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GLCA

**BASELINE SURVEYS FOR MAMMALS
IN FOUR RIPARIAN AREAS IN
GLEN CANYON NATIONAL RECREATION AREA**

FINAL REPORT

Submitted to:

**Glen Canyon National Recreation Area
National Park Service
Post Office Box 1507
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INTRODUCTION

Although various investigators (e.g., Malespin, 1981) have studied mammals in and near Glen Canyon National Recreation Area (GLCA), no comprehensive study of the mammals of this area is available. Kelson (1951) detailed the effects of the Colorado River as a barrier to mammalian distribution and subsequent evolutionary divergence among closely related taxa, and Durrant (1952) provided a statewide summary of mammalian taxonomy and distribution. As part of an environmental study conducted prior to the closure of Glen Canyon Dam, Durrant and Dean (1959) floated the Colorado River and collected mammals from localities that have since been inundated by Lake Powell. Their report remains the only comprehensive list of mammals from the east and west banks of the river in this area. There is no report that details the effects of Lake Powell on mammalian distributions. Hoffmeister (1986), has provided some information on mammals from nearby Arizona and Hall (1981) remains the source of basic information on North American mammals.

Since the early 1980s, biologists from the Fish and Wildlife Service (FWS) and later National Biological Service (NBS) have conducted baseline surveys for mammals on the Colorado Plateau. In 1982 and 1985, biologists from Denver Wildlife Research Center (FWS) conducted studies of small mammals around the periphery of Lake Powell. Their intent was to revisit as many of Durrant and Dean's localities as possible, albeit well above those riverside locations elevationally, and compare the mammal faunas of 1959 and the present. This work remains unfinished to date. Biologists from National Ecology Research Center (FWS) have worked at other parks, including Bryce Canyon, Capitol Reef, Natural Bridges, Arches, and Mesa Verde, and have obtained considerable new information on mammals of southern Utah.

In 1994, biologists from Midcontinent Ecological Science Center (NBS) were asked to accompany National Park Service (NPS) biologists to selected riparian areas at GLCA and obtain information on mammals of those areas. Our goals in 1994 were to: obtain information on current distribution and abundance of mammals in selected riparian areas chosen by NPS; compare these results with those from other areas at GLCA; and provide such information as may be useful to land managers at GLCA regarding status of such riparian areas.

METHODS

During our visit in 1994 we traveled by NPS boats and helicopters and by vehicle. At some sites, where there was sufficient linear habitat, we deployed traps in Calhoun Lines, two parallel lines of 20 stations spaced at intervals of 50 m with three traps per station. These lines provide a more or less standard level of effort on mammals across habitats. We also set traps opportunistically in and near riparian habitats where we saw rodents or their sign, and deployed mist nets (18' and 30' lengths) over small waterholes to capture bats. Opportunistic observations on all mammals were recorded. Voucher specimens are deposited in NBS collections in the Museum of Southwestern Biology (MSB), University of New Mexico; tissues and blood samples (for Hantavirus) from selected specimens also were saved and deposited. Specimens taken as vouchers under permits issued by the Utah Division of Wildlife are reported to the Division in January of each year. We also operated under permits provided by GLCA.

STUDY AREAS AND RESULTS

San Juan Co., Lake Powell, North bank San Juan River, Wilson Creek; 28-30 May 1994.

This site was reached by NPS boat and camp was set up on the rocky shore of the lake southeast of where Wilson Creek enters the lake. To reach the riparian study site, we hiked about 15-20 min overland, north to where we could enter the canyon formed by the creek. The area where we worked appeared to be in the densest stand of riparian vegetation and was just above (north) the waterfall upstream from the lake. The creek was flowing and varied from 1-4 ft wide; further upstream were several small pools (ca. 1-3 ft deep and 6 ft diameter). The riparian vegetation here consisted of large cottonwood trees, willows, cattails and horsetails in the wetter areas, and dense thickets of undergrowth (e.g., clematis) overgrowing downed logs. This was the only area of those we studied in 1994 that resembled a typical forested riparian area. The cottonwoods formed a thin canopy overhead (est. 15-20% canopy cover) and ground cover (mostly leaf litter) was dense. Calhoun lines were deployed in the densest vegetation in the canyon bottom; other traps were set on the side of the canyon in rocky areas thinly covered with small shrubs and Gambel oak. The weather was unseasonably hot during our stay here.

We netted bats over small waterholes in the canyon and captured one Yuma Myotis and one Townsend's Big-eared Bat. Yuma Myotis is relatively common at GLCA and on the Colorado Plateau tends to be associated with permanent sources of water. The Western Big-eared Bat is not common and our capture represented the first record of this species for the park. The paucity of bat captures likely reflects the proximity of our nets to Lake Powell, a source of abundant water and insects. We also captured Hopi Chipmunk, Rock Pocket Mouse, Western Harvest Mouse, Brush Mouse, Canyon Mouse, and Mexican Woodrat. Our capture of the Rock Pocket Mouse here is the first known record of this species on the north side of the San Juan River. They were taken on the rocky hillsides of the canyon. The dominant species in the riparian zone were Brush Mouse and Mexican Woodrat. Both species are denizens of thick brushy cover and their abundance here suggests that this riparian area provides excellent cover for them. We saw a Beaver in the lake and Desert Cottontails on the mesa top. We captured a total of 64 rodents in Wilson Creek, the bulk of those from the dense, productive riparian area.

Kane Co., Glen Canyon NRA, Last Chance Creek; 1-2 June 1994. Our next camp was made by traveling overland by vehicle on the "Warm Creek Road" (Rd. 230) heading north out of Big Water (on Hwy. 89) to the banks of Last Chance Creek. Our odometer recorded 30.3 mi from Big Water to our camp on the north side of the creek, just across the stream from an old gravesite marked "Rogers." This camp, in an arid and sparsely vegetated desert, was riparian only by the stretch of imagination. Vegetation along the creek consisted of only small thinly scattered cottonwoods, willow, and tamarisk; there was some tamarisk on the uplands along with rabbitbrush, blackbrush, snakeweed, saltbush, and Russian thistle. Larger cottonwoods were visible along the creek some distance upstream. The banks of the creek consisted of low rocky cliffs with crevices containing abundant woodrat sign. This site's distance from the waters of Lake Powell provided an opportunity for nearby bats to congregate around the small pools of water in the shallow canyon where we set our mist nets. Our traplines were set generally along

the creek and in the rocky cliffs nearby. Midday temperatures reached 112 F during our stay.

