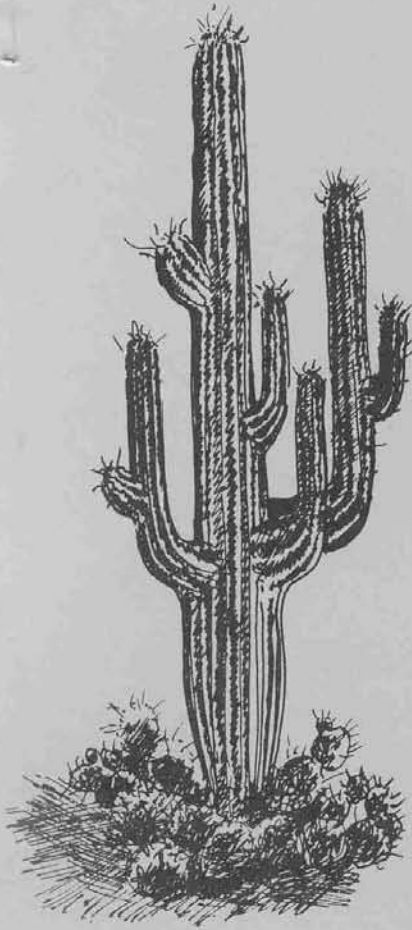




Cooperative National Park Resources Studies Unit

ARIZONA



University of Arizona
Tucson, Arizona 85721

Western Region
National Park Service
Department of the Interior
San Francisco, Ca. 94102

COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT

University of Arizona/Tucson - National Park Service

The Cooperative National Park Resources Studies Unit/University of Arizona (CPSU/UA) was established August 16, 1973. The unit is funded by the National Park Service and reports to the Western Regional Office, San Francisco; it is located on the campus of the University of Arizona and reports also to the Office of the Vice-President for Research. Administrative assistance is provided by the Western Archeological and Conservation Center, the School of Renewable Natural Resources, and the Department of Ecology and Evolutionary Biology. The unit's professional personnel hold adjunct faculty and/or research associate appointments with the University. The Materials and Ecological Testing Laboratory is maintained at the Western Archeological and Conservation Center, 1415 N. 6th Ave., Tucson, Arizona 85705.

The CPSU/UA provides a multidisciplinary approach to studies in the natural and cultural sciences. Funded projects identified by park management are investigated by National Park Service and university researchers under the coordination of the Unit Leader. Unit members also cooperate with researchers involved in projects funded by non-National Park Service sources in order to obtain scientific information on Park Service lands.



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COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT
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TECHNICAL REPORT NO. 2
SURVEY OF THE VERTEBRATE FAUNA
FORT BOWIE NATIONAL HISTORIC SITE

NATIONAL PARK SERVICE/UNIVERSITY OF ARIZONA

Purchase Order No. PX 8100-6-0031

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Warren F. Steenbergh, Acting Unit Leader
National Park Service Research Scientist

COOPERATIVE NATIONAL PARK
RESOURCES STUDIES UNIT

National Park Service - Department of the Interior
University of Arizona

The National Park Service and the University of Arizona, Tucson, Arizona, signed a Master Memorandum of Understanding on August 16, 1973 that provided for the establishment and operation of this Unit. The Unit, although located in the Department of Ecology and Evolutionary Biology, is geared to provide a multidisciplinary approach that utilizes all talents on the University Campus to natural resources studies in areas administered by the National Park Service. Primary attention is directed to the park areas within the Southern Arizona Group.

Through the direction and coordination of the Unit Leader, projects are undertaken in these areas that are designed to provide scientific facts upon which the park managers may make appropriate decisions and formulate and implement effective management action plans. Through close association with faculty members and through guidance of graduate students, a greater awareness of problems and needs of the Service are recognized and academic interests are channelized to participate with the National Park Service in studies of mutual interest and concern.

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SURVEY OF THE VERTEBRATE FAUNA
OF
FORT BOWIE NATIONAL HISTORIC SITE,
ARIZONA

E. Lendell Cockrum, Stephen M. Russell, Charles H. Lowe Chief
Investigators

University of Arizona Project No. 5010-2849-02,

Sponsored by U.S. Department of Interior
National Park Service

Final Project Report, Presented to
Cooperative National Park Resources Studies Unit
University of Arizona
Tucson, Arizona 85721

29 October 1976

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PX8100 600 31

ABSTRACT

Final Project Report, Survey of Vertebrate Fauna of Fort Bowie National Historic Site, Arizona University of Arizona Project No. 5010 - 2849 -02, Sponsored by U. S. Department of Interior, National Park Service, 29 October, 1976.

An intensive field survey of vertebrate animal-species was conducted on the Fort Bowie National Historic Site during the period September 1975October 1976. The data reported were obtained by standard field methods employed by a team of vertebrate ecologists, and from existing records provided by National Park Service personnel resident on the historic site. The habitats on the 970-acre park are desert grassland, oak-juniper savanna, riparian woodland and scrub, and the modified fort ruins areas.

The research provides (1) an annotated inventory of the vertebrate species on the historic site, (2) their habitat preferences, given generally terms of major biotic communities, (3) estimates of relative abundance, (4) notations on seasonal fluctuations in numbers, and (5) some comments and recommendations regarding management.

Data are presented primarily in annotated accounts of species and in appropriate summarizing tables. A total of 9 species of amphibians, 37 species of reptiles, 65 species of mammals, and 157 species of birds are treated. Some of the species are noted as "hypothetical in occurrence" on site; i.e., while they were not observed there during the relatively short period of survey study or before, their occurrence on site may be expected for several reasons that are discussed. Mammal species that are no longer in the general area of the historic site are also noted.

Budgetary and other limitations in the study are discussed. Some remaining faunal questions are noted. Further work during the summer of 1977 is indicated for the clarification of the status of certain species on site--correct identification, presence, abundance, absence, to be determined.

Further modifications on-site that could enhance visitor use in areas already modified are not viewed by the authors as necessarily detrimental. On the other hand, creating new access (trails, roads) to areas yet unmodified on this small park area is definitely not recommended.

NATURAL SCIENCE RESEARCH PROJECT:
SURVEY OF THE VERTEBRATE FAUNA OF
FORT BOWIE NATIONAL HISTORIC SITE

This final report is presented in three parts,
representing the results and conclusions for each of the major
vertebrate groups.

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A Survey of the Mammals of the
Fort Bowie National Historical Site

by

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Tucson

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1. Introduction

The mammalian fauna of the Fort Bowie National Historical Site is characteristic of much of the ecotonal zone (between the upper desert grasslands and the oak zones) in southeastern Arizona. One characteristic of this zone is the great diversity of species that exists within a small area. The following chart shows that more kinds of mammals are in the small area of Fort Bowie than are to be found in all of Maine or Florida. The diversity is especially evident in the bats (which, in general, feed over and do not reside on the site proper) and among the rodents.

	Area (km ²)	Number of Rodents	Number of Families	Number of Genera	Number of Species
Fort Bowie	3.9	6	16	32	47
Fort Bowie*	3.9	6	18	41	65
Florida	140,093	8	20	42	53
Maine	80,082	5	15	40	55
Organ Pipe Cactus National Monument	1,339	6	17	29	38
Arizona	293,750	7	23	63	136

*includes species not actually recorded during this study but probably at least seasonally present. Data for Florida are from Hall and Kelson (1959). Those for Arizona and Organ Pipe Cactus National Monument are from Cockrum (1960). This table excludes marine and extinct species.

2. Accounts of species

Three different groups of accounts follow: (A) species actually observed or taken, (B) species probably in the area but not taken and (C) species probably now extinct in the area.

