

**Small and Medium-Sized  
Mammals of the Hells  
Canyon Area of the Snake  
River in Idaho/Oregon**

Bruce D. Eshelman  
Idaho State University

**Technical Report  
Appendix E.3.2-24**

Hells Canyon Complex  
FERC No. 1971

September 1998  
*Revised July 2003 (Minor Typographical Changes)*

Copyright © 2003 by Idaho Power Company



***Small and Medium-Sized Mammals  
of the Hells Canyon Area of the  
Snake River in Idaho/Oregon***

**A Report Submitted to Idaho Power Company**

**by**

**Bruce D. Eshelman  
Idaho State University  
University of Wisconsin-Whitewater**

**September 1998**

Mammals of Hell's Canyon  
B.D. Eshelman

***Final Report***



## Table of Contents

Abstract .....	1
1. Introduction.....	2
2. Study Area .....	3
3. Methods .....	4
3.1. Sampling Design.....	4
3.2. Field methods.....	5
4. Results .....	6
5. Discussion and Recommendations .....	8
6. Literature Cited.....	11

## List of Tables

Table 1. Sample location, sampling date, and intensity of small and medium-sized sampling effort in the unimpounded reach of the Snake River below Hells Canyon Dam.....	13
Table 2. Mammals observed or captured by one of several trapping methods below Hells Canyon Dam.....	14
Table 3. Comparison of small and medium sized mammals reported in or near the Hells Canyon area .....	15

## List of Figures

Figure 1. Proportion of animals captured by species.....	17
Figure 2. Proportion of animals captured by site.....	17
Figure 3. Diagram of trap line placement at Kirkwood Creek.....	18
Figure 4. Diagram of trap line placement at Somers Creek .....	19
Figure 5. Diagram of trap line placement at Bob Creek.....	20
Figure 6. Diagram of trap line placement at Bernard Creek.....	21
Figure 7. Diagram of trap line placement at Granite Creek #1 .....	22
Figure 8. Diagram of trap line placement at Granite Creek #2 .....	23

## List of Appendices

Appendix A. Site descriptions and directions.

Appendix B. Dates, trap locations, captures, and cover types of the small- and medium-sized mammals of the Hells Canyon Reach of the Snake River.

## **Abstract**

The relicensing of Hells Canyon Dam precipitated the need to assess the biological resources in the reach of the Snake River below the Dam. As part of a larger study this report outlines the small and medium-sized mammals encountered during the study. The deer mouse (*Peromyscus maniculatus*) and the montane vole (*Microtus montanus*) were the most frequently captured small mammals during the study, respectively, accounting for 84% and 12% of the animals captured. No species of special concern were captured during the study. As a preliminary study this trapping was able to capture the most common animals present in the canyon. Further trapping may be necessary to assess the presence or absence of rare animals.

# 1. Introduction

In conjunction with the relicensing of Hells Canyon Dam this study was designed to assess the small and medium sized mammal populations in the reach of the Snake River below the Dam. This study was part of a larger project of Idaho Power Co. intended to appraise the biological resources of the Hells Canyon area of the Snake River of Idaho and Oregon. The Snake River enters Idaho at two points on the eastern side of the state. The Henry's Fork of the Snake River enters near Henry's Lake in the northeastern corner of the state. Along the eastern border near Palisades Reservoir, the south fork of the Snake River crosses Idaho's border. These forks join and proceed south then west across the southern quarter of the state. The river curves northwest near Mountain Home and eventually forms the western boundary of the state with Oregon. West of Boise near Caldwell, Idaho, the river flows toward the north. This region of northerly flow contains the Hells Canyon area of the Snake River.

While it is important that the status of individual animals be determined, the Hells Canyon Area can be viewed at the ecosystem level. Many of the small mammals present serve as the primary prey for animals higher in the food chain. Indeed, the status of the small mammal populations may serve as a barometer for higher carnivores, raptors, and reptiles. As such the status of small and medium mammal populations was considered an integral part of any investigation within the ecosystem. A crew from Idaho Power took vegetation and bird surveys during this mammal survey. Idaho has a rich diversity of mammals due to the many habitat types contained within the state. Habitat types vary from the dry shrub-steppe of the northern Great Basin, riparian, uplands, to the coniferous forests of the northern panhandle of the state.

## 2. Study Area

The Hells Canyon Area of the Snake River forms a border between the states of Idaho to the east and Oregon to the west. This area lies within the boundaries of Adams and Idaho counties of Idaho and includes the Northern and Central Rocky Mountain Biotic areas described by Davis (1939). A mixture of Pacific Coast and Rocky Mountain trees characterizes the Northern Rocky Mountain region. The Pacific Coast trees include: western white pine (*Pinus monticola*), lowland fir (*Abies grandis*), and western hemlock (*Tsuga heterophylla*). Rocky Mountain trees found in this biotic area are: Douglas fir (*Pseudotsuga menziesii*), yellow (*Pinus ponderosa*) and lodgepole pines (*Pinus contorta*), alpine fir (sic) (*Abies lasiocarpa*), and Engleman spruce (*Picea engelmannii*). The Central Rocky Mountain region is dominated by lodgepole pine and includes aspen, (*Populus tremuloides*) and Douglas fir. Larrison and Johnson (1981) refer to this area of the state as the Seven Devils section of the Columbia Intermontane Geomorphic Province. The portion of the Snake River below Hells Canyon Dam is not impounded and is distinguished by steep canyon walls which form the deepest gorge in the continental U.S. Access to the top of the canyon from the river level is mainly achieved by riparian corridors that border numerous small streams that empty into the river. This reach of the river features many large rapids, shallow riffles, and deep pools.

## 3. Methods

### 3.1. Sampling Design

The steep walls of Hells Canyon limit access to the land mostly through the corridors carved by the many tributaries that feed the river. These corridors also contain a wide diversity of habitat types. These two factors (accessibility and diversity) combine to form the basis of the sampling scheme for this study. The sampling areas had to be accessible from the river by white water raft to allow efficient transportation of the traps and equipment. By sampling the habitats contained within and accessible by these corridors, a wide range of habitat types could be included within the study. Individual areas (Appendix A) selected for sampling were spaced to cover the entire reach and include the greatest diversity of habitat types including dunes and streambeds. Trapping for mammals was also coincident with vegetation and bird samples that were often placed in these same areas to allow for continuity within the study. The schedule for rafting the river restricted most trap sessions to one night of consecutive trapping in each area. Two exceptions to this were Granite Creek and Rush Creek where two consecutive nights were possible.

Sampling took place during three time periods (May 20–24; June 3–7; July 17–22, 1996). These periods were selected to provide trapping intervals spaced throughout the summer and during periods when the flow of the river allowed access by the white water rafts used to move among sampling areas. The summer of 1996 had several periods of river flow above 50,000 CFAs which were not considered acceptable for rafting.

### **3.2. Field methods**

Mammals were sampled for presence or absence only and efforts were not be made to estimate population sizes within the study area. Trap lines were often placed near the bird or vegetation survey point within the sampled areas (see site descriptions, Appendix A). Unless noted, the typical trap arrangement was to place trap stations 10 meters apart in a line. Every trap station received a snap trap and at every fifth station a Sherman trap was placed. Snap traps were baited with a small amount of peanut butter. Sherman traps were baited with a small amount of a mixture of rolled oats and peanut butter. A minimum of 25 and a maximum of 60 (two lines of 30) snap traps were placed in each of the sampling areas (Table 1). A maximum of 4 Havahart traps was placed in each area. Havahart traps were placed within the same general area as the trap lines but were placed in areas that were likely to increase the possibility of capture of medium-sized mammals. Havahart traps were intended to capture medium sized mammals such as skunks and raccoons. These traps were baited with a tablespoon of cat food. A maximum of 4 camera traps were also set in each area at sites that were suitable for their placement and in areas considered likely to increase the possibility of capture of animals. The area in front of the camera trap was baited with commercially available bobcat urine or cat food. Unless noted in the location description, camera traps and Havahart traps were placed within 50 meters of the trapline. Whenever possible, animals captured in the traps were weighed, sexed, and identified to species. All traps were set in the early evening after arriving at the sampling area and were left open all night. Trap checks were started at 6:00 am the following morning. Where traps were in place for two days, the snap traps remained set but the Sherman and Havahart traps were closed during the morning check and reopened that evening. Tracks and sign of other mammals were noted as they were encountered. When entering an area for trapping, the basic rule followed was to include as many habitat types as possible in the sampling scheme. This was

usually accomplished (exceptions noted below) by starting a line on one side of a creek or wide bowl and setting subsequent stations to cross the creek or bowl. Sampling was concentrated in riparian areas within the Canyon. These areas provided a diversity of habitats in which small mammals resided and were accessible from the river. Trap lines were situated roughly parallel (except those placed within the creeks) to the river and positioned to span the riparian areas thereby providing a cross-sectional sampling of the available habitats. The following areas were trapped in association with this project: Kirkwood Creek, Cat Gulch, Somers Creek, Bob Creek, Bernard Creek, Sheep Creek, Pine Bar, Rocky Bar, Granite Creek, Rush Creek, and Salt Creek.