The relative scarcity of water here provided some of the best bat netting we have experienced at Lake Powell, and we obtained the first captures of the Allen's Big-eared Bat ($n = 2$) from GLCA and frequently heard them as they flew overhead at night. We also captured California Myotis (7), Yuma Myotis (1), Western Pipistrelle (6), Townsend's Big-eared Bat (1), and Pallid Bat (12). Most bats were examined and released unharmed. In traps set in and near the creek bottom and adjacent hillsides we trapped Long-tailed Pocket Mouse, Ord's Kangaroo Rat, Western Harvest Mouse, and Deer Mouse. The dominant species were Western Harvest Mouse, taken in grassy areas near the creek bottom, and Deer Mouse, taken in a variety of habitats. Given the abundant, but apparently old, sign we were surprised not to capture any woodrats. They must have been at very low densities at the time of our visit. We heard a coyote one evening, saw tracks of mule deer in the sandy canyon bottom, and collected leg bones of a Beaver along the bank of the creek. Overall, 38 rodents were captured at Last Chance Creek.

San Juan Co., East bank Lake Powell, Ribbon Canyon; 4-6 June 1994. This canyon is the first canyon upstream from Cottonwood Canyon, near Lake Mile 64, and is on the west side of Wilson Mesa and was reached by NPS boat. We set up camp on the sandy shore, with nearly incessant sunshine and little shade; cheatgrass and Russian thistle covered nearby slopes. Most of our work was done further up-canyon, about a 30 min walk from camp. There were small scattered cottonwood trees, many of which had been chewed by beaver, along with willow, tamarisk, and grasses in the canyon bottom. We set traps along the intermittent stream in Ribbon Canyon and in a side canyon below a huge hanging garden (Granddaddy Garden of Dr. Spence). The garden had a dense profusion of ferns and grasses while in the areas nearby were Gambel oak, juniper, and saltbush. A pool below the garden was ringed with reedgrass, sedges, bullrush, and cheatgrass and some small willows were growing nearby.

We netted bats over isolated pools of water in the canyon bottom and captured Fringed Myotis, Yuma Myotis, Pallid Bat, and the first record of the Brazilian Free-tailed Bat. Except for Yuma Myotis, of which we captured two, we obtained only single captures of these species. Again, this low capture rate likely reflects our proximity to the lake. We obtained specimens of Rock Pocket Mouse here also that are distributionally interesting, along with Hopi Chipmunk, Western Harvest Mouse, Brush Mouse, Canyon Mouse, Deer Mouse, and two species of woodrats: Bushy-tailed and Mexican. The riparian habitat here consisted of scattered cottonwood trees, with sufficient grass to provide good habitat for rodents, the most abundant of which was the Brush Mouse. Fewer rodents (29) were captured in Ribbon Canyon than elsewhere at GLCA in 1994.

Kane Co., Glen Canyon NRA, East bank Escalante River, Cow Canyon; 10-13 June 1994. Our final study site, the most isolated of the four, was reached by NPS chartered helicopter after a boat ride to Pollywog Bench. This spot, rarely visited, and then only by hikers, was in the bottom of a steep-walled canyon with isolated pools of water just above a major fork in the canyon; several hanging gardens were within 30 -60 min walk. Vegetation in the canyon included

scattered large cottonwoods, willows, tamarisk, grasses, skunkbush, rabbitbrush, and Gambel oak. The wetter areas had cattail, willow, seep-willow, and thick clumps of grasses (including Indian ricegrass and wheatgrass) below the cottonwoods. Again, as at every camp except Last Chance Creek, beaver had gnawed on cottonwoods and hackberry. Cattle have likely grazed this canyon historically but none were present during our visit and the canyon looked pristine to us. We made camp in the canyon bottom, near scattered large and small cottonwoods and near pools providing fresh water, and worked in the vicinity, including the east fork of the canyon.

We captured Yuma Myotis ($n = 10$, both males and females), Big Brown Bat (first record for the park), Western Pipistrelle (6), Pallid Bat (4), and Brazilian Free-tailed Bat (7) over small pools of water near camp. Bats were almost as abundant here as at Last Chance Creek, perhaps because most of their needs relative to roosting and foraging are met in this large canyon. We also captured Rock Squirrel, Hopi Chipmunk, Great Basin Pocket Mouse, Western Harvest Mouse, Brush Mouse, Canyon Mouse, Deer Mouse, and Desert Woodrat. The Brush Mouse was the most abundant species, reflecting the good cover in the canyon, and outnumbered the Canyon Mouse, more common along the rocky cliffs, two to one. Desert Woodrats were also common on the rocky slopes of the canyon. We picked up an antler of Mule Deer and saw them in the side canyons and near water sources. This was the most productive locality for rodents; we captured 79 individuals at Cow Canyon.

DISCUSSION

Neither our methods nor the time available for work were sufficient to allow sample sizes or rigorous experimental design appropriate for sophisticated statistical analysis. However, our results likely mirror the relative abundances of the species captured at the sites where we worked, and thus provide some insight into the small mammal community in these areas, as well as baseline data against which future work can be compared. Whether more rigorous methods and designs would be appropriate in the future depends on the exact nature of the questions being asked.

