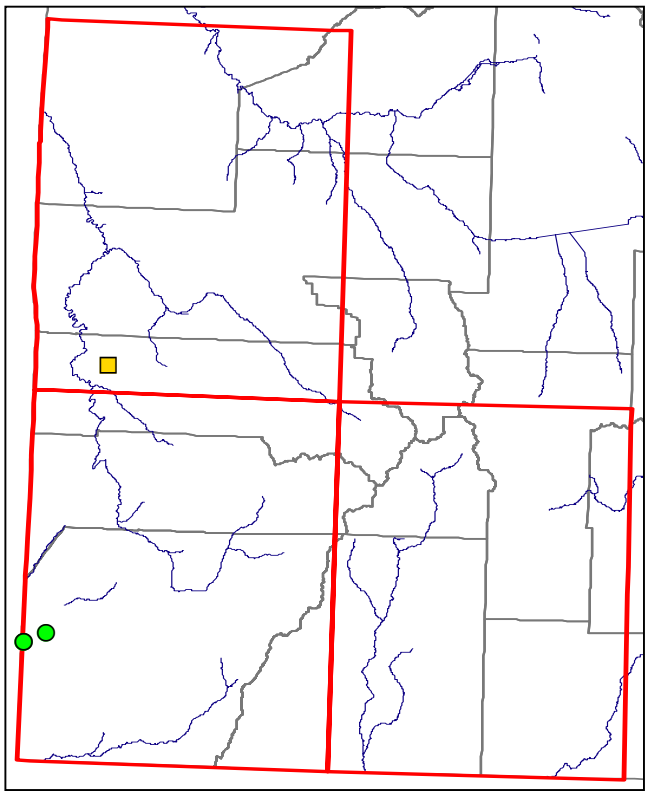


Figure 9. Pocket mouse capture locations.
○ = *Perognathus flavus hopiensis*; □ = *P. flavescens caryi*

Silky pocket mouse (*Perognathus flavus hopiensis*)

Perognathus flavus hopiensis is another pocket mouse subspecies that was considered a state-historic (SH) subspecies by CNHP prior to this study and, according to CNHP's database, had not been documented in Colorado since 1977. This silky pocket mouse subspecies occurs in the extreme southwestern corner of the state in Montezuma and La Plata counties (Armstrong 1972).

Perognathus flavus hopiensis was found in three locations in the study area. Two of these locations were less than 1 km apart and trapped in May and September of 2005. These locations were approximately 5 km from the specimen location from 1977. The other location at which we found this subspecies of silky pocket mouse, which was approximately 7 km from the other two, was trapped in June of 2006. All three new locations occurred within Inter-Mountain Basins Mixed Salt Desert Scrub habitat.

Further survey effort focused on pocket mice (*Perognathus* spp.) in the survey area is warranted. Although we had greater success this year than in previous years (Siemers *et al.* 2003; Siemers and Schorr 2006) capturing pocket mice, overall captures were still quite low.

White-throated woodrat (*Neotoma albigula brevicauda*)

Two subspecies of white-throated woodrat (*Neotoma albigula*) occur within the study area. *N. a. brevicauda* occurs in Mesa, Montrose, and San Miguel counties and *N. a. laplataensis* occurs in the southwestern corner of Colorado in Dolores, Montezuma, La Plata, and Archuleta counties (Armstrong 1972). Only *N. a. brevicauda* was considered a target subspecies during this study because of its comparatively restricted range within the state.