## 4. Results

Several species of small, medium, and large mammals were recorded for this project (Table 2). A total of 992 trap nights were produced during this project. Of these, 740 were from snap traps, 178 were from Sherman traps, 32 trap nights resulted from camera traps, and 42 trap nights were from Havahart traps (Appendix B). *Peromyscus maniculatus* was the most frequently captured species in the Canyon (84% of all captures, Fig. 1). This animal was caught in every habitat sampled and was the most common animal in all of the trap sites. A total of 131 *Peromyscus maniculatus* was captured during the study. Animals were frequently captured in reproductive condition indicating that reproduction was occurring throughout the summer period. *Microtus montanus* was the second most frequently captured species (12% of all captures, Fig. 1). As expected this species was most often found in dense grass habitats. Often their runways could be seen in the grass. A total of 19 of these voles were captured during the study. Three bushy tailed woodrats (*Neotoma cinerea*) were captured: one in a Sherman trap and the others in the Havahart traps. The striped skunk (*Mephitis mephitis*) was represented by many tracks noted at campsites and one capture of an adult individual in a Havahart trap

at the mouth of Salt Creek. Only one shrew was captured during this project. This shrew was identified as a vagrant shrew (*Sorex vagrans*).

The largest number of captures (31 animals, 29 *P. maniculatus* and 2 *N. cinerea*) was recorded at Rush Creek. This was undoubtedly aided by the fact that this was one of the few areas that was trapped for 2 consecutive nights (Appendix B, Fig. 2). Rocky Bar produced the fewest number of animals (1 *P. maniculatus*). Other areas produced numbers similar to one another.

Many animals were noted by sightings or indirect indications of their presence. Raccoon (*Procyon lotor*) tracks were seen at several places along the banks of Kirkwood creek and skunk tracks (probably *Mephitis mephitis*) were seen at Cat Gulch along the riverbank. Two sets of otter (*Lutra canadensis*) tracks were seen at Hutton Gulch, many otter tracks were also seen at Upper Salt Creek Campground. An otter was seen in the river 1 mile above Temperance Creek. Although this project was undertaken to sample small and medium mammals many large mammals were identified directly or indirectly. Bear (*Ursus americanus*) scratches were present on trees in Somers creek. A camera trap recorded a black bear at Granite creek where there was also significant amounts of bear scat. Five elk (*Cervus elaphus*) were seen on the hillside on the south bank of Bob Creek. Deer (both whitetail, *Odocoileus virginianus* and mule deer, *Odocoileus hemionus*) were commonly seen along the river. A mountain goat (*Oreamnos americanus*) was seen on the mountaintop across the river from the parking lot at Hells Canyon Dam.

Both snap traps and Sherman traps were effective in capturing the primary small mammals of the area. The use of Sherman traps also allowed for the possible capture of larger rodents such as the woodrat (*Neotoma cinerea*).

## 5. Discussion and Recommendations

There is generally good agreement between this study, McKern (1976), and Davis (1939) (Table 3). Although Davis (1939) did not report specifically on the Hells Canyon Area, he examined many small- and medium-sized specimens from Idaho including Adams and Idaho counties. Some notable differences of captures among these studies should be mentioned. McKern (1976) did not capture **any** shrews in the Hells Canyon reach of the Snake River. Although represented by only one specimen, the vagrant shrew was captured in the present study. Davis noted specimens of *Sorex vagrans* from both Idaho and Adams counties. Perhaps more striking is that McKern (1976) did not capture **any species** of voles during his study. This may be due to wide variation in population levels of voles. *Microtus montanus*, the mountain vole, was the second most captured animal in the present study. Davis (1939) indicated that these voles had been captured in Idaho County.

The present study and McKern (1976) both found river otters, striped skunks, and raccoons present in the canyon. Davis (1939) did not find any of these species.

The animals captured during this summer session were expected to be found within this section of the Canyon. I view this session as a preliminary trapping session and would recommend that further more intense trapping proceed when funding allows. This statement is made with consideration of the habitat types present below Hells Canyon Dam and the lack of representation of several species in the trapping results. For example, only one shrew was captured during this summer. In my judgment there are many habitats available for shrews, especially in the riparian areas along stream banks. Many of the traps set near stream banks were tripped without a resulting capture and some of these may have been because the trap bar did not catch the small shrews. Also

the kinds of traps used in this study were not ideal for capturing shrews. I recommend that pitfall traps be set for a more complete sampling of the shrews that may be present in the Hells Canyon area. Due to the rafting schedule of this summer's trips, there was not sufficient time available to set pitfall traps with the other trap lines. Preble's shrew (*Sorex preblei*) is an inhabitant of riparian areas and a species of special concern. Zeveloff (1988) stated that Preble's shrew "probably occurs throughout Central Idaho". This shrew was originally known from southeastern Oregon but recent captures suggest a wider distribution (Tomasi and Hoffmann, 1984; Zeveloff, 1988). One specimen was collected by Larrison at a forest spring a few miles southeast of Lewiston (Larrison and Johnson, 1981). Given the wide availability of this type of habitat within the Canyon, further trapping specifically for shrews is justified. *Sorex preblei* has also been found in shrub-grass associations or openings in montane coniferous forests dominated by sagebrush (Tomasi and Hoffmann, 1984). Both of these habitat types can be found within the Hells Canyon section of the Snake River.

Although some sites contained sandy soils below Hells Canyon Dam, no sign (fresh mounds, casts, or tunnels) of mole or gopher activity was found in the stretches of the river that were trapped during this summer's operation. Biologists for Idaho Power have indicated that these animals are present in some areas above the Dam so further sampling below the Dam may prove productive for these species. McKern (1976) identified these animals in his study and they have been found in both Idaho and Adams counties (Davis, 1939).

No signs of pine martens (*Martes americana*) or fishers (*Martes pennanti*) were found during these trapping sessions. Martens prefer areas of mature or mixed forest with greater than 30% cover especially of fir or spruce (Clark et al., 1987). Fishers also prefer areas with "extensive continuous canopy" (Powell, 1981). While most of the area trapped

was not forested enough to contain these animals, some large, heavily forested areas such as Granite Creek may provide adequate habitat for these animals.

I also did not note any specific sign of the pygmy rabbit (*Brachylagus idahoensis*). Pygmy rabbits prefer sagebrush steppe habitat (Davis, 1939; Green and Flinders, 1980, Larrison, 1981; Zeveloff, 1988). While Hells Canyon provides some of this habitat type, the canyon is near the northern boundary of the rabbit's range (Green and Flinders, 1980; Wilson and Reeder, 1993). Davis (1939) noted that a specimen was taken in Owyhee Co., Idaho and also indicated a rabbit had been sighted by Anthony in Malheur Co., Oregon. These animals are large enough that capture in a Sherman trap would be less likely than capture in the Havahart traps. As stated earlier, use of Havahart traps would be improved with longer periods of trap availability.

Common species were readily captured during this project. Species that are less common would benefit from longer trap exposure that was not possible during this project. A combination of pitfall traps and longer availability of traps in a variety of habitats, but particularly the riparian, would provide a more complete catalog of the mammal species of Hells Canyon below Hells Canyon Dam.

I would recommend that future trapping sessions also include both Sherman and snap traps. The Havahart traps for medium sized mammals also provided for the capture of larger animals than could be captured in the snap traps or in the Sherman traps. The usual time at the trapping area was not ideal for the use of Havahart traps, though these did produce captures of woodrats (*Neotoma cinerea*) and a skunk (*Mephitis mephitis*). I believe these traps would be more productive if they were left in the same area for a longer period of time, thus allowing resident animals to acclimate to the trap or locate the trap within their home range. I would also recommend that the camera traps be left in

place for longer than the one or two nights that were available during these recent trapping sessions. Camera traps are set to capture larger animals that may not frequent all areas of their range on a daily basis. I believe camera trap success would improve if the traps could be left set for 4-5 days or longer.

## 6. Literature Cited

- Clark, T. W., E. Anderson, C. Douglas, and M. Strickland. 1987. *Martes americana*. Mammalian Species 289:1-8. Published by the American Society of Mammalogists.
- Davis, W. B. 1939. The Recent Mammals of Idaho. Caxton Printers. Caldwell, ID. 400 pp.
- Green J. S., and J. T. Flinders. 1980. *Brachylagus idahoensis*. Mammalian Species 125:1-4. Published by the American Society of Mammalogists.
- Larrison, E. J., and D. J. Johnson. 1981. Mammals of Idaho. University Press of Idaho. Moscow, ID. 166 pp.
- McKern, J. L. 1976. Inventory of riparian habitats and associated wildlife along the Columbia and Snake Rivers. Volume 1. U.S. Army Corps of Engineers, North Pacific Division. Inventory of Riparian Habitats 1973-1975.
- Powell, R. A. 1981. *Martes pennanti*. Mammalian Species 156:1-6. Published by the American Society of Mammalogists.
- Tomasi, E. T., and R. S. Hoffmann. 1984. *Sorex preblei* in Utah and Wyoming. Journal of Mammalogy 65:708.
- Wilson, D. E., and D. M. Reeder (eds). 1993. Mammal Species of the World. Smithsonian Institution Press, Washington, D.C. 1206 pp.
- Zavelloff, S. I. 1988. Mammals of the Intermountain West. University of Utah Press. Salt Lake City, UT. 365 pp.