Overall, we captured 281 small mammals during our work at GLCA. We added four species of bats (Big Brown Bat, Townsend's Big-eared Bat, Allen's Big-eared Bat, and Brazilian Free-tailed Bat) that had not been recorded previously from GLCA. The most abundant bat species were Yuma Myotis and Pallid Bat; both species are tolerant of arid environments although Yuma Myotis is closely tied to permanent sources of water. As noted previously, the abundance of water in and near Lake Powell makes netting of bats less productive than in areas where water is more restricted. In three trips to GLCA (1982, 1985, 1994) we have netted a total of 88 bats, 64 of those in 1994 when we often worked at a greater distance from the lake proper. Most species of bats not yet recorded from GLCA tend to be species that presumably migrate, and thus are present only for a restricted period of time, or are more common at somewhat higher elevations. We believe that continued netting will result in the capture of additional species of bats.

The most abundant squirrel during our visit was the Hopi Chipmunk, which is adapted to the warm, sunny, sandstone canyons of the Colorado Plateau. Given its predilection for canyons,

it may belong to the list of mammals at the park associated with riparian environments. Among the heteromyid rodents, we captured four of the seven known or suspected species (see Preliminary List of Mammals of GLCA). These rodents are most typical of loose, friable, sandy soils on stabilized banks and were not commonly obtained in the more mesic and rocky areas where most of our traps were set. Of particular note was the first apparent capture of the Rock Pocket Mouse north of the San Juan River, on the east bank of Lake Powell. Inasmuch as we took this species at two localities on Wilson Mesa, we suspect that this mouse has been on the north side of the San Juan River for some time and is not a recent immigrant. Our captures of the Great Basin Pocket Mouse appear to fill a slight distributional gap in the vicinity of Cow Creek.

As is common on the Colorado Plateau, the most abundant rodents were cricetid rodents and the genus *Peromyscus* led the list, accounting for 51% of all rodent captures in 1994. However, in 1994 at GLCA the Brush Mouse was the most abundant species ($n = 61$), rather than the Canyon Mouse ($n = 29$) or Deer Mouse (20; Table 1). In our previous trips to GLCA, we have emphasized habitats other than those where the Brush Mouse is most common and captured correspondingly more individuals of the Canyon Mouse and Deer Mouse. The preponderance of the Brush Mouse in our captures in 1994 reflects the generally brushy nature of areas where we worked. The Canyon Mouse is aptly named and typically occurs in habitat much like that of the Hopi Chipmunk. The Deer Mouse is most common at GLCA in successional areas, areas subject to continued disturbance, and beachside habitats. Our captures in three different years reflect the habitats within which we worked in those years (Table 1).

Table 1. Numbers of three species of *Peromyscus* captured at Glen Canyon NRA during three different years.

Species	1982	1985	1994
<i>P. boylii</i>	38	40	61
<i>P. crinitus</i>	38	280	29
<i>P. maniculatus</i>	215	28	20

When trapping in upland cliff areas away from canyon bottoms we caught Desert Woodrats (12), whereas in the well-vegetated portions of canyon bottoms we trapped Mexican Woodrats (29), which tend to prefer thicker cover. We took one Bushy-tailed Woodrat in Ribbon Canyon at the base of a boulder-strewn rocky ledge. Our emphasis on riparian and canyon bottom situations also produced fair numbers (19) of Western Harvest Mouse, common in more mesic, grassy areas and often underrepresented in rodent captures on the Plateau.

While at GLCA we saved tissues and blood samples from selected animals in liquid nitrogen for possible later analysis and Hantavirus sampling. Preliminary results from Centers for Disease Control in Atlanta reveal that all bats ($n = 9$), chipmunks (8), heteromyids (15), and most cricetid rodents (14 *Neotoma*, 48 *Peromyscus*, 7 *Reithrodontomys*) tested negative for Hantavirus. Only one animal gave a positive response to the test and that was a Western Harvest

Mouse (*Reithrodontomys megalotis*) from Wilson Creek. (NOTE: These results are preliminary at this time. Please do not release these results without contacting Mike Bogan, NBS, Telephone: 505/766-3903).

In most areas, mammals that dwell in riparian habitat are probably not obligate riparian inhabitants. Rather they are inhabitants of woodlands or mesic areas and where such habitat is offered by dendritic riparian strips they tend to occur. In many cases, where there are no wetland or forest mammals to exploit a riparian area, the "riparian" mammals may be mammals from upland and more arid environments that range into the riparian zone or they may be "weed" species that are able to exploit the sometimes variable nature of riparian environments. Examples of woodland and mesic species that tend to be riparian dwellers elsewhere on the Plateau are shrews and voles, not represented in our samples. The only voles in the vicinity of GLCA are known from higher elevations (Mexican Vole: Navajo Mt.; Long-tailed Vole: Henry Mts.). Records of shrews are scarce for lower elevations although we have one record of the Water Shrew from an old oxbow of the Fremont River in CARE.

Beaver are dependent upon water and we saw both sign and individual Beaver while at the park. They likely make their nests in the banks of the river and lake and travel up watercourses where they feed on cottonwood and hackberry; we saw no evidence of attempts to build dams. Muskrat is another water-dependent mammal but we saw no sign of them at GLCA. The Western Harvest Mouse is a riparian dweller on the Plateau, although elsewhere in its range it is a grassland inhabitant. Similarly, the Mexican Woodrat, Brush Mouse, and Mule Deer are at least partly riparian inhabitants at GLCA. That is, at GLCA, the preferred habitat for these species is most commonly found, or restricted to, mesic, canyon-bottom sites. In such areas, the vegetation is sufficiently dense to provide habitat for them.

Our work suggests that at GLCA, riparian areas can be identified from their small mammal fauna by the presence of Western Harvest Mouse, Brush Mouse, Mexican Woodrat, and Beaver sign. In less mesic sites and on the canyon walls, other species such as Hopi Chipmunk, Canyon Mouse, Desert Woodrat, White-tailed Antelope Squirrel, and heteromyid rodents predominate. Although we are not certain that GLCA is an advantageous spot for detailed studies to refine habitat relationships, we suspect that periodic trapping in riparian areas to ascertain the continued presence of Western Harvest Mouse, Brush Mouse, and Mexican Woodrat would provide qualitative data on the continued good health of riparian areas at GLCA. Future trapping in riparian zones at GLCA that failed to produce these species would suggest that these habitats are changing for some reason.