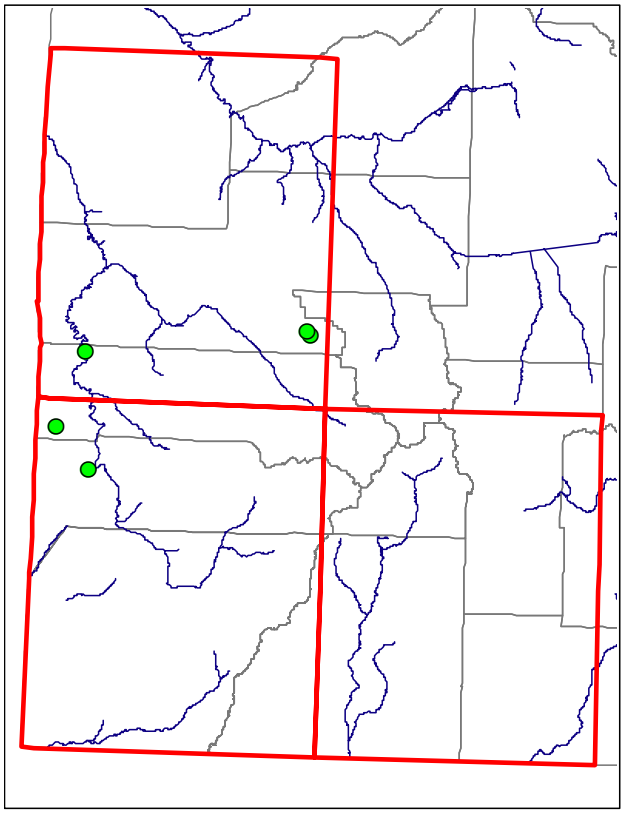


Figure 10. *Neotoma albigula brevicauda* capture locations.

Neotoma albigula brevicauda was captured in five locations in the following habitats: Southern Rocky Mountain Pinyon-Juniper Woodland, Colorado Plateau Pinyon-Juniper Woodland, Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland, and Inter-Mountain Basins Montane Sagebrush Steppe. The capture location in Dolores County falls between the two subspecies' ranges (Armstrong 1972) and may represent a zone of intergradation between *N. a. brevicauda* and *N. a. laplataensis*.

Based upon the relative ease with which *N. a. brevicauda* was captured, the status of this subspecies appears to be relatively stable. When middens were found in suitable habitat, captures of this subspecies were typically made.

Other Fine-filter Species

There were two species that are yet to be documented within Colorado for which we spent considerable effort looking. Stephens' woodrat (*Neotoma stephensi*) and Allen's big-eared bat (*Idionycteris phyllotis*) both occur in adjacent states and likely occur in the southwest corner of Colorado.

Stephens' woodrat is known from San Juan County, New Mexico within a mile of the Colorado border (Harris 1963 cited in Armstrong 1972). Suitable habitat was found south of Durango on the Southern Ute Indian Reservation, but permission from the Southern Ute Indian Tribe was not obtained to trap at that location. One woodrat specimen was taken from Archuleta County approximately 15 km from the location near the Colorado border in New Mexico, however this individual was identified as a Mexican woodrat (*Neotoma mexicana*) (Appendix I).

Allen's big-eared bat is a species restricted to Mexico and the southwestern United States (Czaplewski 1983) and has been captured in Utah near the Colorado border (Armstrong 1974; Black 1970). Allen's big-eared bat is one of the few bat species in the western United States that emits echolocation calls that are audible to humans. Audible "clicks" were heard at numerous locations while mistnetting that are thought to be unique to Allen's big-eared bat (Figure 12), but no captures were made to verify the identification of these individuals.