This page left blank intentionally.

Table 1. Sample location, sampling date, and sampling effort of the small- and medium-sized mammal community in the unpounded reach of the Snake River below Hells Canyon Dam.

Sample Location	Trap Date	No. Trap Nights	No. Snap Traps	No. Sherman Traps	No. Camera Traps	No. Havahart Traps
Kirkwood	5/21/96	1	45	11	2	2
Cat Gulch	5/22/96	1	60	14	2	4
Somers Creek	5/23/96	1	50	13	2	2
Bob Creek	5/24/96	1	45	11	2	4
Bernard Creek	6/4/96	1	55	13	2	4
Sheep Creek	6/5/96	1	40	11	2	4
Pine Bar	6/6/96	1	60	14	2	4
Salt Creek	6/7/96	1	60	14	2	4
Rocky Bar	7/17/96	1	25	6	0	0
Granite Creek	7/18/96	2	60	14	4	4
Rush Creek	7/20/96	2	60	14	4	4
Salt Creek	7/22/96	1	60	15	4	4

Table 2. Mammals observed or captured by one of several trapping methods along the Snake River below Hells Canyon Dam.

Species	Type of Trap Used	Location
<i>Peromyscus maniculatus</i>	Sherman and snap traps	All sites
<i>Microtus montanus</i>	Sherman and snap traps	Somers, Bob, Bernard, and Sheep Creeks
<i>Neotoma cinerea</i>	Sherman and Havahart traps	Granite and Rush Creeks
<i>Mephitis mephitis</i>	Havahart trap, tracks	Salt Creek, Cat Gulch
<i>Sorex vagrans</i>	snap trap	Kirkwood
<i>Procyon lotor</i>	tracks in sand	Kirkwood, Salt and Rush Creeks
<i>Lutra canadensis</i>	sight observation, tracks	Hutton Gulch, Salt creek, 1 mi. above Temperance Creek
<i>Odocoileus hemionus</i>	sight observation, tracks, scat	Numerous locations, common in Hells Canyon
<i>Ovis canadensis</i>	sight observation	Bernard Creek
<i>Cervus elaphus</i>	sight observation	Bob Creek
<i>Ursus americanus</i>	camera trap, tracks, scratchings, scat	Somers and Granite Creeks
<i>Canis latrans</i>	scat	Common in Hells Canyon

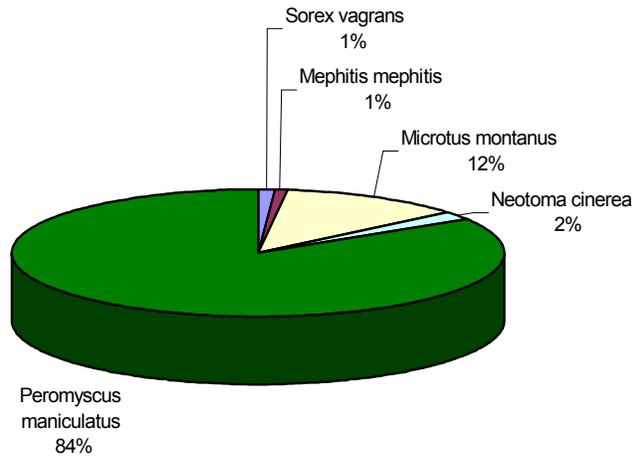
Table 3. Comparison of small- and medium-sized mammals reported in or near the Hells Canyon Reach below Hells Canyon Dam.

Scientific Name	Common name	McKern	Davis <sup>1</sup>	This Study
<i>Sorex cinereus</i>	masked shrew		A,	
<i>Sorex vagrans</i>	vagrant shrew		A,I	x
<i>Sorex palustris</i>	water shrew		A,I	
<i>Ursus americanus</i>	black bear	x	A	x
<i>Mustela frenata</i>	long-tailed weasel	x	A, I	
<i>Lutra canadensis</i>	river otter	x		x
<i>Mephitis mephitis</i>	striped skunk	x		x
<i>Marmota flaviventer</i>	yellow-bellied marmot	x	I	
<i>Spermophilus columbianus</i>	Columbian ground squirrel		A, I	
<i>Spermophilus brunneus</i>	Idaho ground squirrel		A	
<i>Spermophilus lateralis</i>	golden-mantled g.s.		A	
<i>Tamias amoenus</i>	chipmunk		A, I	
<i>Tamiasciurus hudsonicus</i>	red squirrel	x	A, I	
<i>Thomomys talpoides</i>	northern pocket gopher	x	A, I	
<i>Peromyscus maniculatus</i>	deer mouse	x	A, I	x
<i>Neotoma cinerea</i>	bushy-tailed woodrat	x	A, I	x
<i>Phenacomys intermedius</i>	heather vole		A	
<i>Clethrionomys gapperi</i>	southern red-backed vole		A	
<i>Microtus montanus</i>	mountain vole		I	x
<i>Microtus longicaudus</i>	long-tailed vole		A, I	
<i>Microtus richardsoni</i>	water vole		A, I	
<i>Ondatra zibethica</i>	muskrat		I	
<i>Zapus princeps</i>	western jumping mouse		A	
<i>Erethizon dorsatum</i>	porcupine	x	A	
<i>Ochotoma princeps</i>	pika		A,I	
<i>Lepus americanus</i>	snowshoe hare		A	
<i>Procyon lotor</i>	raccoon	x		x
<i>Canis latrans</i>	coyote	x	A,I	x
<i>Mus musculus</i>	house mouse	x		

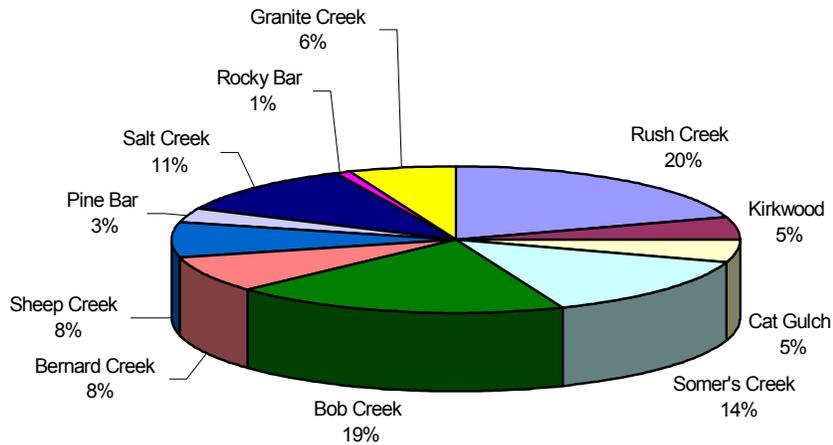
<sup>1</sup> Species recorded in A–Adams or I–Idaho counties, Idaho

This page left blank intentionally.

**Fig. 1. Proportion of Animals Captured by Species**



**Fig. 2. Proportion of Captures by Site**



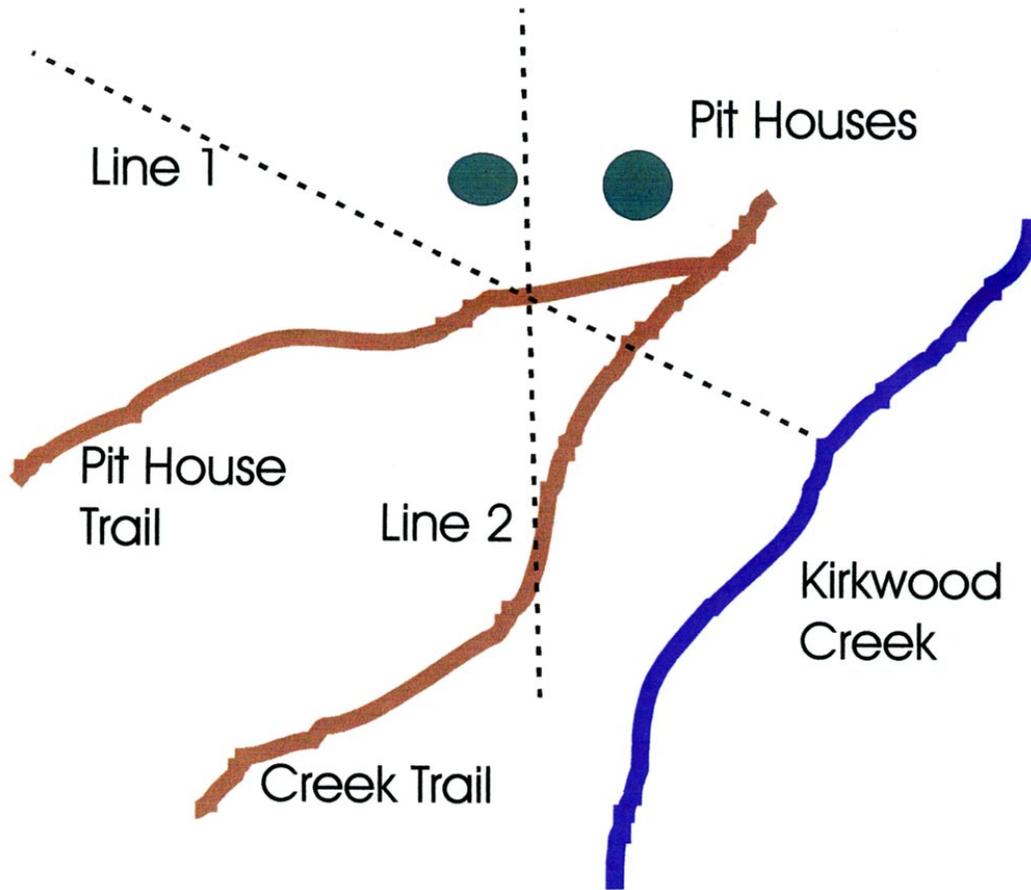


Figure 3. Diagram of Trap Line Placement at Kirkwood Creek.