RECOMMENDATIONS

1. Periodic assessment of riparian areas at GLCA should be conducted to monitor evidence of change in such areas. We suspect that the most efficient mode of monitoring would be to conduct vegetation surveys, which the park is equipped to do. Periodic trapping of small mammals also can be done but poses certain methodological problems (see below).
2. There are no extant Threatened or Endangered species of mammals at GLCA. However, there are several Candidate Category 2 (but no Category 1) species of mammals that occur near or at GLCA (see Preliminary List of Mammals). Most of these Candidate Species are not riparian inhabitants. Bats, however, are dependent upon pools of water in isolated areas away from the lake, as at Cow Canyon and Last Chance Creek. We think the presence of such water resources and their condition should be evaluated as a part of riparian monitoring.
3. At GLCA, Beaver are riparian dwellers and at the time of our visit were feeding on and felling cottonwoods and some hackberries. We do not have sufficient information to suggest a management plan for Beaver at GLCA, nor do we even know if one is necessary. However, as a part of a routine riparian monitoring plan, it might be desirable to note the numbers and kinds of riparian trees affected by Beaver so that trends in levels of activity could be established. We prefer to think that current levels simply represent a natural process but no data exist to support this hypothesis.
4. Populations of mammals tend to respond to climatic conditions and other environmental changes and may demonstrate considerable variation in numbers and species composition over time. Only a long-term trapping program is sufficient to explain annual or cyclical fluctuations, and even then unexplained variation may be present. Such long-term trapping (using live traps on grids or webs) is probably not an efficient use of personnel at GLCA. Nonetheless, we foresee that the park will occasionally want information on mammals in specific sites. In the case of riparian habitats at GLCA, their linear nature poses certain methodological problems in study design for small mammals. For this and for economic reasons we suggest that if park staff is interested in monitoring mammals, they consider the use of a "Calhoun-type" design that standardizes effort and requires no great amount of expertise to deploy. Even then, assistance in species identification may be needed. Precautions to protect against zoonotic agents (e.g., Hantavirus) also should be used.

LITERATURE CITED

- Durrant, S. D. 1952. Mammals of Utah. Univ. Kansas Publ.Mus. Nat. Hist., 6:1-549.
- Durrant, S. D. and N. K. Dean. 1959. Mammals of Glen Canyon. Univ. Utah Anthro. Papers, 40:73-106.
- Hall, E. R. 1981. The mammals of North America. Wiley & Sons, New York, 1181 p.
- Hoffmeister, D. F. 1986. Mammals of Arizona. Univ. Arizona Press and Arizona Game and Fish Dept., 602 p.
- Kelson, K. R. 1951. Speciation in rodents of the Colorado River drainage. Univ. Utah Biolog. Ser., 11 (3):1-125.
- Malespin, M. G. 1981. A baseline study of the rodents of Antelope Island. Unpubl. M. S. Thesis, Utah State Univ., Logan, 90 p.

Preliminary List of the Mammals of Glen Canyon National Recreation Area

This listing of species is based on the proximity of known ranges to GCNRA, historical accounts, specimens collected, and literature records. Species believed to be extirpated are indicated by a (+), those of questionable occurrence by a (?). Pertinent records are in parentheses. Species captured by FWS/NBS are noted by the year of capture. Category 2 Candidate Species (FWS) are noted as C2.

INSECTIVORA

✓ *Sorex cinereus* ?

S. merriami ?

S. monticolus ?

S. nanus ?

S. palustris ?

✓ *Notiosorex crawfordi* (Hoddenbach, 1978; 3.4 km NE The Post)

CHIROPTERA

✓ *Myotis californicus* 82, 94

✓ *M. ciliolabrum* (Durrant and Dean, 1959) (C2)

✓ *M. evotis* (Henry Mts.) (C2)

✓ *M. lucifugus* ?

✓ *M. thysanodes* 82, 94 (C2)

✓ *M. volans* (Henry Mts.) (C2)

✓ *M. yumanensis* 82, 85, 94 (C2)

✓ *Lasionycteris noctivagans* (Henry Mts.) ✓

✓ *Lasiurus blossevillei* ?

✓ *L. cinereus* (Henry Mts.)

✓ *Pipistrellus hesperus* 82, 85, 94

✓ *Eptesicus fuscus* 94

✓ *Euderma maculatum* (CARE) (C2)

✓ *Plecotus townsendii* 94 (C2)

✓ *Idionycteris phyllotis* 94 (C2) ✓

✓ *Antrozous pallidus* 82, 94

✓ *Tadarida brasiliensis* 94

✓ *Nyctinomops macrotis* (NABR) (C2)

LAGOMORPHA

✓ *Sylvilagus audubonii* 82, 85, 94 (observed)

✓ *Lepus californicus* 82

RODENTIA

✓ *Eutamias dorsalis* (Henry Mts.)

✓ *E. quadrivittatus* (= *hopiensis*) 82, 85, 94

✓ *Ammospermophilus leucurus* 82, 85

✓ *Spermophilus spilosoma* (Navajo Mt.)

✓ *S. variegatus* 85, 94

✓ *Thomomys bottae* (Durrant and Dean saw no sign but examined one skull from the Escalante R. area)

✓ *Chaetodipus intermedius* 82, 85, 94

✓ *C. formosus* 82, 94

✓ *Perognathus flavescens* 85

✓ =
on GLCA
mammal list
for visitors
add others
to NP Spec.

questionable

Tamias dorsalis in (1715) (no sign)
" *quadrivittatus* " " " " " " " " " " " "

✓ *P. flavus* (Navajo Mt.)

✓ *P. longimembris* 82

✓ *P. parvus* 82, 85, 94

add note ✓ *Dipodomys microps leucotis* (C2; not surely known from GLCA, AZ?)