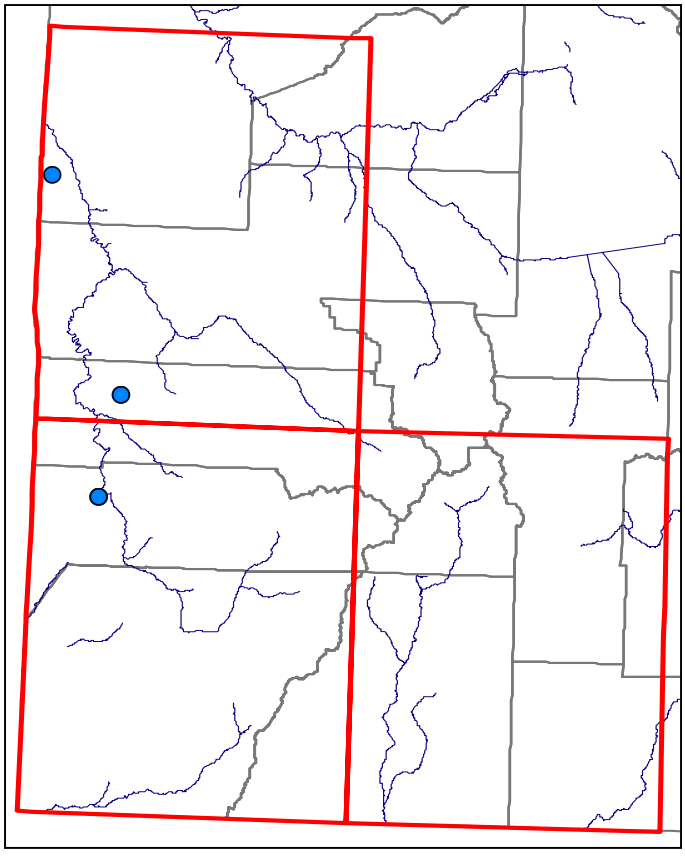


Figure 11. Mistnetting locations at which distinctive audible clicks were heard, indicating the possible presence of Allen's big-eared bat.

Coarse-filter Species

California myotis (*Myotis californicus*)

The California myotis was captured at two different locations in the study area. One location was in Mesa County in Colorado Plateau Pinyon-Juniper Woodland habitat and the other was in Montezuma County in Inter-Mountain Basins Mixed Salt Desert Scrub.

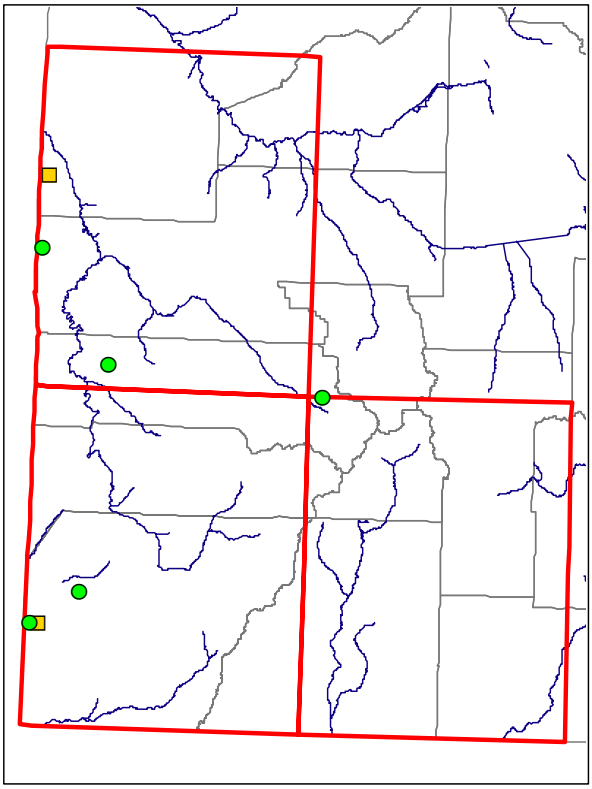


Figure 12. Bat capture locations. □ = *Myotis californicus*; ○ = *M. thysanodes*

Fringed myotis (*Myotis thysanodes*)

The fringed myotis was captured in five locations in the study area and in four different habitats. These habitats included: Colorado Plateau Pinyon-Juniper Woodland, Inter-Mountain Basins Big Sagebrush Shrubland, Rocky Mountain Subalpine Mesic Meadow, and Inter-Mountain Basins Mixed Salt Desert Scrub.

Yuma myotis (*Myotis yumanensis*)

The Yuma myotis was captured at one location in San Miguel County in Colorado Plateau Pinyon-Juniper Woodland habitat.