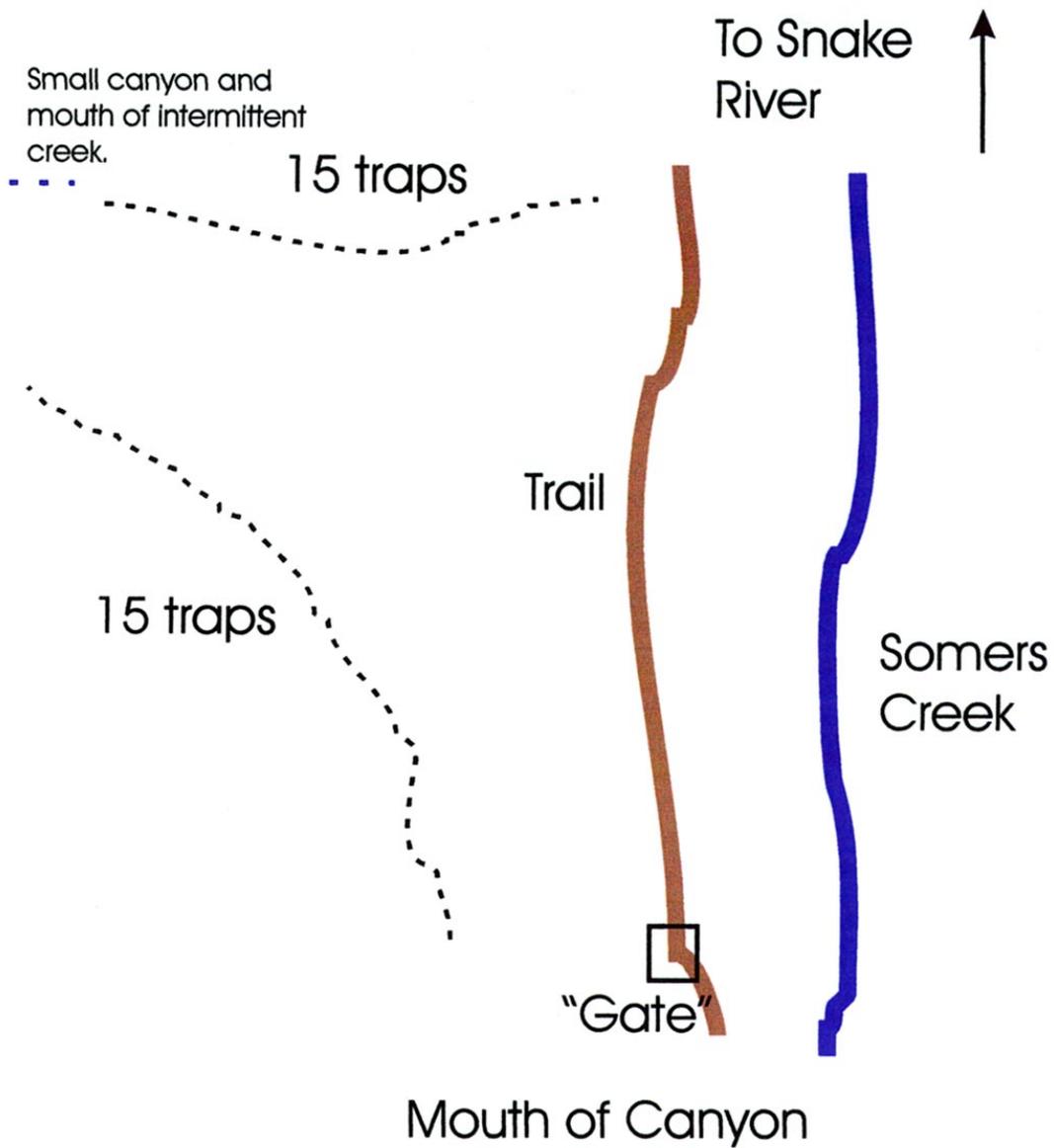


Figure 4. Diagram of Trap Line Placement at Somers Creek.

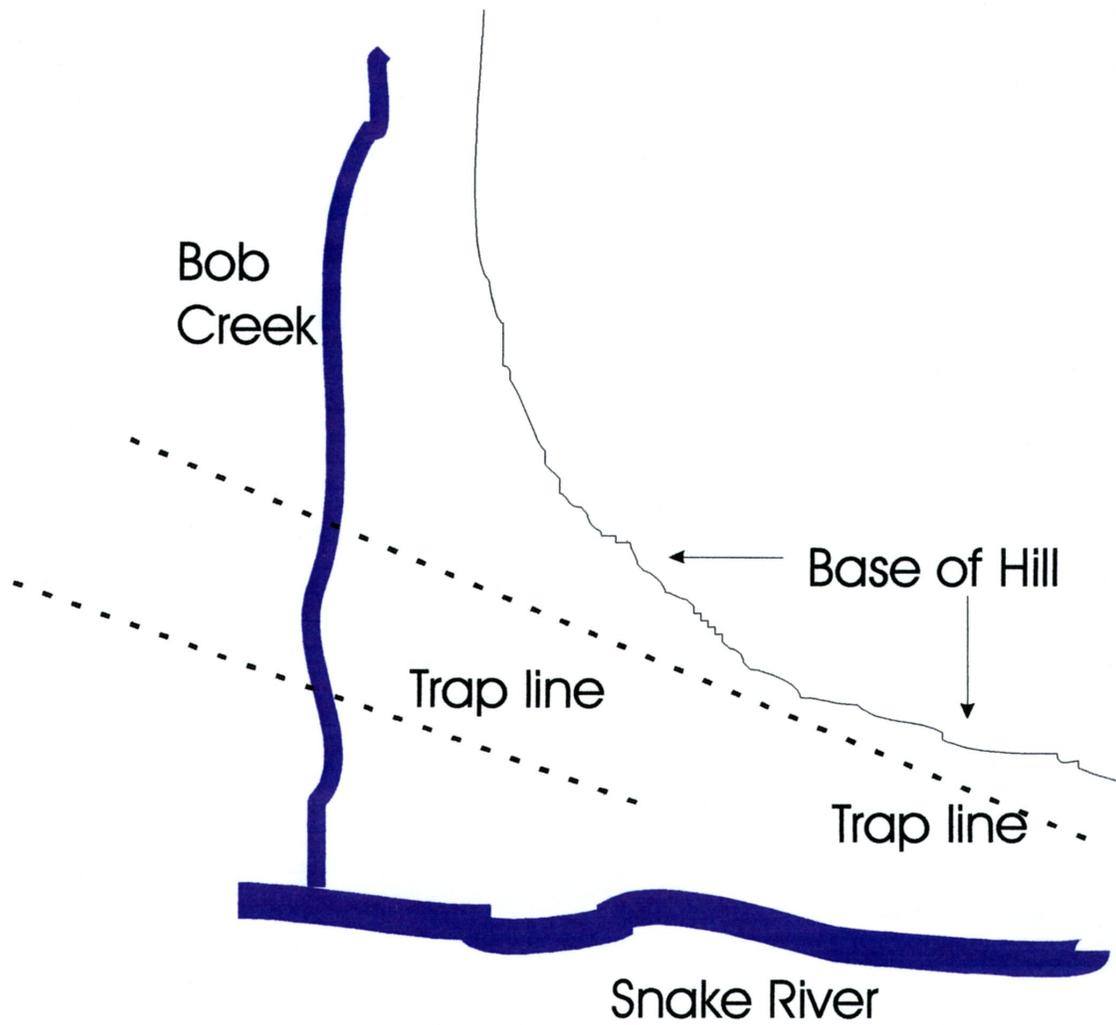


Figure 5. Diagram of Trap Line Placement at Bob Creek.