✓ *D. ordii* 82, 85, 94

✓ *Castor canadensis* 94 (and observed)

✓ *Reithrodontomys megalotis* 82, 85, 94

✓ *Peromyscus boylii* 82, 85, 94

✓ *P. crinitus* 82, 85, 94

✓ *P. maniculatus* 82, 85, 94

✓ *P. truei* 85

✓ *Onychomys leucogaster* 82, 85

✓ *Neotoma albigula* 82, 85

✓ *N. cinerea* 82, 85, 94

✓ *N. lepida* 82, 85, 94

✓ *N. mexicana* 82, 85, 94

add note ✓ *N. stephensi* (Navajo Mt.)

" ✓ *Microtus longicaudus* (Henry Mts.)

" ✓ *M. mexicanus* (Navajo Mt.) (C2)

add note → ✓ *Ondatra zibethicus* (Durrant and Dean question occurrence of this species)

✓ *Erethizon dorsatum* (Durrant and Dean, 1959, sign)

CARNIVORA

✓ *Canis latrans* 85

add - ext? ✓ *C. lupus* ⊕

✓ *Vulpes vulpes* (Durrant and Dean, 1959, observed)

✓ *Urocyon cinereoargenteus* (Navajo Mt.)

✓ *Ursus americanus*

" ✓ *U. arctos* ⊕

✓ *Bassariscus astutus* (Durrant and Dean, 1959, sign)

✓ *Procyon lotor* ? raccoon

✓ *M. frenata* (Navajo Mt.) *Mustela*

add - ✓ *M. vison*

✓ *Taxidea taxus* (Durrant and Dean, 1959)

✓ *Spilogale gracilis* (Navajo Mt.)

✓ *Mephitis mephitis*

add note ✓ *Lutra canadensis* (Durrant and Dean question occurrence of this species)

✓ *Felis concolor*

✓ *Lynx rufus* (Navajo Mt.)

ARTIODACTYLA

✓ *Odocoileus hemionus* 94

✓ *Antilocapra americana* ⊕

add note ✓ *Bison bison* ⊕ (re-introduced to Henry Mts.) - on park list, handwritten "hypothetical"

✓ *Ovis canadensis*

**1994 Capture Summary for
Glen Canyon National Recreation Area (GLCA)**

MAMMALS

**Utah: San Juan Co., Lake Powell, N bank San Juan River,
Wilson Creek**

28-30 May 1994

1 *Myotis yumanensis yumanensis*
1 *Plecotus townsendii pallescens*
2 *Eutamias quadrivittatus hopiensis*
2 *Chaetodipus intermedius crinitus*
2 *Reithrodontomys megalotis megalotis*
18 *Peromyscus boylii rowleyi*
2 *P. cf. boylii*
10 *P. crinitus auripectus*
28 *Neotoma mexicana inopinata*
66

Utah: Kane Co., GLCA, Last Chance Creek

1-2 June 1994

1 *Idionycteris phyllotis*
2 *Myotis californicus stephensi*
1 *M. yumanensis yumanensis*
2 *Pipistrellus hesperus hesperus*
1 *Plecotus townsendii pallescens*
4 *Antrozous pallidus pallidus*
5 *Chaetodipus formosus domisaxensis*
6 *Dipodomys ordii cupidensis*
1 *Castor canadensis repentinus*
11 *Reithrodontomys megalotis megalotis*
16 *Peromyscus maniculatus sonoriensis*
50

Utah: San Juan Co., E bank Lake Powell, Ribbon Canyon

4-6 June 1994

1 *Myotis thysanodes thysanodes*
2 *M. yumanensis yumanensis*
1 *Antrozous pallidus pallidus*
1 *Tadarida brasiliensis mexicana*
3 *Chaetodipus intermedius crinitus*

6 *Eutamias quadrivittatus hopiensis*
 1 *Reithrodontomys megalotis megalotis*
 11 *Peromyscus boylii rowleyi*
 3 *P. crinitus auripectus*
 2 *P. maniculatus sonoriensis*
 1 *Neotoma cinerea arizonae*
 1 *N. mexicana inopinata*
1 *N. cf. mexicana*
 34

Utah: Kane Co., GLCA, E bank Escalante River, Cow Canyon

10-13 June 1994

1 *Eptesicus fuscus pallidus*
 3 *Myotis yumanensis yumanensis*
 1 *Pipistrellus hesperus hesperus*
 1 *Tadarida brasiliensis mexicana*
 6 *Eutamias quadrivittatus hopiensis*
 1 *Spermophilus variegatus utah*
 4 *Perognathus parvus trumbullensis*
 5 *Reithrodontomys megalotis megalotis*
 32 *Peromyscus boylii utahensis*
 16 *P. crinitus doutti*
 2 *P. maniculatus sonoriensis*
 12 *Neotoma lepida sanrafaeli*
1 *Odocoileus hemionus hemionus*
 85

Identifications provided above should be considered tentative pending cleaning of skulls and final examination. Specimens are housed in the National Biological Service's vertebrate collection in the Museum of Southwestern Biology, University of New Mexico, Albuquerque, NM 87131. Questions about specimens should be directed to Cindy Ramotnik, Collections Manager (505/766-3903).

**BASELINE SURVEYS FOR MAMMALS AT
NATURAL BRIDGES NATIONAL MONUMENT
UTAH**

Annual Report

**Submitted to:
National Park Service
Rocky Mountain Regional Office
12795 West Alameda
Denver, Colorado 80225**

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7 February 1995

Introduction

This was our second summer of expanded efforts of baseline surveys of mammals and our fourth season of sampling bats at NABR. In 1993, our efforts to survey rodents were suspended due to the outbreak of the zoonotic respiratory disease caused by Hantavirus. Suitably attired with HEPA-cartridges and respirators, we returned to NABR in 1994 to resume our survey work. Four biologists from the Midcontinent Ecological Science Center, National Biological Service, travelled to NABR on 27 June. We worked steadily for nine nights and completed our work on 7 July.

Objectives.--We continued to net bats at all suitable localities (wherever pools of water were present), and particularly in pools beneath each Bridge, to monitor the rich bat fauna of NABR. We surveyed new areas for rodents and revisited former collecting localities to monitor year-to-year variation of mammals. We made particular attempts to revisit sites studied by Nix (1977. Mammals of Natural Bridges National Monument, Utah. Final Report to NPS), who conducted mammal surveys at NABR in 1976, in an effort to verify some of the species reported by him but for which we had no record. For example, Nix captured three White-throated Woodrats and large numbers of the Least Chipmunk yet we had taken none to date during our survey work.