Especially in the case of many small rodents, considerable morphological variation, especially in color but also in size, can be found associated with populations in different regions. In extreme cases, statistically significant differences have been documented between two woodlot populations separated only by a plowed field! Mammalogists are not in uniform agreement as to (a) the level of morphological difference necessary for the recognition of separate subspecies, (b) the usefulness of subspecific names, especially in such genetically plastic species as the pocket gophers and (c) do not yet have detailed variability analysis of most species suitable for the precise assignment of subspecific names to all populations.

For these reasons the subspecies names used in these accounts are assigned on the basis of geographic probability and may be subject to change by later workers.

A. Species Actually Observed

1. Desert Shrew. Notiosorex crawfordi crawfordi (Coues). Desert shrews are rarely taken in traps, although their abundance in owl pellets indicates they are quite common.

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Marina Hoy trapped several in a pit-fall trap next to the trailer at the site headquarters in the spring-summer of 1973. They probably occur throughout the site.

2. Long-Tongued Bat. Choeronycteris mexicana Tschudi. Females of this species migrate northward into southern Arizona from Mexico in early May each year. Here they spend the days, one or two in a roost, in the "twilight zone" of caves, mine tunnels and even in shallow crevices, generally at elevations between 4000 and 6000 feet (1200 - 1800 meters). A few -- perhaps only an adult female and her single offspring -- roost during the summer days in the ice cave of the Fort. Flowers of various agaves furnish the nectar that these bats take as food on their night flights. By late September or early October they have all migrated back into Mexico.

Specimens examined: Locality 20.

3. Sanborn's Long-Nosed Bat. Leptonycteris sanborni Hoffmeister. Long-nosed bats are nectar feeders and are present in the Fort Bowie area during summer months. They are colonial, with day roosts in mines and caves. Several were observed in the mine tunnels south of Quillen Well (locality 23).

4. Cave Myotis. Myotis velifer brevis Vaughan. The Cave Myotis are probably the most abundant bat at Fort Bowie. In September 1959, five were taken in the ice caves. These are on deposit in the collection at the University of Arizona.

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These bats inhabit caves and mine tunnels during the day. The mine tunnels southwest of Quillen Well contained hundreds of Cave Myotis during the summer months of 1976. Nets set in canyons and over water always yielded this species. Although it is not known where these bats spend the winter months, they apparently are absent from the region throughout the winter.

Specimens examined: 2, 18, 20, Quillen Well (22).

5. Fringed Myotis. Myotis thysanodes thysanodes Miller. Fringed Myotis are common inhabitants of caves and mine tunnels. These bats occupy the mine tunnels with Myotis velifer.

Specimens examined: Quillen Well (locality 22).

6. Western Pipistrelle. Pipistrellus hesperus apus Elliot. Like the Cave Myotis, Western Pipistrelles are common at Ft. Bowie. This tiny species, weighing 4 to 5 grams, is the smallest bat living in the United States. They are not gregarious in their day roosts. Only rarely are more than one or two found together. Roosts are generally in rock crevices but they are sometimes found in crevices in buildings. Flight is in early evening, and they are often seen even before sunset. They feed on tiny insects that they capture in foraging flights in canyons, over water, and around tall trees.

Pipistrelles have been seen at all collecting localities at Fort Bowie.
Specimens examined: Quillen Well.

7. Pallid Bat. Antrozous pallidus pallidus (LeConte). A single pallid bat was collected over the water tank at Quillen Well. These bats feed on large moths and probably forage over Fort Bowie. As indicated in the section on "probable species," the report of a big-eared bat roosting in the ice caves at the old fort may well have been this species.

Specimens examined: Quillen Well (locality 22).

8. Black-tailed Jack Rabbit. Lepus californicus eremicus J. A. Allen. Although no Black-tailed Jack Rabbits were taken during this study, they are abundant at Fort Bowie and were observed at many locations. A single specimen, shot by a hunter in Emigrant Canyon, was preserved. Black-tailed Jack Rabbits are most common on the flats north of Siphon Canyon and along Siphon Canyon west to the foot trail. They are most active at night but are occasionally seen during the day. Jack rabbits feed on a great variety of herbaceous and woody vegetation. West of the Stage Station Ruin there is abundant evidence of their feeding on the bark of mesquite.

9. Antelope Jack Rabbit. Lepus alleni alleni Mearns. A single Antelope Jack Rabbit was seen just east of the Wagon Train Massacre Site on Apache Pass Road. Although not collected, this animal was observed long enough to make identification certain. A specimen was taken 3 miles west of Apache Pass summit.

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10. Desert Cottontail. Sylvilagus audubonii minor (Mearns). Like jack rabbits, cottontail rabbits are abundant and widespread. Numerous individuals were seen throughout the Historic Site. They are especially abundant in Siphon Canyon. A single specimen was collected near Tevis Rocks (locality 2).

11. Cliff Chipmunk. Eutamias dorsalis dorsalis (Baird). These chipmunks show a marked preference for rock slides and cliffs in areas of pinyon-juniper. They seem to be most abundant near the wikiup in Siphon Canyon and were observed in Siphon Canyon from the Bascom Camp Site to its junction with the foot trail near the Stage Station Ruin and then east along the trail to Apache Spring. When approached cliff chipmunks scurry off a few feet to a rock or other high place and give out a series of sharp barks. Each individual bark is accompanied by a quick twitching of the tail. They feed on a variety of seeds, nuts, and green vegetation, and are especially active on clear sunny days.

Specimens examined: 4, localities 1, 2, 4, 18. 12.

Harris' Antelope Squirrel. Ammospermophilus harrisi harrisi (Audubon and Bachman). These ground squirrels resemble cliff chipmunks but are larger, lack white facial stripes and run with their tail curved over the back. They are not as vociferous as their chipmunk relatives.

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Harris' antelope squirrels are residents of the sparsely vegetated flats and hillsides, being most common in those areas with gravelly or rocky soils. They are fast runners and quickly seek cover under bushes and trees when approached. Although seen throughout the site, they were most common near the parking lot at the trailhead and on the slopes west of Parke Camp Site.

Specimens examined: 3, localities 1, 7, 8.

13. Rock Squirrel. Spermophilus variegatus grammurus (Say). Rock squirrels are abundant within the Fort Bowie National Historic Site, especially in the Apache Pass area. Many were seen at many localities. They seem to prefer areas of large boulders and rocky outcrops such as those near Apache Pass Summit and the cliffs south and west of Quillen Well.

These squirrels are active on warm sunny days and are often seen foraging under oaks and junipers. At Tevis Rocks an individual was observed foraging for seeds was watched for 30 minutes from a distance of less than 30 feet and seemed unaware he was being watched, even though camping gear, etc. was in plain sight. He would forage for 3 - 5 minutes, scurry off, presumably to cache the collected seeds, and then return and continue foraging. He was not observed eating. Occasionally he climbed into low growing bushes to snip off the tender ends of branches.

No specimens were taken.

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14. Roundtail Ground Squirrel. Spermophilus tereticaudus neglectus (Merriam). Roundtail ground squirrels inhabit the low desert in areas of mesquite, creosote bush and cactus. They seem to prefer open, sandy areas with little ground cover. They have been seen at the junction of Siphon Canyon with the Apache Pass road, in the wash near the east gate to Fort Bowie, and along the Apache Pass Road north of Siphon Canyon.

None have been observed on the Site proper, but they may occasionally occur on the flats south of the parking lot.

Specimens examined: Locality 21.

15. Valley Pocket Gopher. Thomomys bottae extenuatus Goldman. Pocket Gopher burrows are readily recognized by the large mound of earth shoved to one side during excavation of the burrow. Several mounds are usually found clustered in a small area, all being part of a single burrow system. Gophers are solitary except during the breeding season. Burrows are found in rocky, sandy soil in areas of fairly dense herbaceous vegetation. Mounds associated with burrows were seen around the ruins at Fort Bowie and near the parking lot and trailhead on Apache Pass Road.

Specimens examined: Localities 13, 20.

16. Silky Pocket Mice. Perognathus flavus flavus Baird. This grassland species is one of the smallest rodents in the Fort Bowie area. Burrows are inconspicuous and located

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in dense vegetation.