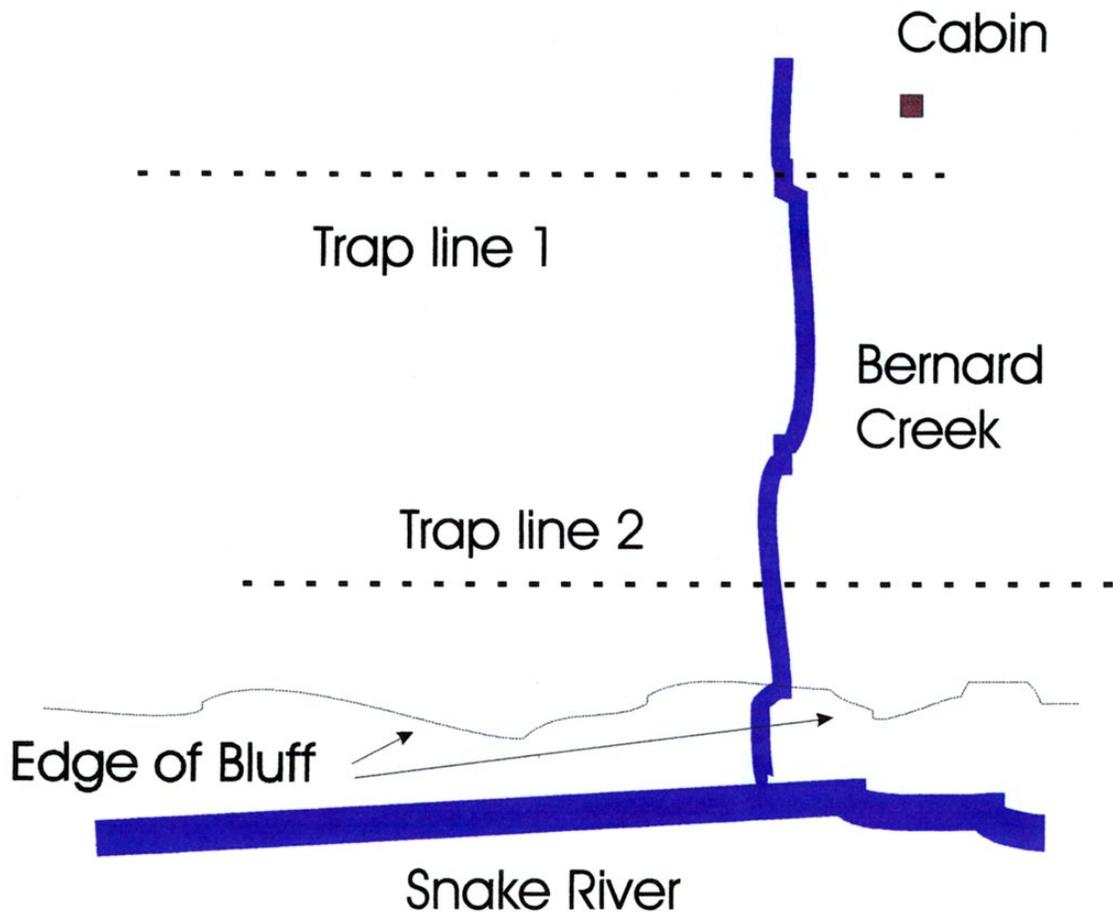


Figure 6. Diagram of Trap Line Placement at Bernard Creek.

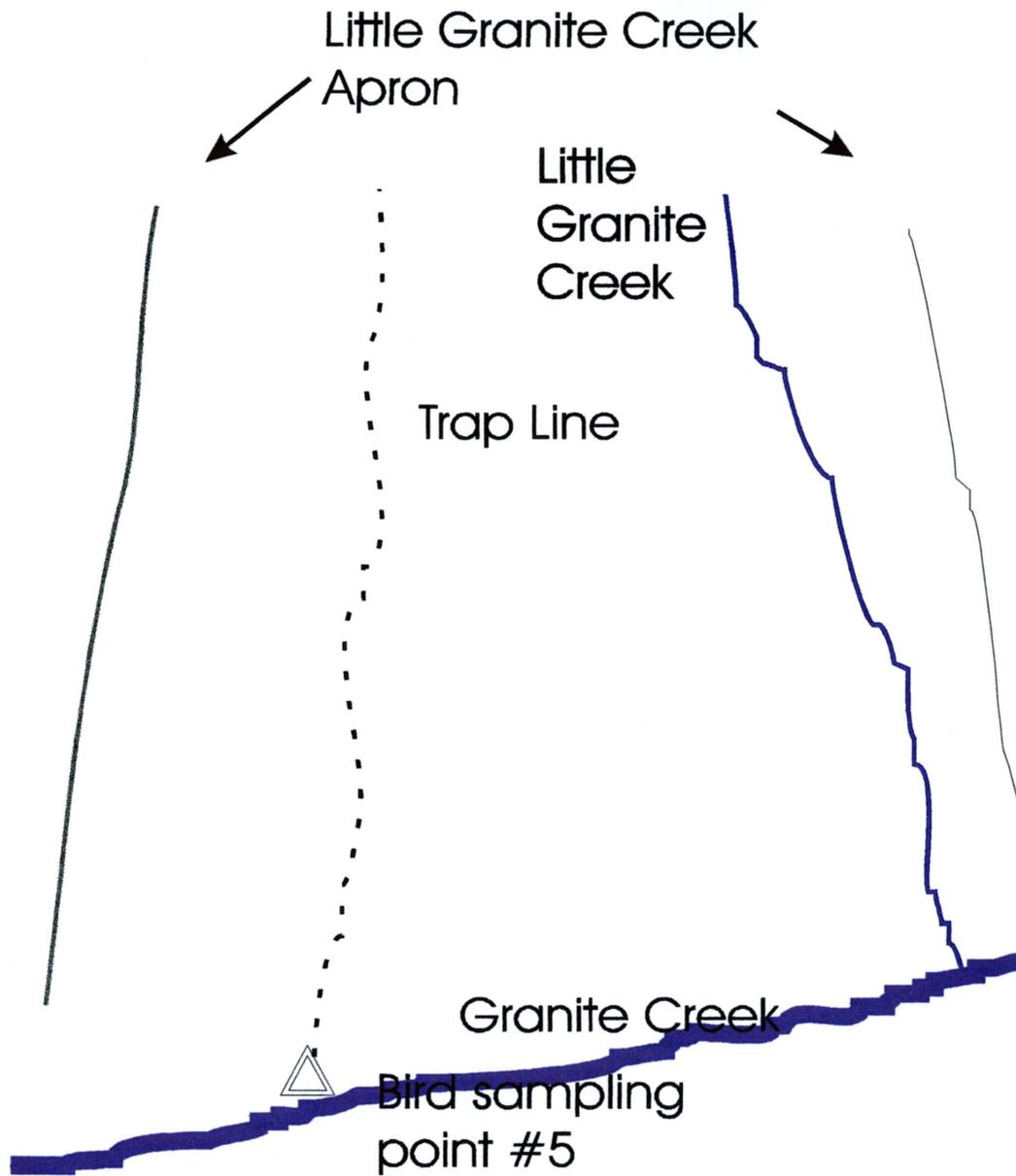


Figure 7. Diagram of Trap Line Placement at Granite Creek #1.

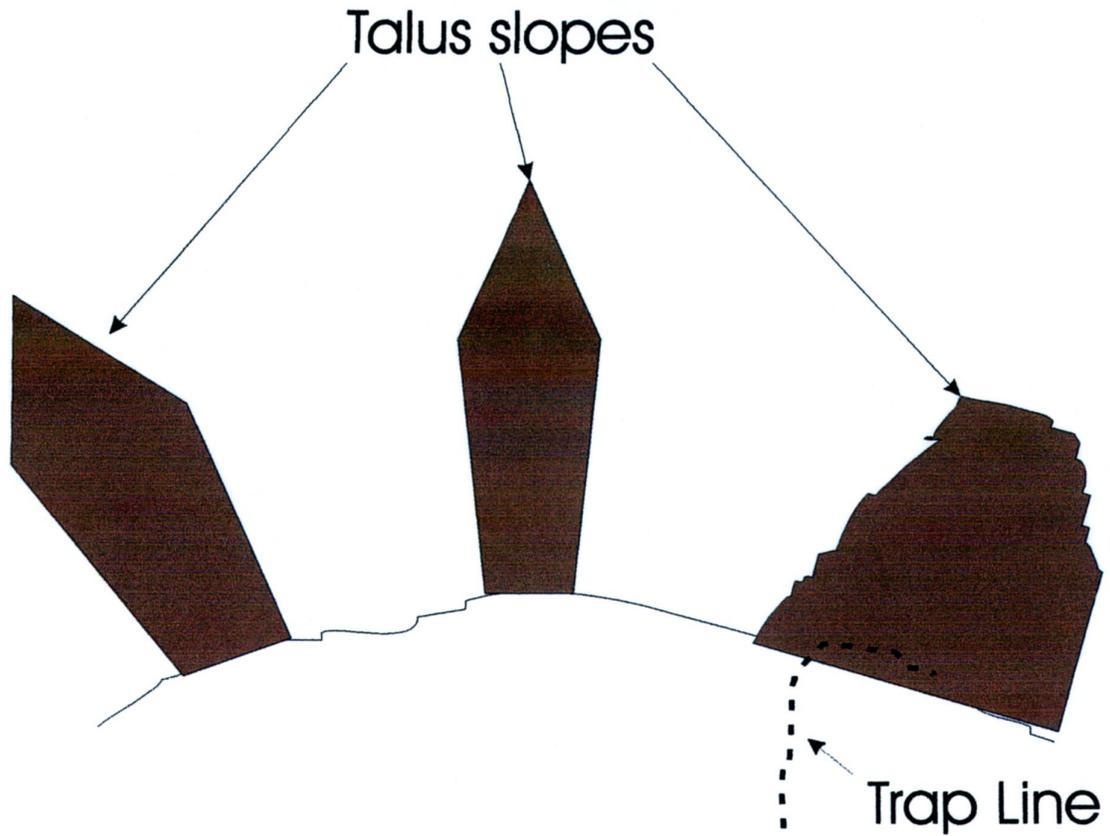


Figure 8. Diagram of Trap Line Placement at Granite Creek #2.