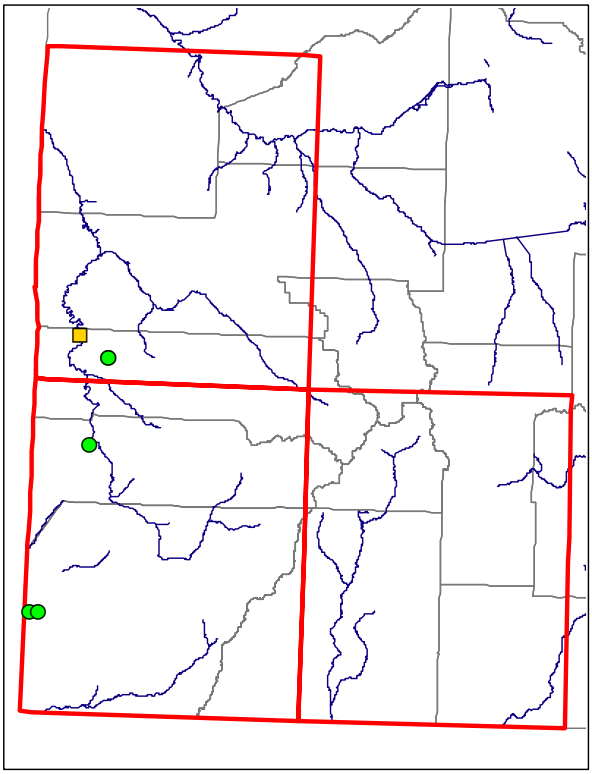


Figure 13. Bat capture locations. ○ = A*ntrozous pallidus*; □ = *Myotis yumanensis*

Pallid bat (*Antrozous pallidus*)

The pallid bat was captured at five locations in Montrose, San Miguel, and Montezuma counties in Inter-Mountain Basins Big Sagebrush Shrubland, Southern Rocky Mountain Pinyon-Juniper Woodland, and Inter-Mountain Basins Mixed Salt Desert Scrub habitats.

Shrews

The dwarf shrew (*Sorex nanus*) was a coarse-filter target for this year's study area (Table 2). In Colorado the dwarf shrew occurs primarily in the mountainous regions of the state at elevations above 5,500 feet (Fitzgerald *et al.* 1994), and its range overlaps the interior margin of this year's study area. Despite considerable effort in apparently suitable habitat, no captures of the dwarf shrew were made during this year's effort.

In a previous study of shrew habitats and capture methods by Brown (1967), the dwarf shrew was readily captured in pitfall traps placed in rockslide habitats. We placed 22 pitfall traps in a rockslide/talus slope for over two weeks and did not capture any shrews. Further survey effort in rockslide and talus slope habitats is warranted to determine how widespread the use of these habitats is throughout the range of the dwarf shrew.

One shrew specimen captured during this year's effort has been tentatively identified as *Sorex preblei*, based upon relative size of the third and fourth unicuspid (U3 > U4) and its relatively small size. This individual was captured in San Juan County in Rocky Mountain Subalpine – Montane Riparian Woodland and Shrubland habitat and was captured with *S. cinereus* and *S. monticolus* (Table 4; Appendix I). This could be an important finding as there are very few *S. preblei* specimens from Colorado; however, identification cannot be confirmed until further verification of this individual's identity is made.

Shrews remain one of the least-known groups of any vertebrates in Colorado in terms of both where they occur and what their population trends may be. Continued effort to better understand the distribution and population status of shrews in Colorado is needed.

Figure 14. *Sorex monticolus*. Photo by R. A. Schorr

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Appendix I. Museum specimen data. All specimens have been submitted to the Museum of Southwestern Biology at the University of New Mexico. Identifications are tentative and subject to change following museum cataloging.