Specimens examined: Locality 20.

17. Rock Pocket Mouse. Perognathus intermedius intermedius Merriam. The Rock Pocket Mouse, as implied by its name, inhabits those areas where rocks cover a considerable portion of the surface. It is also commonly found on talus slopes and along rocky outcrops and ridges. Burrow entrances are often located at the base of rocks, bushes, or concealed within rock piles.

During this study individuals were collected at localities 1, 2, 7, 13, 15 and 17.

18. Desert Pocket Mouse. Perognathus penicillatus pricei Allen. Desert pocket mice are abundant. Unlike the Rock pocket mouse, they prefer washes and other open sandy areas. They are seldom found in rocky situations or in soils with high gravel content.

Burrow openings are generally small, inconspicuous mounds of earth under small bushes. The opening is often plugged with loose soil during the day to maintain a more favorable temperature and humidity within the burrow system.

Specimens examined: Localities 1, 3, 4, 5, 6, 9, 10, 11, 12.

19. Bailey's Pocket Mouse. Perognathus baileyi baileyi Merriam. This is the largest pocket mouse found at Fort Bowie. It is most often found on gravelly soils but a few were taken on sandy soils or in rocky situations. Burrow openings are similar, but larger than, those of other pocket

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mice.

Specimens examined: Localities 1, 10, 14, 20.

20. Hispid Pocket Mouse. Perognathus hispidus conditi Allen. These mice are primary residents of open grassland situations. Burrows are generally in the open and not under concealing vegetation. Entrances to burrows are about 25 mm in diameter and go straight down rather than entering on a slope.

Hispid pocket mice were found only in the ungrazed portion of the site around the ruins.

Specimens examined: Locality 20.

21. Ord's Kangaroo Rat. Dipodomys ordii ordii Woodhouse. Only one specimen was taken during this study. It was trapped in the ruins of Fort Bowie. Possibly they occur in the flats south of the parking lot although none were taken.

Specimens examined: Locality 20.

22. Merriam Kangaroo Rat. Dipodomys merriami merriami Mearns. Kangaroo rats prefer flat, open and semi-open areas with sandy or light gravel soils. Burrow openings are often at the base of mesquites or other shrubs but, may be in the open away from vegetation. Occasionally burrows are constructed in mounds of earth 6 - 8 feet in diameter and 1 - 2 feet high. These mounds are generally at the base of shrubby vegetation.

Kangaroo rats are abundant in suitable habitat within the boundaries of Fort Bowie National Historic Site. The best

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kangaroo rat habitat is west of the foot trail between the unidentified ruin and the Stage Station Ruin. They are also abundant near the gate in Siphon Canyon, in the ruins of Fort Bowie, and northeast of the Post Cemetery.

Specimens examined: Localities 1, 3-6, 9, 10, 20.

23. Banner-tailed Kangaroo Rat. Dipodomys spectabilis spectabilis Merriam. These large kangaroo rats construct mounds 6 to 10 feet in diameter and 1 to 2 feet high. Several large openings to the burrow system are located in this mound.

Banner-tailed kangaroo rats prefer open brush country with sparse grass.

Specimens examined: Locality 21.

24. Fulvous Harvest Mouse. Reithrodontomys fulvescens fulvescens Allen. Like Perognathus flavus, Perognathus hispidus and Dipodomys ordii, Reithrodontomys fulvescens is a grassland species. All are uncommon on the Site. Specimens examined: Locality 20.

25. Cactus Mouse. Peromyscus eremicus anthonyi (Merriam). Cactus mice prefer rocky hillsides and canyons, but were also found in fewer numbers in almost every type of habitat within the Site, including dense grassland, shrub desert and open, gravelly flats. The Cactus Mouse is the most widely distributed rodent within the boundary of the Site, and was found in low to moderate numbers throughout the Site.

Specimens examined: Localities 1, 3, 5, 6, 7, 8, 9, 10, 11, 14, 17, 20.

26. Deer Mouse. Peromyscus maniculatus sonoriensis (LeConte).

Deer mice were collected at only one locality, locality 18 near Apache Spring. Two individuals were collected here in dense brush and trees. Deer mice are known to occupy a wide variety of habitats from low desert to grassland, forest and mountain meadow. It seems likely, therefore, that deer mice occur in low numbers throughout the Site.

Specimens examined: Locality 18.

27. Brush Mouse. Peromyscus boylii rowleyi (Allen). Brush mice appear to be more restricted in their habitat requirements than other species of Peromyscus collected at Fort Bowie. These mice prefer rocky habitat but are also found on soils that are not rocky. They were always found in association with oak, pinyon, or juniper.

Brush mice are widely distributed throughout the Site and were found in large numbers in suitable habitat. Some of the best habitat for these mice was found near Apache Pass and Willow Gulch.

Specimens examined: Localities 1, 2, 7, 11, 15, 16, 17.

28. Northern Grasshopper Mouse. Onychomys leucogaster ruidosae Stone and Rehn. This grassland species was only found around the ruins of the Site. It is possible that these mice also inhabit the area near the Stage Station Ruin.

Specimens examined: Locality 20.

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29. Southern Grasshopper Mouse. Onychomys torridus

torridus (Coues). Grasshopper mice appear to be restricted to the large, relatively flat area centering around the junction of the foot trail with the Butterfield Overland Trail. These mice were taken in large numbers here and were not found elsewhere on the Site. They were also taken near the junction of Siphon Canyon and the Apache Pass Road.

Desert scrub and desert grassland in areas of sandy or gravelly soils appears to be the preferred habitat of grasshopper mice. They are found in association with kangaroo rats and pocket mice.

Specimens examined: Localities 3, 4, 6, 9.

30. Hispid Cotton Rat. Sigmodon hispidus eremicus Mearns. Cotton rats were observed in stands of dense grass around the ruins of Fort Bowie. These rodents are active during daylight hours as well as at night. Their presence is easily detected by the numerous relatively large interconnecting runways in stands of dense grass, and piles of grass clippings. These clippings are 2 - 3 inch pieces of grass stem and there may be a few as 2-3 or as many as 20-30 clippings per pile. Their runways are usually well worn paths that are often used by smaller rodents. Nests are either in underground burrows or in concealing vegetation on the surface..

Specimens examined: Locality 20.

31. White-throated Woodrat. Neotoma albigula albigula Hartley.

White-throated woodrats are widely distributed and abundant throughout the Site. They occur in all available habitats. Nests observed in the rocky cliffs near Apache Pass are inconspicuous structures built in cracks or under boulder piles. In flatter country and rolling hills nests are constructed of any available material. These are large piles of sticks and debris, generally at the base of a tree or bush. Nests vary in size from less than one to over two meters in diameter. Numerous runways radiate from these nests.

Woodrats collect a large variety of material to construct their nests. Spent cartridges, shot gun shells, bones, old nails, cans, glass, and a glass chandelier pendant as well as large amounts of vegetation were found in a single nest in Siphon Canyon.

Prickly pear cactus pads are a popular food item and signs of woodrats feeding on them are abundant.

Specimens examined: Localities 2, 4, 5, 7, 8, 11, 13, 14, 20.

32. Porcupine. Erethizon dorsatum couesi Mearns. Porcupines were not observed within the boundary of Fort Bowie National Historic Site.

One individual, a road kill, was seen 1 mile west of Apache Pass summit.

33. Coyote. Canis latrans mearnsi Merriam. Coyotes are common throughout Fort Bowie and surrounding area. Several were seen during this study, on the Historic Site

Page 2-14.

and along roads adjacent to Fort Bowie. Local ranchers also report coyotes to be common. Howling coyotes were frequently heard at night.

34. Gray Fox. Urocyon cinereoargenteus scotti Mearns. Two individuals, possibly mates, were observed near the trailer at headquarters by Park Service personnel. These were eating scraps of food that had been placed on the road and were not disturbed by flashlights and nearby talking. Local ranchers often see gray foxes crossing the road in Emigrant Canyon near the east gate to the Fort.