This page left blank intentionally.

## Appendix A. Site Descriptions and Directions.

### Kirkwood Creek

Fig. 5. Kirkwood Creek Quadrangle. T. 26N, R. 1W, Section 29, elevation 1560'.  
5-21-96.

General description of the habitat: The trap lines start in the riparian area of the creek and move into a very grassy area. Each line then proceeds up a hill where the habitat becomes rockier with less grass interspersed among the rocks. These trap lines were set in this manner to cover the available habitat types in this small opening.

The first camera trap was set down by the creek at the start of line 1.

Trap line 1 at Kirkwood starts at the creek:

Directions to line 1: From the campground, walk up the creek about  $\frac{3}{4}$  of a mile, until the canyon opens slightly. The first trap line starts at the creek. Trap station 1 has one snap trap, one camera trap, one Havahart trap and one Sherman trap.

This trap line is 30 stations long. One snap trap is set every 10 m and every fifth station (including #1) also has a Sherman trap present. Total traps for this line 30 snap traps, 7 Sherman traps, one Havahart trap, and one camera trap.

The trap line then leads back from the creek toward the Pit House almost due north for total trap stations ca 290 m.

Trap line 2 at Kirkwood starts also starts at the creek ca 40 downstream from the start of trap line 1.

At station 1 there is a Havahart trap, snap trap, and Sherman trap. This trap line then follows a northeasterly direction and bisects trap line #1 at the Pit House trail. GPS point for this bisection is N4533.838 W116.29798.

A camera trap was placed on this line near station 13. There was a total of 15 trap stations in this line.

### **Cat Gulch**

Kirkwood Creek Quadrangle. T. 26N, R 1W, Section 16, elevation 1400'. 5-22-96.

General description of the area: Cat Gulch is a typical camping area on the river as it has a small beach and a small bowl is shaped by two small ridges that run perpendicular to the river. The bowl contains long grasses, interspersed with hackberry trees. The trap lines were placed to span this small bowl from small ridge to small ridge therefore sampling the entire bowl.

Two trap lines were set in the Cat Gulch area. Each trap line contained 30 stations. Both lines run parallel to the river and are ca 50 m apart. Trap line #2 is further up the hill from the river than line #1. Trap line #1 was ca 135 m up the hill from the river. We had rain starting at 1:15 am and lasting all night while the traps were open. As was standard practice, Sherman traps were placed every 5<sup>th</sup> trap station including station #1 for a total of 7 Sherman traps per trap line. A total of 4 Havahart traps were set in the bowl of the gulch. These were placed at likely looking places where trails met or animal sign was present. Two camera traps were also set in the bowl of the gulch.

### **Somer's Creek**

Fig. 6. Lord Flat Quadrangle. T 26N, R 2W, Section 11-12, elevation 1600'. 5-23-96.

General description of the habitat: Trap line 1 is on a small hillside covered with sparse grass. Trap line 2 is in an area that contains much thicker and taller grass cover. The second half of trap line 2 is contained within a broad wash with coarse sandy soil and hackberry trees.

Two areas were trapped in the Somer's Creek area. The first area to be trapped has 2 lines of 10 stations each.

Directions to line 1 of area 1: From the campground, go up the canyon until you see the first south facing grassy hillside. This is a small area. Two lines of only 10 stations each could be set in this area. The hillside is dominated by grasses and hackberry. Trap line 1B is ca 30 m lower on the hillside than trap line #1A. Trap line 1A is ca 40 m up the hillside from the trail leading from the campground.

Area #2 of Somer's Creek covers the canyon that forms the next large opening up the trail from area 1. This area is also on a south-facing slope dominated by grasses. The trap line starts near a "gate" in the fence and heads back to the river toward the opening of a small canyon. Once in the mouth of the canyon, the first part of the line ends where the canyon closes off. A small stream trickles over the rocks and disappears into sandy soil. From

this point the second part of the line heads back toward Somers Creek down the side of a wash that has many junipers in it. Because the trap line changes direction at the sandy area where the little creek disappears, a snap trap and a Sherman trap were placed at this station (16).

### **Bob Creek**

Fig. 7. Wolf Creek Quadrangle. T 3N, R 50 E, Section 10, elevation 1200'. 5-24-96.

General description of habitat: This area is dominated by grasses that form a thick dense carpet covering the soil. Every time this type of habitat was seen, vole runways were very obvious.

Two trap lines were set in the Bob creek area. Trap line 1 has 25 stations and trap line 2 has 20 stations. Trap line 1 is set against the hillside and follows the contour of the hill. Trap line 2 is 50 m toward the river from #1. This meadow has a profusion of vole runways.

### **Bernard Creek**

Fig. 8. Old Timer Mtn. Quadrangle. T 24N, R 2W, Section 20, elevation 1360. 6-4-96.

General description of habitat: Once again this habitat is very thick grass located on the bluff overlooking the river. Trap lines were started on the edges of the grass area used for the campground.

Two trap lines were sent in this area. Trap line one was set at the base of the hill at the east side of the camping area. This trap line started at the north end of the campground and headed back toward Bernard Creek and MacAfree cabin. There were 30 traps in this line. The line crossed the creek at station 15 and went up river of the cabin. Trap line 2 is 25 traps long and starts at the edge of the bluff west of trap line 1. This line runs north up river following the edge of the bluff. One Havahart was set 20 m downstream of bridge that crosses the creek. One Havahart set against hillside up river from trap 1 line 1. One Havahart set in grassland that was on the cabin side of the creek, up river from the campground.

### **Sheep Creek**

Old Timer Mtn. Quadrangle. T 25N, R 2W, Section 35, elevation 1280. 6-5-96.

Trap line 1 was set on river bank just up river from lower campsite in hackberry/grassland area. Only 2 rows of 5 stations each would fit in this area. This area is mostly sand with a canopy of hackberry trees.

Trap line 2 is on a grassy upper bench just across the creek from the old cabin. Fifteen stations were set in this area plus one Havahart trap was set at station 1. This habitat was similar to that sampled by Somers Creek 1 trap line. Many exposed rocks with grass and a few hackberry trees present on the hillside.

Trap line 3 is across Sheep Creek from the old cabin on the (up river side of the creek) in a riparian/grassy area. Fifteen trap stations follow the creek upstream. This is a very lush area near the creek. The grass is very thick and greener than the grass on the hillsides just a few meters away.

### **Pine Bar**

Old Timer Mtn. Quadrangle. T 25N, R 2W, Section 23, elevation 1380'. 6-6-96.

Trap line 1 contains 30 stations and is ca 350 m from the river on a steep slope in a Ponderosa pine stand. The trap line parallels the river. Trap line 1 has station 1 on the up river end of the line. The trap line was placed under the Ponderosa pine canopy so that this unique type of habitat was represented in the trapping program. This cover type can be seen on the topographic map.

Trap line 2 is located ca 70m down slope (toward river) from trap line 1. Trap line 2 has first 15 stations in grassland and last 15 stations in Ponderosa pine stand. Trap line 2 has trap station 1 on the down river end of the line. Many vole runways were seen in the grassy portion of this trap line but no voles were captured during this session.

### **Upper Salt Creek Campground**

Temperance Creek Quadrangle. T 26N, R 2W, Section not shown on this quadrangle, elevation 1240'. 6-7-96.

Line 1 starts on the up river side of Coral Creek ca 100 m from the river and heads up river toward the campground. Two lines were set of 30 stations each and both bisect the dune area near the campground. Line 2 starts ca 50 m toward the river from line 1 and follows the edge of the sandy hill that is adjacent to the river. The dune habitat is indicated as "sand" on the topographic map.

### **Rocky Bar**

Prairie Quadrangle. T 23 N, R 3W, Section 14, elevation 1480'. 7-17-96.

We arrived here very late after some delays getting on the river for this segment of the project. Twenty-five trap stations were set on the Snake River Hells Canyon Trail on the

Idaho Side. The trap line extended upstream from the south end of Rocky Bar on the hill to the end of Wild Sheep Rapid.

### **Granite Creek**

Squirrel Prairie Quadrangle. 7-18-96.

General description of habitat: The area where the traps were set was primarily open forest/shrub habitat. The major trap line started in the riparian zone and moved up the apron formed by the mouth of little granite creek.