Methods

We netted bats over pools of water in the canyon bottoms and at the Sewage Disposal pond at NABR. In addition, we returned to a site in Kane Gulch on BLM land south of NABR that we netted in 1993. Nets were set up and opened by dusk and tended until about midnight. At the Sewage Disposal pond and in Kane Gulch we took the nets down before departing for the night. We remained with the nets set in the canyon bottoms and were able to check them through the night. Most bats captured were released unharmed; we saved voucher specimens of new species or localities.

Most small ground-foraging rodents were sampled with snap traps (Museum Specials and Victor-type rat traps), and Sherman live-traps. We recorded sightings of larger mammals. Voucher specimens were saved and deposited in the NBS collections in the Museum of Southwestern Biology (MSB), University of New Mexico; tissues and blood samples (for Hantavirus) from selected specimens also were saved and deposited. Specimens taken as vouchers under permits issued by the Utah Division of Wildlife are reported to the Division in January of each year. We also operated under permits provided by NABR.

Results

Precipitation at NABR was below average in 1994 and it was dry during our visit. While this potentially reduces the number of pools (and water) available to bats, it also concentrates them at the remaining pools. We netted two pools in Armstrong Canyon near Owachomo Bridge on 28 and 29 June 1994 and captured and released a total of 32 bats representing 10 species. We netted here in July of 1991, 1992, and 1993 and took fewer bats of the same species; however, this was the first time we netted Long-eared Myotis and Fringed Myotis at this locality. Also of interest is

the capture of a solitary male Silver-haired Bat, a presumed tree-roosting migratory species. We netted this bat in mid-May (1993) and late June (1994) but have not taken them in mid-July (1991 and 1992). We suspect they are thinly scattered throughout this area during the summer.

We netted several pools and a flyway in White Canyon near Kachina Bridge on 2 and 3 July. Bat activity was high; we captured 37 bats of eight species. Particularly noteworthy was the capture of a Spotted Bat which represents the first record of this bat for NABR. This species is known from several localities in southern Utah. Visits in 1992 and 1993 to Kachina Bridge yielded 7 species of bats (Long-eared Myotis, Yuma Myotis, Silver-haired Bat, Big Brown Bat, Western Pipistrelle, Pallid Bat, and Mexican Free-tailed Bat); this year we added California Myotis, Allen's Big-eared Bat, Townsend's Big-eared Bat, and Spotted Bat. The capture of Allen's Big-eared Bat represents only the second record for NABR, although they seem to be common at times and we have heard their audible echolocation cries without capturing them. We netted a solitary California Myotis from the Sewage Disposal pond on 5 July. We hypothesize that the low activity is due to the occurrence of preferred water sources elsewhere that are closer to roosting sites.

We visited Kane Gulch on 4 July and netted over several pools upstream from the Ranger Station, as we did in 1993. Bat activity was high, as were water levels. We captured 32 bats of 7 species. The Big Brown Bat was captured most frequently and it seems likely that there is a roost nearby. In 1993, in May, we captured 16 bats of 5 species. Not taken last year, but taken in 1994, were the California Myotis, Long-legged Myotis, Western Small-footed Myotis, and Western Pipistrelle. With the capture of the Western Small-footed Myotis and Spotted Bat, we have now confirmed the presence of 15 bat species at, or near, NABR. Only three species (Little Brown Bat, Hoary Bat, Red Bat), of those possible in this vicinity, remain unconfirmed. The Hoary Bat undoubtedly migrates through the park in spring and fall and males may be resident in the nearby mountains. Of the other two species, the Little Brown Bat may occur but the Western Red Bat is unlikely to be present. Our netting on the Plateau has yielded no captures of this species.

We were unable to capture Western Harvest Mouse and Long-tailed Vole at additional localities. Previously we took one Western Harvest Mouse from the bottom of Owachomo Canyon and despite returning to the same locality in 1994, we took none. Similarly, we revisited our 1992 capture site of Long-tailed Vole, along a sandy bank in White Canyon, north of Kachina Bridge, and captured none this year. Both these species are grassland inhabitants and might be expected to be uncommon in marginal habitats during dry years. At NABR they occur only in the more mesic canyon bottoms and then perhaps only in good years. The below average precipitation at NABR in 1994 also may have had a direct impact on food resources of these animals as well (harvest mice, insects and seeds; voles, grasses).

We revisited 3 localities of Nix (1977) where he captured White-throated Woodrats and large numbers of Least Chipmunks. While we were unable to confirm their presence at these specific localities, we did take 4 White-throated Woodrats at 4 other localities (including another site of Nix where he obtained no woodrats). At one site where Nix captured large numbers of Least Chipmunks, one of us observed a small, dark chipmunk in the vicinity but we were unable to capture any for identification. The only chipmunk we have recorded from NABR is the Hopi Chipmunk which is abundant and widespread. The Least chipmunk may be present at NABR but

because of its predilection for more mesic, less rocky habitats than those favored by the Hopi Chipmunk, it must be less common, at least at present. It seems unlikely that Nix would have confused the two species as they are quite distinct in this area. We were also able to verify the presence of White-tailed Antelope Squirrel near the park; we observed one in the piñon-juniper mesa top just off the Monument's East boundary. Nix observed one in 1976 but the specific locality is unknown.

One of the more exciting localities we worked, also examined by Nix, was along a mesa top across (SW) from Owachomo Bridge, near an old Ranger Station. Of the four species taken by Nix in 1976 (Ord's Kangaroo Rat, Least Chipmunk, the Deer Mouse and Piñon Mouse), we took all but the Least Chipmunk. In addition, we added seven species: the Desert Cottontail; Bushy-tailed, Desert, and Mexican Woodrats, Brush Mouse, Canyon Mouse, and Plains Pocket Mouse. The pocket mouse is especially noteworthy because it is the first specimen for NABR. The closest locality record is John's Canyon, along the San Juan River.