None were observed during this study.

35. Coati. Nasua nasua pallida Allen. Coatis were not seen during this study; however, according to personnel at Fort Bowie they are commonly seen in the Fall and occasionally seen at other times of the year.

Marina Hoy, Ft. Bowie National Historic Site, informs us that coatis form bands of 10-15 individuals during the Fall months. She is of the opinion that these are large foraging groups that feed on the acorns that are ripe at this time. At other times of the year only single individuals are seen and then only occasionally. Bands of 12 and 15 individuals have been seen at Apache Spring in October and November; 2 individuals in January; and a single coati was seen near the parking lot and trail head in August.

36. Raccoon. Procyon lotor mexicanus Baird. No raccoons were observed during the course of this study. Tracks were

Page 2-15.

seen in the mud around Pass Tank near Apache Pass summit and in the soft sand near the east gate to Fort Bowie. Park Service personnel have seen raccoons around the trailer at headquarters.

Raccoons probably inhabit most of the canyons within the Site.

37. Ringtail Cat. Bassariscus astutus flavus Rhoads. A single specimen of the ringtail was live trapped just south of Tevis Rocks in Siphon Canyon. This animal, a male, was trapped using ripe banana as bait and was quite docile within a few hours after capture.

Specimens examined: 1, locality 19.

38. Spotted Skunk. Spilogale gracilis gracilis Merriam. A single individual of the spotted skunk was seen near Apache Spring late at night. Unlike the striped skunks observed, this skunk quickly ran from the light and was soon out of sight in the brush and was not seen again. Personnel from Ft. Bowie National Historic Site have seen spotted skunks in the upper reaches of Cut Off Canyon.

39. Hognose Skunk. Conepatus mesoleucus venaticus Goldman. A hognose skunk was seen near Bascom Camp Site in Siphon Canyon. This skunk was feeding on the remains of rodents collected as part of this study. The moon was bright and the skunk was observed for several minutes without additional light. When a flashlight was shined on the skunk

it quickly ran. up the hill to the west.

A hognose skunk was seen by Marina Hoy at Apache Spring and Helen's Dome Spring.

40. Hooded Skunk. Mephitis macroura milleri (Mearns). A skunk thought to be a hooded skunk was seen near the small pond southwest of the parking lot on the Apache Pass Road. This skunk was easily frightened and quickly disappeared into the thick brush. Identification is uncertain.

41. Striped Skunk. Mephitis mephitis estor Merriam. Striped skunks appear to be quite common within the Site. These skunks were observed at the base of the dam for Pass Tank near Apache Pass Summit; in Willow Gulch near the bridge abutments; in Siphon Canyon near Tevis Rocks; and, also in Siphon Canyon, near its junction with the foot trail east of the Post Cemetery. Park Service personnel report having seen striped skunks on the hill northwest of the trailer. All observations were at night.

A dead striped skunk was collected at the Bascom Camp Site in Siphon Canyon. Only the skeleton of this individual was preserved.

Striped skunks are not particularly bothered by lights and if approached slowly will continue foraging until one approaches within a few feet. At this time they will break away quickly and run off a few feet and raise their tail in a menacing manner. If they are not approached again they soon lower their tail and continue foraging for food.

42. Badger. Taxidea taxus spp. Badgers were not observed during the course of this study. Burrows thought to have been constructed by badgers were observed in the flat area west of Overlook Ridge and also just north of Parke Camp Site, west of the foot trail. Park personnel have seen badgers around the ruins.

43. Bobcat. Felis rufus baileyi Merriam. A bobcat with kittens was seen in August 1976 by Terri Johnson, University of Arizona, near Overlook Ridge. They are also occasionally seen around the headquarters area by Park Service personnel.

44. Mountain Lion. Felis concolor azteca Merriam. No sign of mountain lion was seen during this study. Bill Hoy has seen mountain lions near the junction of Apache Pass Road and Siphon Canyon; on the southeast ridge of Bowie Peak; and 100 yards southeast of the trailhead on Apache Pass Road.

Local ranchers report they have seen lions in the mountains quite often in recent months.

45. Collared Peccary. Dicotyles tajacu sonoriensis (Mearns). This species was not seen during this study. Diggings thought to be made by Javelina were seen beneath prickly pear cactus along the foot trail and in Siphon Canyon. Park personnel have seen Javelina near the Stage Station Ruin and at Apache Spring.

46. White-Tailed Deer. Odocoileus virginianus couesi (Coues and Yarrow). White-tailed deer were not seen during

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this study but Park personnel have seen white-tailed deer near the Wagon Train Massacre Site.

This area is a popular deer hunting area in the Fall and numerous hunters were interviewed. All report many deer in the area.

47. Mule Deer. Odocoileus hemionus crooki (Mearns).

A single mule deer was seen near the large cottonwood tree in Siphon Canyon. Mule deer have also been seen on the saddle east of Overlook Ridge. Hunters in the area around Port Bowie report moderate success in hunting this species.

B. Species Probably in Area

The following species were not collected or observed during the course of this study. They probably do occur in the area, however. For status of the bats listed without comment see Cockrum and Ordway (1959). All have been recorded in the Chiricahua Mountain area and probably all at least occasionally fly over the Site.

1. California Myotis. Myotis californicus californicus (Audubon and Bachman). This is a common species collected over water tanks in the Chiricahua Mountains.

2. Southwestern Myotis. Myotis auriculus Baker and Stains (= Myotis evotis in Cockrum and Ordway).

3. Myotis. Myotis subflavus melanorhinus (Merriam).

4. Long-Legged Myotis. Myotis volans interior Miller.

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5. Red Bat. Lasiurus borealis teliotis (H. Allen)
6. Hoary Bat. Lasiurus cinereus cinereus (Beauvois).
7. Southern Yellow Bat. Lasiurus ega (Gervais).

May occur in area.

8. Silver-Haired Bat. Lasionycteris noctivacans LeConte.
9. Townsend's Big-Eared Bat. Plecotus townsendii pallescens Miller. Park personnel report big-eared bats reputed to be this species as nesting in ice caves. During this study, only the long-tongued bat was seen there. While this species is locally common in the Chiricahua Mountains just to the south, and at least seasonally feed over the Site, it is much more probable that the "big-eared" bat seen in the ice caves was a pallid bat (Number 5, above).

10. Allen's Big-Eared Bat. Plecotus phyllotis (Allen). This is one of the rarest bats in North America. This species has been taken from the Chiricahua Mountains at an elevation of 5400 feet.

11. Brazilian Free-Tailed Bat. Tadarida brasiliensis mexicana (Sassure). Cockrum and Ordway (1959) found this to be the most common bat at the Southwest Research Station in the Chiricahua Mountains.

12. Big Free-Tailed Bat. Tadarida macrotis (Gray). A single specimen is known from Fly Park in the Chiricahua Mountains.

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13. Eastern Cottontail. Sylvilagus floridanus holzneri

(Mearns). This species has been taken in the Chiricahua mountains and may well occur on the Site.

14. Spotted Ground Squirrel. Spermoduillus spilosoma canescens

Merriam. Spotted ground squirrels probably do not occur within the boundary of the Site at the present time although they have been recorded here in the past.

15. Western Harvest Mouse. Reithrodontomys megalotis megalotis

(Baird). A single harvest mouse was collected by Marina Hoy in a pit fall trap near the trailer at headquarters in 1973. It was identified by her as a Western Harvest Mouse but was not preserved. The species has been recorded in the general region but a specific record is needed to confirm its presence on the Site.

16. Northern Pygmy Mouse. Baiomys taylori ater Blossom and Burt.

This rodent prefers areas of dense grass and has been recorded from lower elevations in the Chiricahua Mountains.