This is the first area that allowed me to trap for 2 consecutive nights. A total of 60 trap stations were set.

Fifty-five of these stations were set in the mouth of the canyon where Little Granite Creek joins with Granite Creek (Fig. 9. T 23 N, R3W, Section 13, elevation 1960').

An additional 5 stations (Fig. 10. T 23N, R 3W, Section 12, elevation 1200' were set at the base of a talus slope in the first clearing up the trail from the campground. No previous talus slopes had been sampled.

The 55 stations were set in one long row starting at bird point #5 next to Granite Creek and going up at game trail near Little Granite Creek.

Four Havahart traps were set: one at bird point #4, a second at the 2nd wet creek that crosses the trail to Little Granite Creek, a third in the same clearing and next to the talus slide as the first 5 trap stations, and a fourth next to Granite Creek approx 200 m from the foot bridge on the trail that leaves the campground. Three camera traps were also set in the area: the first near bird point #4, and two in the Little Granite Creek apron that contains the line of 55 trap stations. One of the camera traps was set at trap station 24 and the other was at trap station 50.

### **Rush Creek**

Old Timer Mtn. Quadrangle. T 24N, R 2W, Section 4, elevation 1600'. 7-20-96.

Another place where 2 trap nights were possible. Thirty trap stations were placed between the banks of the creek and follow the creek upstream. Traps were placed wherever possible, the line sometimes criss-crossing the creek. This line was meant to sample the rocky creek habitat covered by significant canopy. Bird points and vegetation surveys are both associated with this creek. Because these traps were within the creek

boundaries they were placed at 5 m intervals rather than the usual 10 m. This line starts ca 15 m above the trail crossing of the creek. Trap station 17 is at the bird point located in Rush Creek.

Line 2 runs parallel to the down river side of Rush Creek. Station 16 is ca 20 m from station 30 of the trap line 1. Trap stations of line 2 are 10 m apart and located in the grass/hackberry vegetation type.

Camera trap 1 was set ca 15 m above the trail crossing for Rush Creek. Two Havahart traps were also in this area. Camera trap #2 was placed at the mouth of Rush Creek along with a Havahart trap.

### **Salt Creek**

Temperance Creek Quadrangle. T 26N, R 2W, Section not shown on this quadrangle. elevation 1240'. 7-22-96.

Trap line 1 has 20 stations set between the banks of Salt Creek to get another sample of the creek bottom habitat. As with the trap line in Rush Creek these stations were spaced at 5 m intervals. This line starts at the trail crossing of Salt creek and goes downstream.

Trap line 2 has 2 lines set to cross the dunes. Both lines run parallel to the river. One line had a total of 25 stations and the other line had 15 stations. Two deer were seen below camp this morning, a doe and a yearling.

Von Pope took one camera trap to the draw in Coral Creek. Nothing was recorded from this camera trap. Another camera was set at the mouth of Salt Creek where the creek enters the Snake River. A third camera trap was set at a creek crossing up near the cabin. The fourth camera trap was set in a dry creek bed just down river from the campground. This creek bed is just on the down river side of the dunes. One Havahart trap was also set here. Another Havahart was placed at the mouth of Salt Creek just under the trees where the creek enters the Snake River. Another Havahart was set near the trail crossing for Salt Creek and a fourth at the midpoint of trap line 1.

## Appendix B. Dates, trap locations, cover types, and species of the small- and medium-sized mammals captured in the Hells Canyon Reach of the Snake River.

Date	Location	Sex <sup>1)</sup>	Species <sup>2)</sup>	Condition	Trap Type <sup>3)</sup>	Station	Vegetation Cover Type	No Snap Traps	No. Sherman Traps	No. Cameras	No. Havaharts	Notes
5/21/96	Kirkwood #1	?	Pm		Sherman	1	riparian	30	7	1	1	
		F	Pm		snap	3	closed mixed grass					
		?	Sv	immature	snap	9	wet seep, grass					1
		M	Pm		snap	13	open mixed grass					
		F	Pm		snap	20	open mixed grass					
		M	Pm	juvenile	snap	21	open mixed grass					
	Kirkwood #2	F	Pm		snap	2	closed mixed grass	15	4	1	1	
		M	Pm	juvenile	snap	15	open mixed grass					
5/22/96	Cat Gulch #1	M	Pm		snap	4	mixed grass, shrub	30	7	2	4	
		M	Pm	juvenile	snap	6	mixed grass, shrub					
		M	Pm		snap	29	mixed grass, shrub					
	Cat Gulch #2	F	Pm	nips exposed	snap	1	mixed grass, shrub	30	7			
		M	Pm		Sherman	1	mixed grass, shrub					
		F	Pm		snap	22	mixed grass, shrub					
		F	Pm		snap	29	mixed grass, shrub					
		M	Pm	scrotal testes	Sherman	30	mixed grass, shrub					
5/23/96	Summer Creek 1A	M	Pm	scrotal	snap	1	open mixed grass	10	3	2	2	
		M	Pm	scrotal; 22 g	Sherman	1	open mixed grass					
		M	Pm	juvenile	snap	6	open mixed grass					
		M	Mm	40 g	snap	8	open mixed grass					
		F	Pm		snap	9	open mixed grass					
	Summer Creek 1B	M	Pm		snap	1	open mixed grass	10	3			
		F	Pm	25 g nips exposed	snap	8	open mixed grass					
	Summer Creek 2	M	Mm	22 g	snap	2	open mixed grass	30	7	2		
		F	Mm	41 g	snap	4	closed mixed grass					
		?	Mm	?	snap	5	closed mixed grass					2

Date	Location	Sex <sup>1)</sup>	Species <sup>2)</sup>	Condition	Trap Type <sup>3)</sup>	Station	Vegetation Cover Type	No Snap Traps	No. Sherman Traps	No. Cameras	No. Havaharts	Notes
		F	Pm	24g	Sherman	5	closed mixed grass					
		F	Mm	26 g	snap	6	closed mixed grass					
		F	Pm	?	snap	8	closed mixed grass					
		F	Pm	18 g	Sherman	10	closed mixed grass					
		F	Pm	juvenile	snap	11	closed mixed grass					
		F	Pm		snap	14	closed mixed grass					3
		M	Pm	24g	snap	16	closed mixed grass					
		M	Pm	22 g	snap	17	closed mixed grass					
		M	Pm	24	snap	18	closed mixed grass					
		F	Pm	lact. 22g	snap	25	open mixed grass					
		?	Pm	juvenile	snap	27	open mixed grass					
		F	Pm	29 g	snap	29	sandy wash					
5/24/96	Bob's Creek #1	M	Mm	22 g scrotal	Sherman	1	mixed grass apron	25	6	2	4	
		M	Pm	22 g scrotal	snap	6	mixed grass apron					
		F	Mm	30 g	snap	8	mixed grass apron					
		M	Pm	7 g juvenile	snap	9	mixed grass apron					
		M	Mm	22 g	Sherman	10	mixed grass apron					
		M	Mm	33 g	snap	11	mixed grass apron					
		F	Pm	13 g juvenile	snap	13	mixed grass apron					
		F	Pm	20 g lact	snap	15	mixed grass apron					
		F	Mm	18 g	snap	17	mixed grass apron					
		M	Pm	12 g juvenile	snap	18	riparian					
		M	Pm	13 g juvenile	snap	22	riparian					
		M	Pm	25 g	snap	24	riparian					
		M	Pm	20 g scrotal	Sherman	25	riparian					
		M	Pm	14 g juvenile	snap	25	riparian					
	Bob's Creek #2	M	Pm	25 g	snap	4	Open grass, shrub	20	5			
		F	Pm	33 g nips exposed	snap	5	Open grass, shrub					
		M	Pm	26 g scrotal	Sherman	5	Open grass, shrub					
		F	Pm	23 g	snap	6	Open grass, shrub					
		F	Pm	17 g	snap	7	Open grass, shrub					