Scientific Name	Location	Collection Date
Order Insectivora		
Sorex sp.	Montrose Co., 2 K Springs	6/9/2005
Sorex sp.	Montrose Co., Horsefly Creek	6/30/2005
Sorex sp.	Montrose Co., Uncompahgre NF, Antone Spring Quadrangle	7/1/2005
Sorex sp.	Montrose Co., Uncompahgre NF, Antone Spring Quadrangle	7/3/2005
Sorex cinereus	Rio Blanco Co., Oak Creek	7/18/2005
Sorex palustris	Montezuma Co., San Juan NF, Wallace Ranch Quadrangle, Along Taylor Creek	7/20/2005
Sorex sp.	Montezuma Co., Little Taylor Trailhead	7/20/2005
Sorex cinereus	Montrose Co., Forest Service Road 561	7/25/2005
Sorex monticolus	Montrose Co., Forest Service Road 561	7/25/2005
Sorex cinereus	Mesa Co., Big Domiguez Creek	7/25/2005
Sorex cinereus	Montrose Co., Horsefly Creek	7/25/2005
Sorex cinereus	Hinsdale Co., Hermit Lakes Quadrangle	8/21/2005
Sorex monticolus	Hinsdale Co., Hermit Lakes Quadrangle	8/22/2005
Sorex merriami	Hinsdale Co., Hermit Lakes Quadrangle	8/22/2005
Sorex monticolus	Hinsdale Co., Williams Creek	8/25/2005
Sorex preblei	San Juan Co., Cement Creek	9/8/2005
Sorex cinereus	San Juan Co., Cement Creek	9/8/2005
Sorex monticolus	San Juan Co., Cement Creek	9/9/2005
Sorex cinereus	San Juan Co., Cement Creek	9/10/2005
Sorex monticolus	San Juan Co., South Fork Creek	9/10/2005
Sorex monticolus	Mesa Co., Grand Mesa NF, Haypress Campground	9/28/2005
Sorex monticolus	Mesa Co., Grand Mesa NF, Haypress Campground	9/29/2005
Order Chiroptera		
Lasionycteris noctivagans	Montrose Co., Manti - La Sal NF, Forest Service Road 371	6/14/2005
Order Rodentia		
Thomomys talpoides	Montezuma Co., Rampart Hills Quadrangle	5/10/2005
Neotoma mexicana	Dolores Co., Secret Canyon Quadrangle, near Box Elder Campground	5/12/2005
Neotoma albigula	San Miguel Co., Egnar Quadrangle, Bishop Canyon, 2.6 kilometers west of Egnar, Colorado	5/14/2005
Thomomys sp.	San Miguel Co., Egnar Quadrangle, Bishop Canyon, 2.6 kilometers west of Egnar, Colorado	5/14/2005

Appendix I (continued)

Scientific Name	Location	Collection Date
Perognathus flavus hopiensis	Montezuma Co., Wickiup Canyon Quadrangle, 1 mile south and ½ mile east of Ismay Trading Post, Canyons of the Ancients National Monument	5/29/2005
Neotoma sp.	Dolores Co., Dove Creek	6/5/2005
Cleithrionomys gapperi	Montrose Co., Uncompahgre NF, Antone Spring Quadrangle	7/1/2005
Cleithrionomys gapperi	Montrose Co., Uncompahgre NF, Antone Spring Quadrangle	7/2/2005
Neotoma mexicana	Archuleta Co., Allison Quadrangle, near Arboles Campground off of Carracas Road, approximately 2.1 miles east of Arboles, Colorado	8/7/2005
Thomomys sp.	Archuleta Co., San Juan NF, near Turkey Springs Road	8/27/2005
Thomomys sp.	Archuleta Co., San Juan NF, near Turkey Springs Road	8/27/2005
Cleithrionomys gapperi	San Juan Co., BLM land along Cement Creek approximately 1 mile north of Silverton	9/8/2005
Perognathus flavescens caryi	San Miguel Co., Hamm Canyon Quadrangle, Big Gypsum Valley	9/26/2005
Perognathus flavus hopiensis	Montezuma Co., Canyons of the Ancients National Monument, Cannon Ball Mesa	6/21/2006