17. Tawny-Bellied Cotton Rat. Sigmodon fulviventer minimus

Mearns. These cotton rats have been reported from the San Simon Valley, 3800 feet.

18. Ursus americanus Pallas. May occasionally wander this far from the Chiricahua population.

C. Species Probably Extinct

These may have on occasion wandered into the Site. They certainly were present in the region.

1. Black-Tailed Prairie Dog. Cynomys ludovicianus arizonensis Mearns.
2. Grizzly Bear. Ursus arctos Linnaeus.
3. Long-Tailed Weasel. Mustela frenata arizonensis Mearns.
4. Jaguar. Felis onca (Linnaeus).
5. Jaguarundi. Felis yagouaroundi tolteca Thomas.
6. Margay. Felis pardalis Linnaeus
7. Elk. Cervus elaphus Linnaeus.
8. Pronghorn. Antilocapra americana (Ord).
9. Mountain Sheep. Ovis canadensis Shaw.

3. List of collecting sites and species collected

The following localities are all in T 15 S, R 28 E, Cochise County, Arizona. The locality numbers are plotted on the attached map (Figure 1). The first 20 localities are all on the Fort Bowie National Historical Site proper. The last 3 are in immediately adjacent areas. Following the precise locality are given dates of sampling and the number of traps set. Lastly are listed the species and number of individuals taken at the site.

1. 1 mi. NW Old Fort Bowie, 4600 ft., NE 1/4 of SW 1/4, Sect. 1.
Oct. 18, 1975, 200 traps. Dipodomys merriami (7); Perognathus intermedius (1); Perognathus penicillatus (4);
Neotoma albigula (3); Peromyscus eremicus (7); Peromyscus boylii (1); Ammospermophilus harrisi (1); Eutamias dorsalis (1);
Mephitis mephitis (1).

2. 3/4 mi. NW Old Fort Bowie, 4600 ft., SE 1/4 of SW 1/4, Sect. 1.
Oct. 18, 1975, 50 traps. Neotoma albigula (3); Eutamias dorsalis (1);
Mephitis mephitis (1); Peromyscus boylii (2); Perognathus intermedius (2).

3. 1/2 mi. NW Old Fort Bowie, 4800 ft., NE 1/4 of NW 1/4, Sect.
12. Oct. 19, 1975, 100 traps. Dipodomys merriami (2); Perognathus penicillatus (2); Peromyscus eremicus (1); Onychomys torridus (1).

4. 3/4 mi., NW Old Fort Bowie, 4760 ft., NW 1/4 of NW 1/4, Sect
12. Nov. 2, 1975, 100 traps. Onychomys torridus (5);

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Neotoma albigula (6); Dipodomys merriami (4); Perognathus penicillatus (3); Peromyscus leucopus (1); Eutamias dorsalis

5. 1/2 mi. NW Old Fort Bowie, 4920 ft., NW 1/4 of NW 1/4, Sect 12. Nov. 2, 1975, 100 traps. Peromyscus eremicus (2); Perognathus penicillatus (2); Dipodomys merriami (4); Neotoma albigula (2).

6. 1/2 mi. NW Old Fort Bowie, 4880 ft., SW 1/4 of NW 1/4, Sect. 12. Oct. 31, 1975, 100 traps. Dipodomys merriami (9); Perognathus penicillatus (2); Onychomys torridus (1); Peromyscus eremicus (1).

7. 1/2 mi. NW Old Fort Bowie, 4920 ft., SW 1/4 of NE 1/4, Sect. 12. Nov. 2, 1975, 100 traps. Neotoma albigula (2); Peromyscus boylii (2); Peromyscus eremicus (3); Perognathus intermedius (1); Ammospermophilus harrisi (1).

8. 3/4 mi. W Old Fort Bowie, 4880 ft., NW 1/4 of SW 1/4, Sect 12. Nov. 1, 1975, 100 traps. Peromyscus eremicus (1); Neotoma albigula (1); Perognathus baileyi (3); Ammospermophilus harrisi (1).

9. 1 mi. NW Old Fort Bowie, 4800 ft., NE 1/4 of NE 1/4, Sect. 11. Oct. 19, 1975, 100 traps. Perognathus penicillatus (2); Onychomys torridus (7); Dipodomys merriami (3); Peromyscus eremicus (2).

10. 1 mi NW Old Fort Bowie, 4800 ft., NE 1/4 of NE 1/4, Sect. 11. Nov. 2, 1975, 100 traps. Dipodomys merriami (2); Perognathus baileyi (2); Perognathus penicillatus (1); Peromyscus eremicus (1).

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11. 1 mi. NW Old Fort Bowie, 4800 ft., SE 1/4 of SE 1/4, Sect 2.
Nov. 3, 1975, 100 traps. Neotoma albigula (1); Peromyscus eremicus (1);
Peromyscus boylii (1); Perognathus penicillatus (2).

12. 1-1/2 mi. NW Old Fort Bowie, 4680 ft., NW 1/4 of SE 1/4,
Sect. 2. Aug. 6, 1976, 100 traps. Perognathus penicillatus (3).

13. 1-1/2. mi. NW Old Fort Bowie, 4800 ft., NW 1/4 of SE 1/4,
Sect. 2. Aug. 6, 1976, 100 traps. Neotoma albigula (1); Thomomys bottae
(1); Perognathus intermedius (2).

14. 1-1/4 mi. NW Old Fort Bowie, 5000 ft., NW 1/4 of
NE 1/4, Sect. 11. Nov. 1, 1975, 100 traps. Perognathus baileyi (2);
Neotoma albigula (1); Peromyscus eremicus (2); Peromyscus leucopus
(1).

15. 2 mi. W Old Fort Bowie, 4920 ft., NE 1/4 of NE 1/4, Sect. 10.
Aug. 6, 1976, 75 traps. Peromyscus boylii (1); Peromyscus eremicus (1);
Perognathus intermedius (1)

16. 2-1/4 mi. NW Old Fort Bowie, 4920 ft., SW 1/4 of SE 1/4,
Sect. 3. Aug. 5, 1976, 75 traps. Peromyscus boylii (1).

17. 2-1/2 mi. NW Old Fort Bowie, 5120 ft., SE 1/4 of SW 1/4,
Sect. 3. Aug. 6, 1976, 75 traps. Peromyscus boylii (1); Peromyscus
eremicus (1); Perognathus intermedius (1).

18. 1/4 mi. W Old Fort Bowie, 4920 ft., SE 1/4 of NW 1/4, Sect.
12. Oct. 31, 1975, 100 traps. Peromyscus maniculatus (2).; Eutamias
dorsalis (1).

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19. 1/2 mi. NW Old Fort Bowie, 4720 ft., SE 1/4 of SW 1/2, Sect. 1.
Oct. 18, 1975, Bassariscus astutus (1).

20. Old Fort Bowie, 5000 ft., SE 1/4 of NE 1/4, Sect. 12. Aug. 15,
1976 and Sept. 24, 1976, 300 traps. Sigmodon hispidus (2); Perognathus
baileyi (2); Perognathus penicillatus (4); Peromyscus eremicus (2);
Dipodomys merriami (6); Thomomys bottae (2); Neotoma albigula (2);
Reithrodontomys fulvescens (1); Perognathus flavus (1); Perognathus
hispidus (1); Onychomys torridus (2).

21. 1/2 mi. NNW Old Fort Bowie, 4800 ft., SE 1/4 of NW 1/4,
Sect. 1, 4800 ft. Sept. 23, 1976, 100 traps. Dipodomys ordii (1);
Onychomys leucogaster (1); Dipodomys merriami (6); Neotoma albigula
(3); Spermophilus tereticaudus (2); Dipodomys spectabilis (2);
Onychomys torridus (2); Perognathus baileyi (2).