Date	Location	Sex <sup>1)</sup>	Species <sup>2)</sup>	Condition	Trap Type <sup>3)</sup>	Station	Vegetation Cover Type	No Snap Traps	No. Sherman Traps	No. Cameras	No. Havaharts	Notes
		M	Pm	18 g scrotal	snap	8	Open grass, shrub					
		F	Pm	15 g	snap	9	Open grass, shrub					
		F	Pm	33 g nips exposed	snap	11	Open grass, shrub					
		F	Mm	28 g	snap	14	Open grass, shrub					
		M	Pm	20 g scrotal	snap	15	Open grass, shrub					
		M	Mm	28 g	snap	16	Open grass, shrub					
		M	Pm	17 g scrotal	snap	17	Open grass, shrub					
		F	Pm	25 g	snap	18	Open grass, shrub					
		M	Pm	25 g scrotal	snap	19	Open grass, shrub					
		F	Pm	29 g nips exposed	snap	20	Open grass, shrub					
6/4/96	Barnard Creek #1	F	Pm	26 g lact	snap	7	mixed grass apron	30	7	2	4	
		F	Pm	29 g nips exposed	snap	15	mixed grass apron					
		?	Mm	?	snap	19	mixed grass apron					4
		F	Mm	26 g	Sherman	20	mixed grass apron					
		F	Pm	18 g	snap	21	riparian					
		?	Mm	?	snap	23	Open grass, shrub					5
		M	Mm	23 g	snap	25	Open grass, shrub					
	Barnard Creek #2	F	Pm	17 g	snap	10	Open grass, shrub	25	6			
		M	Mm	32 g	Sherman	10	Open grass, shrub					
		M	Pm	13 g juvenile	snap	12	Open grass, shrub					
		F	Pm	26 g	snap	15	riparian					
		M	Pm	22 g scrotal	Sherman	15	riparian					
6/5/96	Sheep Creek #1	M	Pm	25 g	snap	1	open grass, hackberry	10	3	2	4	
		F	Pm	23 g	snap	8	open grass, hackberry					
		F	Pm	27 g nips exposed	snap	9	open grass, hackberry					
	Sheep Creek #2	F	Pm	17 g	snap	2	open, mixed grass	15	4			
		F	Mm	27 g	snap	3	open, mixed grass					
		M	Pm	23 g	Sherman	5	open, mixed grass					
		M	Pm	12 g juvenile	Sherman	15	open, mixed grass					
	Sheep Creek #3	M	Pm	20 g	snap	1	closed mixed grass	15	4			
		M	Mm	18g	snap	2	riparian					

Date	Location	Sex <sup>1)</sup>	Species <sup>2)</sup>	Condition	Trap Type <sup>3)</sup>	Station	Vegetation Cover Type	No Snap Traps	No. Sherman Traps	No. Cameras	No. Havaharts	Notes
		F	Pm	27 g nips exposed	snap	3	riparian					
		F	Pm	18 g	snap	4	riparian					
		M	Pm	20 g	snap	11	closed mixed grass					
		F	Pm	20 g nips exposed	snap	14	closed mixed grass					
6/6/96	Pine Bar #1	M	Pm	23 g scrotal	Sherman	5	open Ponderosa Pine	30	7	2	4	
	Pine Bar #2	M	Pm	23 g	snap	11	open mixed grass	30	7			
		F	Pm	29 g pregnant	snap	12	open mixed grass					
		M	Pm	20 g scrotal	snap	21	open mixed grass					
6/7/96	Upper Salt Creek #1	F	Pm	23 g nips exposed	snap	4	open grass, rock	30	7	2	4	
		F	Pm	18 g	snap	5	open grass, rock					
		F	Pm	16 g	snap	19	open grass, dune					
		M	Pm	12 g juvenile	Sherman	25	open grass, shrub					
	Upper Salt Creek #2	F	Pm	23 g	snap	15	open grass, dune	30	7			
		M	Pm	20 g	snap	16	open grass, dune					
		M	Pm	25 g	snap	29	riparian					
		F	Pm	20 g	Sherman	30	riparian					
7/17/96	Rocky Bar	F	Pm	26 g nips exposed	Sherman	5	open mixed grass, rock	25	6			
7/18/96	Granite Creek (long)	M	Pm	20 g	snap	5	open grass, shrub	55	12	4	4	
		M	Pm	14 g	Sherman	30	open grass, shrub					
7/18/96	Granite Creek (short)	M	Pm	15 g	Sherman	1	open grass, shrub	5	2			
		M	Pm	22 g scrotal	Sherman	5	talus					
7/19/96	Granite Creek (long)	M	Pm	17 g	Sherman	5	open grass, shrub	55	12	4	4	
		M	Pm	17 g	snap	17	open grass, shrub					
		M	Pm	21 g	snap	29	open grass, shrub					
		M	Pm	13 g	snap	31	open grass, shrub					
		M	Nc	258 g	Havahart		closed canopy dry creek					6
7/19/96	Granite Creek (short)	F	Pm	14 g	snap	1	open grass, shrub	5	2			
7/20/96	Rush Creek #1	M	Pm	22 g	Sherman	1	riparian, creek bank	30	7	4	4	
		F	Pm	18 g nips exposed	snap	2	riparian, creek bank					
		M	Pm	18 g	snap	7	riparian, creek bank					
		F	Pm	23 g	snap	9	riparian, creek bank					

Date	Location	Sex <sup>1)</sup>	Species <sup>2)</sup>	Condition	Trap Type <sup>3)</sup>	Station	Vegetation Cover Type	No Snap Traps	No. Sherman Traps	No. Cameras	No. Havaharts	Notes
		?	Nc	250 g	Sherman	10	riparian, creek bank					
		F	Pm	21 g	snap	11	riparian, creek bank					
		F	Pm	18 g	snap	16	riparian, creek bank					
		M	Pm	18 g	snap	17	riparian, creek bank					
		M	Pm	20 g	snap	18	riparian, creek bank					
		F	Pm	24 g	snap	21	riparian, creek bank					
		M	Pm	13 g	snap	22	riparian, creek bank					
		F	Pm	26 g nips exposed	snap	30	riparian, creek bank					
	Rush Creek #2	F	Pm	13 g	snap	20	closed mixed grass, shrub	30	7			
		F	Pm	20 g nips exposed	Sherman	20	closed mixed grass, shrub					
		M	Pm	18 g	snap	23	closed mixed grass, shrub					
		F	Pm	14 g	snap	26	closed mixed grass, shrub					
		F	Pm	13 g	snap	27	closed mixed grass, shrub					
		M	Pm	14 g	snap	29	closed mixed grass, shrub					
		M	Pm	19 g	Sherman	30	closed mixed grass, shrub					
		M	Pm	24 g scrotal	snap	13	closed mixed grass, shrub					
		?	Nc	?	Havahart		closed mixed grass, shrub					8
		F	Pm	17 g	snap	9	closed mixed grass, shrub					
7/21/96	Rush Creek #1	M	Pm	*	snap	4	riparian, creek bank	30	7	4	4	9
		F	Pm	17 g	snap	9	riparian, creek bank					
7/21/96	Rush Creek #2	M	Pm	8 g	snap	16	closed mixed grass, shrub	30	7			10
		M	Pm	21 g	snap	21	closed mixed grass, shrub					
		M	Pm	15 g	snap	23	closed mixed grass, shrub					
		M	Pm	17 g	snap	24	closed mixed grass, shrub					
		F	Pm	9 g	snap	25	closed mixed grass, shrub					
		M	Pm	13 g	snap	27	closed mixed grass, shrub					
		F	Pm	20 g	snap	2	closed mixed grass, shrub					
7/22/96	Salt Creek #1	F	Pm	15 g	snap	4	riparian, creek bank	20	5	4	4	
		F	Pm	21 g	snap	5	riparian, creek bank					
		M	Pm	21 g	snap	8	riparian, creek bank					
		F	Pm	18 g	snap	11	riparian, creek bank					

Date	Location	Sex <sup>1)</sup>	Species <sup>2)</sup>	Condition	Trap Type <sup>3)</sup>	Station	Vegetation Cover Type	No Snap Traps	No. Sherman Traps	No. Cameras	No. Havaharts	Notes
		F	Pm	18 g	snap	18	riparian, creek bank					
		?	Me m	?	Havahart		riparian					11
7/22/96	Salt Creek #2	F	Pm	20 g nips exposed	Sherman	15	open mixed grass	40	10			
		F	Pm	21 g nips exposed	snap	2	open mixed grass					
		F	Pm	20 g	snap	13	open mixed grass					

Notes:

- #1 Trap Station #9 that captured this shrew was located in an extremely lush moist patch of low vegetation which may have been a seep.
- #2 This *Microtus* had most of its head eaten away while in the trap. Also, a portion of its side had also been eaten making it impossible to get a correct weight or sex of the animal.
- #3 This *Peromyscus* had a large fly larvae protruding from the left side of the belly. An accurate weight was not considered possible.
- #4 This *Microtus* was mostly eaten away. A correct weight or sex could not be taken.
- #5 This *Microtus* was mostly eaten away. A correct weight or sex could not be taken.
- #6 *Neotoma cinerea* captured in the Havahart trap that was set at the second wet creek crossing the trail. This was located between bird points 4 and 5. Lots of overhead cover and rock outcroppings.
- #7 Photograph of a bear at very close range. Muzzle is so close to camera that it is out of focus. Picture is of right side of muzzle and head. Granite Creek had a great deal of bear sign including droppings, tracks, and scrapes. Deer tracks were also abundant.
- #8 *Neotoma cinerea* captured in the Havahart trap set at the mouth of Rush Creek just under the trees where Rush Creek enters the Snake River.
- #9 *P. maniculatus* was wet from the creek water and therefore no mass was recorded.
- #10 At least 5 traps were removed from this line over the 2 day period. Rush Creek had many crows frequenting the trees near the trap line. I believe these crows were responsible for the removal of the traps.
- #11 This Havahart was placed at the mouth of Salt Creek just under the trees where it enters the Snake River. An adult skunk, *Mephitis mephitis* was captured in this trap. For obvious reasons the animal was not sexed or weighed. While skunk tracks were seen at other locations (i.e., Cat Gulch) and skunks were smelled numerous times, this was the only individual captured.