We returned to sites in the canyon bottom near the three bridges and broadened our survey area further from the bridges. In one site, approximately 0.4 mi from Owachomo Bridge in Armstrong Canyon, we captured the Brush Mouse, Canyon Mouse, and Deer Mouse. Mule deer were observed in the canyon bottom near Kachina and Owachomo bridges. We sampled additional mesa top sites in 1994, including the Sipapu Bridge trailhead, the nearby mesa top trail, and our campsite, just east of the Monument's eastern boundary. We took the Hopi Chipmunk, Mexican and White-throated Woodrat, Brush Mouse, Canyon Mouse, Deer Mouse, and Piñon Mouse.

We ventured to the far western edge of NABR, along the North side of US Hwy 95, to survey an area we had not previously sampled. This locality was typical mesa top habitat: we took the Hopi Chipmunk, White-throated and Mexican Woodrats, Canyon Mouse, and large numbers of the Piñon Mouse.

Comments and Summary

During our visit we saved tissues of 103 animals for testing for Hantavirus. Testing was performed by Centers for Disease Control (CDC) in Atlanta. The animals tested included 1 Townsend's Big-eared Bat, 2 Desert Cottontails, 11 Hopi Chipmunks, 1 Ord's Kangaroo Rat, 1 Plains Pocket Mouse, 31 Brush Mice, 13 Canyon Mice, 13 Deer Mice, 14 Piñon Mice, 3 White-throated Woodrats, 2 Bushy-tailed Woodrats, and 11 Mexican Woodrats. Of this total, only one Deer Mouse gave a positive response to the test for Hantavirus. Although considerably more is known about western Hantaviruses now than in 1993, we encourage park staff to continue to follow guidelines published by CDC and NPS to reduce exposure to Hantavirus. (Note: These results are preliminary at this time and should not be released without first contacting Mike Bogan at 505/766-3903).

Several species of bats were given Category 2 Candidate Species Status ("Taxa for which information now in the possession of the Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which persuasive data on biological vulnerability and threat are not currently available to support proposed rules") by the Fish and Wildlife Service late

in 1994 (Federal Register, Vol.59: 58982-59028). This listing includes the following species at NABR: Western Small-footed Myotis, Fringed Myotis, Long-eared Myotis, Long-legged Myotis, Yuma Myotis, Allen's Big-eared Bat, Townsend's Big-eared Bat, and Big Free-tailed Bat. My understanding is that these bats were listed on request of individuals who were concerned about bats threatened by abandoned mine closures. In general, there are no known data supporting population declines in these species with the exception of Townsend's Big-eared Bat. The status of this species is of increasing concern in the West and an effort is underway to collate information on this species. We continue to net good numbers of most of these species at NABR but will maintain our policy of capture and release for these species except for new records. Closure of abandoned mines should not be done until mines have been checked for significant concentrations of roosting bats.

Work on mammals from NABR now will focus on final specimen identification and data analysis preliminary to report writing. Among groups of mammals at NABR, we have been unsuccessful in obtaining shrews, extremely successful in sampling the bat fauna, and moderately successful with rodents. Many rodents on our Preliminary List of Mammals probably do not occur at NABR, especially several species in the squirrel family. Tree squirrels are probably restricted to higher elevations in this area and prairie dogs and some ground squirrels may never have occurred in the rocky areas of NABR. Our continuing inability to see or capture Least Chipmunks is puzzling. Perhaps Nix's visit was made at a time of wet years when this species was more common. We have confirmed the presence of most other species of small rodents. Nix (1977) provides some information on carnivores unseen by us. Staff at the park should be encouraged to record observations of mammals, especially carnivores and ungulates.

82

Preliminary List of the Mammals of Natural Bridges National Monument

This listing of species is based on the proximity of known ranges to NABR, historical accounts, and museum and literature records. Species captured by NBS are noted by the year of capture. Species believed to be extirpated are indicated by a (+), those of questionable occurrence by a (?). Category 2 Candidate Species (FWS) are noted as (C2).

INSECTIVORA

Sorex merriami (Known from Elk Ridge)
S. monticolus (Known from Abajo Mts.)
S. nanus (Known from Elk Ridge)
S. palustris (Known from Abajo Mts.)
Notiosorex crawfordi ?

CHIROPTERA

Myotis californicus 91, 92, 93, 94
M. ciliolabrum Kane Gulch, 94 (C2)
M. evotis 91, 92, 93, 94 (C2)
M. lucifugus
M. volans 91, 92, 94 (C2)
M. thysanodes 92, 94 (C2)
M. yumanensis 91, 92, 93, 94 (C2)
Lasionycteris noctivagans 93, 94
Lasiurus blossevillii ?
L. cinereus
Pipistrellus hesperus 91, 92, 93, 94
Eptesicus fuscus 91, 92, 93, 94
Euderma maculatum 94 (C2)
Plecotus townsendii 91, 92, 94 (C2)
Idionycteris phyllotis 91, 92, 94 (C2)
Antrozous pallidus 91, 92, 94
Tadarida brasiliensis 91, 92, 93, 94
Nyctinomops macrotis 92, 94 (C2)

LAGOMORPHA

Sylvilagus audubonii 92, 94
S. nuttallii ?
L. californicus observed, 92; 94

RODENTIA

Eutamias minimus (Nix, 1977)
E. quadrivittatus [= *hopiensis*] 92, 94
Marmota flaviventris (Known from LaSal Mts.)
Ammospermophilus leucurus observed off-park, 94
Spermophilus spilosoma (Known from Navajo Mt., Monticello)
S. variegatus observed, 92, 94
Cynomys gunnisoni (Known from near Blanding)
Sciurus aberti (Known from Kigala Ranger Station, Elk Ridge)
Tamiasciurus hudsonicus (Known from Abajo Mts.)