22. 1 mi. W Old Fort Bowie, 5000 ft., NE 1/4 of NE 1/4, Sect 10.
Aug. 6, 1976, Sept. 23, 1976 and Sept. 24, 1976, Myotis velifer (34);
Antrozous pallidus (1); Pipistrellus hesperus (17); Myotis thysanodes (8);
Eptesicus fuscus (3); Leptonycteris sanborni (4); Choeronycteris mexicana
(3).

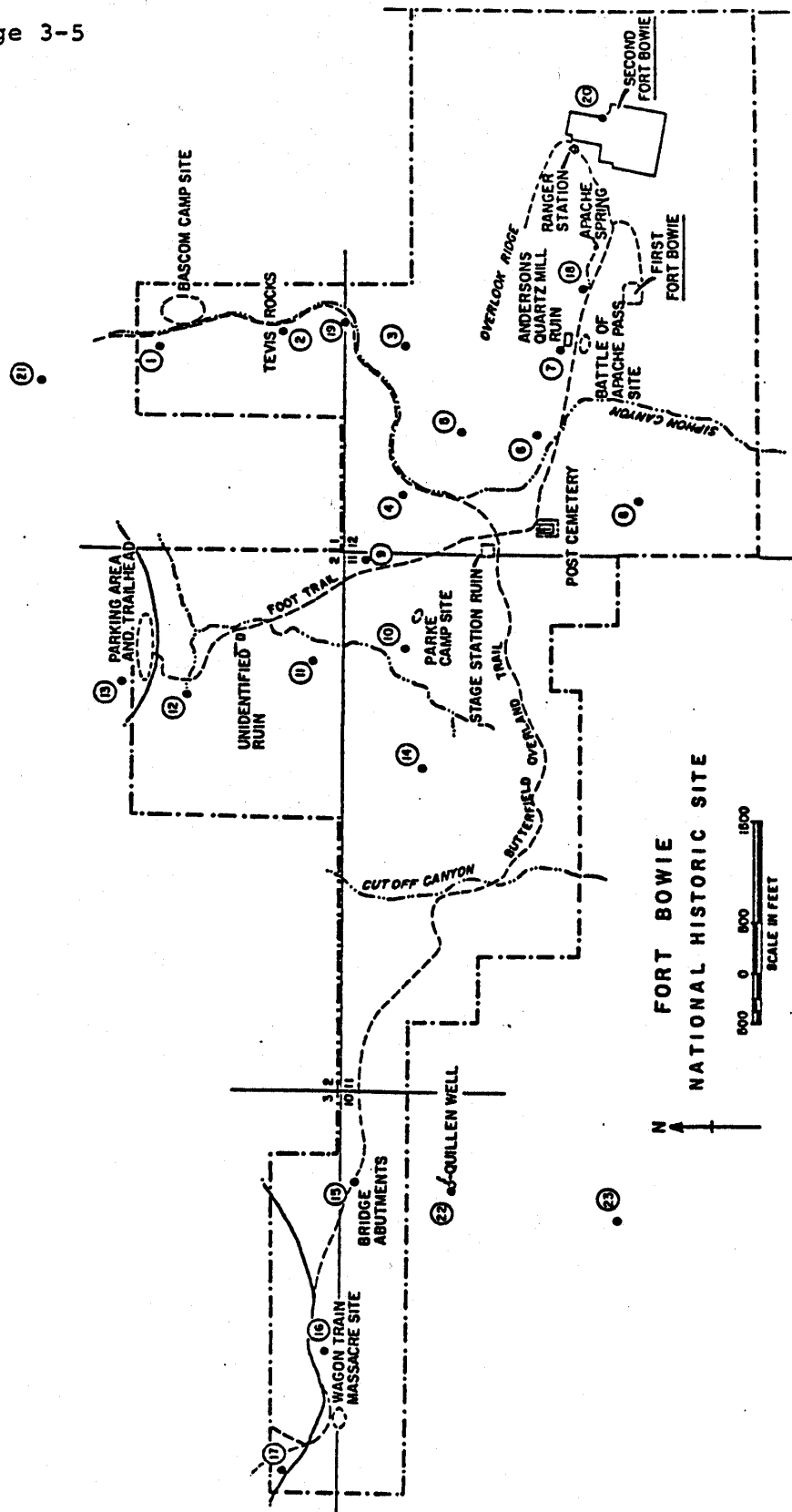


Figure 1. Sampling localities for mammals. Numbers refer to localities defined in text.

4. Historical change

Prior to the 1890's, no systematic account of the mammals of the southeastern part of Arizona appears to have been recorded. In 1895, J. A. Allen published a paper entitled "On a collection of mammals from Arizona and Mexico, made by Mr. W. W. Price, with field notes by the collector." This was a report on a collecting trip made on behalf of the American Museum of Natural History (New York), "chiefly in Cochise County," from January to September in 1894. Apparently Mr. Price and his associates (especially B. C. Condit) did not visit Fort Bowie, but they did collect at Fairbank, Willcox, and in the Huachuca and Chiricahua Mountains -especially at Camp Rucker.

The following are some direct quotes concerning observations that were made in the region. Scientific names used in this section are the modern equivalents of the names used by Allen.

White-tailed deer "common in brushy tracts of country."

Black-tailed jack rabbit "abundant over the entire region to about 7000 elevation.

Black-tailed prairie dog "...on the plain at the [east] base of the Huachuca Mountains ... we saw about twenty, and by the number of hillocks, estimated the colony to number about 200 individuals. To the next town east it was nearly a dozen

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miles. Old settlers know of a time when no Prairie Dogs could be found about the Huachuca Mountains. These people thought that the dogs had emigrated from northern Sonora, Mexico. In the Sulphur Spring and San Simon Valleys, Prairie Dogs are found in numerous colonies, especially about Willcox."

Ring-tail. "This species is rare in the Huachucas, though a few are killed every year by the miners... In the Chiricahua Mountains a single specimen had been killed several years previous to my visit, the only case of its capture of which I could find evidence."

Gray fox "was seen over the entire region."

Bobcat "...were not uncommon over the entire country."

Mountain lion "... is restricted to the brushy and timbered mountains of the entire region. Occasionally this beast travels across the valleys from one range to another."

Coyote. "Abundant over entire region."

Wolf "is found over the entire region, though more especially in the mountainous parts. We saw it on several occasions during our stay in the country."

Kit fox "not uncommon on the San Simon Plain east of the Chiricahua Mountains..."

Black bear "...in all the mountainous and wooded regions..."

Grizzly "...only one 'silver tip' had been killed in southern Arizona in recent years ... killed ... near Guadalupe

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Cañon."

Antelope "are still to be found on the plains of most of the region. Several bands were found along the bases of the Huachuca and Chiricahua Mountains. The most we saw in any band was twelve -- a very different story from that told by old settlers of bands of hundreds, which in the early days trampled down the grass like sheep."

Mule deer "...formerly extremely abundant, but, like the Antelope, will soon become practically extinct." Mountain sheep "said to be found on the rocky eastern flanks of the Chiricahua Mountains, but I found no positive evidence of their occurrence there."

Obviously, the above selected quotes reveal that species now rare or absent formerly occurred in the region and, perhaps, on the Fort Bowie site.

Perhaps even more interesting are some species that were not recorded by Price. For example, neither the peccary nor the coatimundi were recorded from any part of the state. The antelope jack rabbit was reported as inhabiting the desert proper at elevations below 3000 feet. It was "abundant about Tucson and in the lower portions of the desert belt." None were reported from anywhere in Cochise County. A similar situation exists for the round-tailed ground, squirrel. Also in the year 1894, several different mammals were collected at or near Fort Bowie by Dr. A. K. Fisher of the United States Biological Survey. These specimens are now

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deposited in the U. S. Biological Survey' portion of the United States National Museum, Museum of Natural History collection. These are: Pipistrellus hesperus; Lepus californicus; Ammospermophilus harrisi; Spermophilus variegatus; Spermophilus spilosoma; Thomomys bottae; Perognathus penicillatus; Perognathus intermedius; Dipodomys spectabilis; Dipodomys merriami; Peromyscus boylii; Neotoma albigula; Canis lupus; Urocyon cinereoargenteus; and Felis rufus. In addition, one female mountain lion (Felis concolor) was taken at "Fort Bowie Peak" in January, 1894.

Mearns (1907) reported on the mammals taken during the Mexican Boundary Survey. Field work along the border was accomplished in 1892 and 1893. Most of his report reflects the material presented above. For example, Mearns reported that the peccary occurred in the southeastern corner of the satae and that "we found evidence of the former presence of paccaries in the Huachuca Mountains, Arizona, where soldiers killed some of them ... a few years before ... On Silver Creek, in southeastern Arizona, these animals are periodically abundant, and many have been killed by hunting parties from the old post (now abandoned) of Fort Bowie." Concerning the pronghorn he wrote " ...is already a rare animal in the region of the Southwest, where it ranged in the thousands twenty-five years ago."

In comparison to today, the disappearance of the large carnivores (grizzly bear, wolf, jaguar) and the antelope

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are most evident. The former absence or extreme rarity of the peccary and coatimundi are also worthy of note. However, all changes in mammalian fauna are not restricted to large species. The spotted ground squirrel, for example, is now absent at the Site.

5. Recommendations

The small area of the Fort Bowie National Historical Site is not, in itself, suitable for the long term survival of many species of mammals. If we assume that the Site were to suddenly become an "island," completely surrounded by a large "ocean" (actual, or by some other situation that results in complete incompatibility with the needs of the mammals on the island) then the diversity seen would soon disappear. The area is not large enough to support breeding populations of carnivores, large herbivores, or the several species of bats. Further, competitive interactions would markedly reduce the number of rodent species present. If our "island" were to be surrounded by areas subjected to extensive human modification (e.g. intense agriculture or urban development) the "contamination" by house mice, as well as predation by domestic cats and dogs would further degrade the diversity of native species, even if no humans were permitted on the area.

The above considerations lead to the obvious conclusion that maintenance of the present mammalian fauna of the Site depends to a large extent on the land use in the surrounding area. For the past several decades the region has been devoted to cattle grazing and, seasonally, limited hunting of game species. Probably minor multiannual fluctuations in weather parameters (especially rainfall) as well as grazing and occasional fires have interacted with slope,

exposure, and soil types to result in the present patterns of distribution of plants (grasslands, etc.).

A major shift in any one of these factors has the potential of resulting in a change in vegetation cover and, concurrently, in the mammals present. For example, overgrowth of grassy areas would eliminate habitat for such grassland rodents as harvest mice, cotton rats, silky pocket mice and even most kangaroo rats. Further, reduction in "edge" environments between open grassy areas and areas of continuous woody vegetation results in less area favorable to browsing by deer and, overall, reduced populations.

The above observations are the basis of the following recommendations.

1. The Fort Bowie National Historical Site should not be considered as a game preserve. Limited "habitat improvement," in the form of additional permanent water sources, would encourage more use of the area by deer, peccary and the larger carnivores. Hunting or trapping probably should not be permitted on the Site, but should not be discouraged in adjacent areas.

2. The Site should be publicized as having a mammalian fauna similar to that of many other regions of southeastern Arizona. A mammal "guide," similar to one already prepared by Marina Hoy, could be provided (from a coin-operated dispenser?) at the beginning of the trail. At appropriate places along the trail, information signs, keyed to the

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"guide" could point out a pack rat den, kangaroo rat burrow, cotton rat activity, pocket gopher burrows, areas of ground squirrel activity, and so on.

3. Limited cattle grazing should be permitted on the Site each year. If this is not done much of the grassland area will become overgrown by woody vegetation in a few years ... destroying the microhabitats of some of the species now present.

4. The area around some of the restored buildings should be kept free of mesquite and other woody vegetation in order to give the visitor a better insight as to what Fort Bowie was really like. Certainly all woody vegetation was cleared and burned for fuel, grasses were overgrazed by domestic animals and soil tramping by animals and man resulted in much dusty bare ground. Not only is the current regrowth misleading, but if not controlled, will eventually overgrow the area around the buildings. This will not only obscure the buildings from view but also, by root action, etc., result in their destruction.

5. Since multiannual variations occur in most mammalian populations, some sort of uniform, annual census of at least the more obvious mammals should be instituted at the Site. Probably such a census design should include the following features: (1) Be conducted for three or four successive days, to help counteract the variations in activity resulting from differences in weather; (2) be conducted twice

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a year, once in the late spring just before the year's crop of young are produced, and once in the late summer or early fall, after the reproductive season; and (3) be reported to some central office of the National Park Service for permanent recording. Further, weather data, especially concerning temperature and rainfall, should be summarized for the year and recorded with the census results.

Ideally such weather and census records should be obtained at all of the various National Park Service Units. After a few years such a program might well yield data concerning (a) geographic patterns of population increases/ decreases, (b) relation to variations and (c) perhaps most importantly, the nature of any long term trends in mammalian populations.

6. Acknowledgments

Numerous hunters were interviewed during the course of this study, especially during the Fall of 1975. To these individuals we express our thanks. Their observations and knowledge of the larger mammals were valuable in compiling this report.

Local ranchers were another important source of information on the wildlife of the area. Among these we are especially grateful to Hugh Peterson of the Knappe Ranch and Sam Mosely. Their interest in this project and willingness to help in any way was sincerely appreciated.

Bill Hoy, Marina Hoy and Dick Ferdon of the Fort Bowie National Historic Site deserve our special thanks. They were not only helpful during the compiling of the data for this report but went out of their way to see that our every need was satisfied during the field work phase of this study. Their interest and familiarity with the wildlife of the region were essential to the successful completion of this project.

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Persons interested in details of mammals recorded from the general area of southeastern Arizona should consult the following references.

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A Survey of the Birds of the
Fort Bowie National Historic Site

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INTRODUCTION

The Fort Bowie National Historic Site occupies a land area of only about 400 ha, elongated from east to west. It is in the Upper Sonoran Life-zone at an elevation of about 1600 m and includes woodland, grassland, and riparian communities. A fault line crosses the Site, and limestone outcroppings dominate a part of its area. A history of human utilization has altered its original aspect. The heterogeneity of the Site results in an especially rich bird fauna. This report considers the bird species that are known within the present boundaries of the Site.

METHODS

This inventory consists of an annotated list of all species recorded from the Site and a table of the birds counted on periodic surveys. The annotated list concisely summarizes the extent of available information on each species. The basic information obtained in the field by the authors was greatly enhanced through the use of field notes made by Marina Hoy. Initialed acknowledgements in the list refer frequently to her observations (MH) or to those of the authors (TBJ, SMR). Files kept at the Site Headquarters of unusual bird species were considered, as were a few publications and field notes of men who spent time at the Fort in the 19th Century. It is difficult in reviewing early material to determine if specimens or observations pertain to the area within the present Site boundary. Only species positively known from the present Site are included in this report. Some species (Olivaceous Flycatcher, Purple Finch, Cassin's Sparrow, and Clay-colored Sparrow) have been reported from the Site but are omitted because inadequate details of the observations are available.

Fieldwork by the authors was conducted in September 1975 and in January, February, April, May, June, July, and August 1976. No specimens were collected, but observations were made in all habitats. Particular effort was made to determine the breeding species and their seasonal distribution and abundance. A number of bird species nest following good winter and spring rains; others nest in July after the onset of summer rains. In 1976, precipitation was lower than normal and we suspect that many birds (summer nesting species, especially) bred

elsewhere. The first substantial summer rain fell on 16 July. Data are weakest for fall migrants, which pass southward from July to November and are often influenced by weather. We were in the field least in fall. Consequently, we found some transients in small numbers that may subsequently be found commonly. Transients and winter visitants may vary considerably in number from year to year: A 5.6 km route, outlined in Figure 1, was walked twice in September (20,21), and four times each in January (28-30), May (12-15), and August (4-7). All birds seen or heard were counted and the results presented as individuals per transect kilometer in each of the four major habitats. The data are inadequate for determination of densities but serve to demonstrate relative abundance and habitat preferences. Figure 1 utilizes an aerial photograph to describe the route and habitats covered, and will provide a baseline for any comparisons to be made in the future. On the 5.6 km route, 1.3 km are in the riparian community in Siphon Canyon and near Apache Spring, 1.3 km are in shrub-grassland, 1.3 km are in oak-juniper woodlands, and 1.7 km pass through the ruins area, Overlook Ridge, the old dump, and steep rocky slopes.