Thomomys bottae
T. talpoides (Known from Abajo Mts.)
Perognathus flavescens 94
P. flavus ?
Dipodomys ordii 92, 94
Castor canadensis
Reithrodontomys megalotis 92
Peromyscus boylii 92, 94
P. crinitus 92, 94
P. maniculatus 92, 94
P. truei 92, 94
Onychomys leucogaster
Neotoma albigula 94
N. cinerea 92, 94
N. mexicana 92, 94
Microtus longicaudus 92
M. montanus (known from Abajo Mts.)
Ondatra zibethicus ?
Erethizon dorsatum (Nix, 1977)

CARNIVORA

Canis latrans observed, 92
C. lupus +
Vulpes vulpes (Nix, 1977)
Urocyon cinereoargenteus (Known from near Monticello)
Ursus americanus (Known from Abajo Mts.)
U. arctos +
Bassariscus astutus
Procyon lotor
Mustela erminea (Known from Abajo Mts.)
M. frenata
M. nigripes + (Known from near Blanding)
Taxidea taxus (Nix, 1977)
Spilogale gracilis (Nix, 1977)
Mephitis mephitis (Nix, 1977)
Felis concolor (Nix, 1977)
Lynx rufus (Nix, 1977)

ARTIODACTYLA

Cervus elaphus
Odocoileus hemionus observed, 92, 94
Antilocapra americana +?
Bison bison +
Ovis canadensis

1994 Capture Summary for
Natural Bridges National Monument (NABR)

MAMMALS

Utah: San Juan Co., NABR, Armstrong Canyon,
0.25 mi SSE Owachomo Bridge

28 June 1994

8 *Peromyscus boylii rowleyi*
1 *Neotoma albigula laplatensis*
9

Utah: San Juan Co., NABR, Armstrong Canyon,
0.25 mi ESE Owachomo Bridge

29 June 1994

1 *Neotoma mexicana inopinata*
1 *Peromyscus boylii rowleyi*
1 *P. crinitus auripectus*
2 *P. maniculatus rufinus*
5

Utah: San Juan Co., NABR, Tuwa Canyon,
0.2 mi ESE Owachomo Bridge

29 June 1994

1 *Myotis thysanodes thysanodes*
4 *Peromyscus boylii rowleyi*
5

Utah: San Juan Co., NABR, 0.2 mi SW Owachomo Bridge

30 June 1994
6 July 1994

1 *Sylvilagus audubonii cedrophilus*
7 *Eutamias quadrivittatus hopiensis*
1 *Perognathus flavescens caryi*
1 *Dipodomys ordii nexilis*
1 *Neotoma albigula laplatensis*
2 *Neotoma cinerea arizonae*
1 *N. mexicana inopinata*
1 *Peromyscus boylii rowleyi*
2 *P. crinitus auripectus*
2 *P. maniculatus rufinus*
10 *P. truei truei*
29

Utah: San Juan Co., NABR, Armstrong Canyon,
0.35 mi NW Owachomo Bridge

30 June 1994

3 *Peromyscus boylii rowleyi*
3 *P. crinitus auripectus*
2 *P. maniculatus rufinus*
8

Utah: San Juan Co., NABR, Tuwa Canyon,
0.3 mi ENE Owachomo Bridge

30 June 1994

4 *Neotoma mexicana inopinata*
4 *Peromyscus boylii rowleyi*
2 *P. crinitus auripectus*
1 *P. truei truei*
11

Utah: San Juan Co., NABR, 0.75 mi SW Kachina Bridge,
N of Hwy 95

1-2 July 1994

4 *Eutamias quadrivittatus hopiensis*
1 *Neotoma albigula laplatensis*
2 *N. mexicana inopinata*
1 *Peromyscus crinitus auripectus*
12 *P. truei truei*
20

Utah: San Juan Co., NABR, 1.7 mi SE Visitor Center

1, 5 July 1994

1 *Eutamias quadrivittatus hopiensis*
1 *Neotoma mexicana inopinata*
3 *Peromyscus maniculatus rufinus*
15 *P. truei truei*
20

Utah: San Juan Co., NABR, Kachina Bridge

2-4 July 1994

1 *Euderma maculatum*
10 *Peromyscus boylii rowleyi*
11

~~Utah: San Juan Co., NABR, White Canyon, 0.25 mi N Kachina Bridge~~ ~~2 July 1994~~

~~1 *Neotoma mexicana inopinata*~~
~~10 *Peromyscus boylii rowleyi*~~
~~11~~

Utah: San Juan Co., NABR, Armstrong Canyon,
0.25 mi S Kachina Bridge

2 July 1994

1 *Plecotus townsendii pallescens*

Utah: San Juan Co., NABR, Kachina Bridge trailhead

3 July 1994

5 *Eutamias quadrivittatus hopiensis*
3 *Peromyscus crinitus auripectus*
3 *P. maniculatus rufinus*
6 *P. truei truei*
17

Utah: San Juan Co., Kane Gulch
6 mi S, 6.1 mi E NABR Visitor Center

4 July 1994

1 *Myotis cf. ciliolabrum*
1 *M. cf. evotis*
2

Utah: San Juan Co., NABR, Sipapu Bridge trailhead
mesa top trail

5 July 1994

2 *Eutamias quadrivittatus hopiensis*
1 *Neotoma albigula laplatensis*
3 *Peromyscus truei truei*
6

Utah: San Juan Co., NABR, Sipapu Bridge trailhead

5 July 1994

5 Eutamias quadrivittatus hopiensis
2 Peromyscus boylii rowleyi
1 P. crinitus auripectus
4 P. maniculatus rufinus
1 P. truei truei
13

Utah: San Juan Co., NABR, 0.3 mi SW Owachomo Bridge

6 July 1994

1 Sylvilagus audubonii cedrophilus
9 Peromyscus truei truei
10

Utah: San Juan Co., NABR, 0.75 mi S Owachomo Bridge

6 July 1994

3 Eutamias quadrivittatus hopiensis
13 Peromyscus truei truei
16

Utah: San Juan Co., 4.1 mi SE NABR Visitor Center
6 mi (by rd) E jct Hwy 95 & 276 along Hwy 95

7 July 1994

1 Lepus californicus texianus