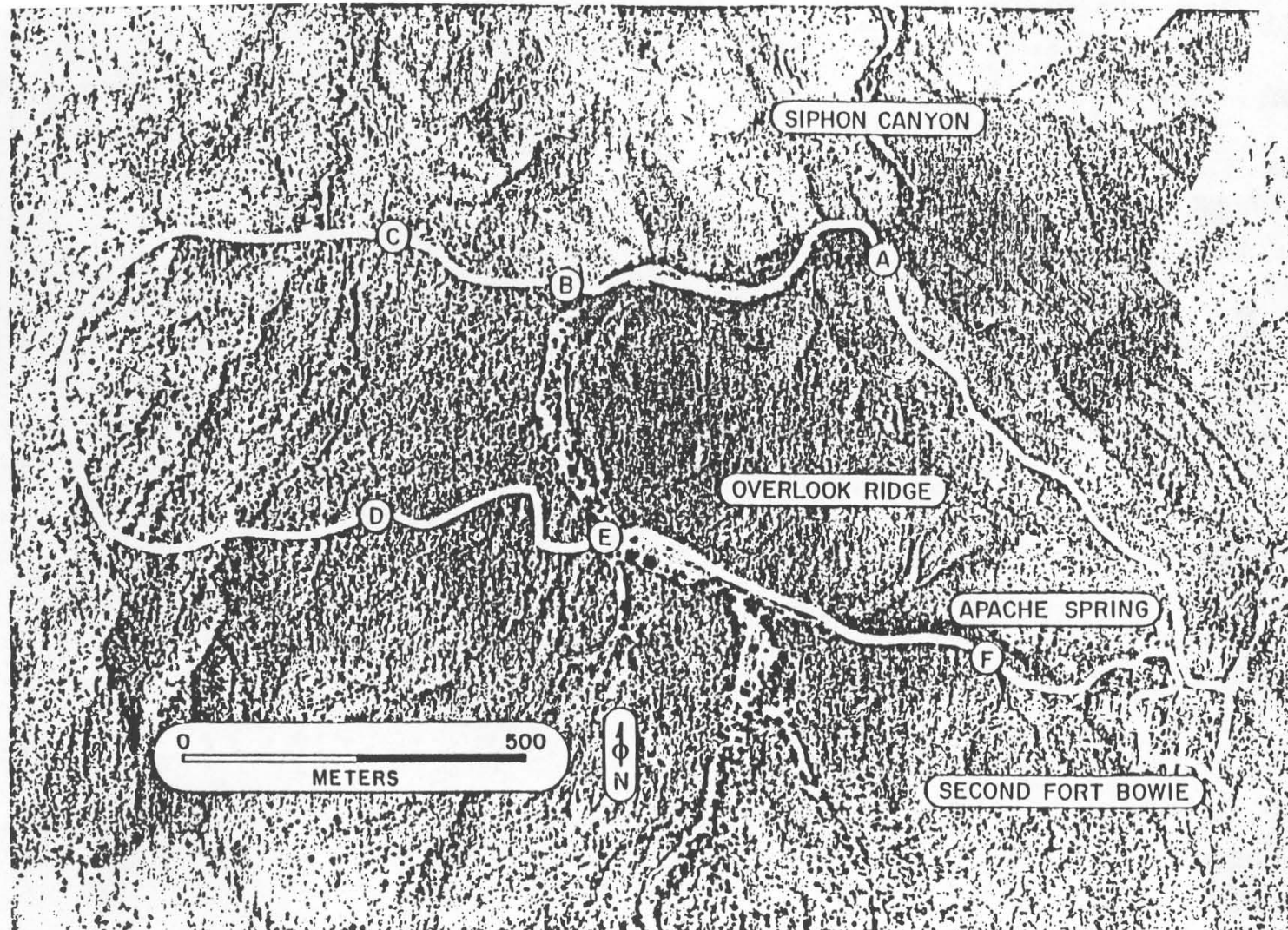


Fig. 1. Route utilized to obtain counts of individuals of birds per transect kilometer on the Fort Bowie National Historic Site. Sections A-B and E-F are in the riparian community; B-C and D-E are in shrub-grassland; C-D is in oak-juniper woodland; F-A is in the ruins area and on arid ridges. See text and Table 1.

RESULTS

Results are summarized in the Annotated List of Species and counts made on transects appear in Table 1. For additional information on the occurrence of species in southeastern Arizona, refer to Birds of Arizona (Phillips, Marshall, and Monson, 1964). The following comments apply to the Annotated List.

Relative abundance. Expressions of avian density have different meanings to different people. In this report, an abundant species is highly predictable in its occurrence and is found in large numbers. Common is used to describe a species that may be seen in moderate numbers anytime in the appropriate season. Fairly common implies lower predictability and very small numbers; the species may not be seen on some trips in the field. Uncommon indicates the species is infrequently seen but is to be expected occasionally. Rare suggests a species within its range but unexpected. This terminology is adapted from Phillips et al (1964) in order to facilitate comparisons with that reference.

Seasonal distribution. The term resident indicates the species breeds on the Site, unless a qualifying statement is used. Some birds are permanent residents, implying they are present throughout the year and nest. Other nesting species are summer residents and are present only in the warmer months; they migrate elsewhere to spend the winter. Migrants or transients are birds in spring (generally, March-May) or fall (late July-October) that are in passage between wintering and breeding grounds. Some birds move into the Fort Bowie area to spend the winter (November-February) and are termed winter visitors.

Habitat. Detailed vegetational mapping would indicate 15-20 vegetational types on the Site. Birds are highly mobile and do not recognize such resolution of habitat types. This report recognizes the following basic habitat subdivisions.

Riparian. The alluvial plain of Siphon Canyon and the wooded area extending from Siphon Canyon to above Apache Spring.

Some of the other major washes also have riparian growth.

Shrub grassland. Includes mesquite savanna and other grass dominated small-shrub communities.

Woodland. Scattered oaks, junipers, or pinyon pine.

Ruins area. This subdivision is artificial and includes Second Fort Bowie, the steep slopes of Overlook Ridge, and the sharp slopes above the lower part of Siphon Canyon.

Annotated List of Species

Green Heron (Butorides virescens).- Rare; eight individuals were present at Apache Spring 22 September 1972 after a storm (MH).

Canada Goose (Branta canadensis).- Observed once in March 1974, when six individuals flew from the San Simon Valley toward the Sulphur Springs Valley over the Site.

Turkey Vulture (Cathartes aura).- Common migrant and summer resident. Forages over entire Site and may occasionally nest. Flocks of 30± individuals were noted roosting on east facing rocks above Siphon Canyon in September. Dates range from early April to early October.

Black Vulture (Coragyps atratus).- Rare, from April to mid-September, but not reported every year.

Sharp-shinned Hawk (Accipiter striatus).- Uncommon (MH); may be seen in any month.

Cooper's Hawk (Accipiter cooperii).- Fairly common resident; successfully nested at Apache Spring in 1976 and old nests were noted in Siphon Canyon. May hunt over entire Site.

Red-tailed Hawk (Buteo jamaicensis).- Uncommon resident. Forages over all habitats and undoubtedly occasionally nests in area.

Swainson's Hawk (Buteo swainsoni).- A summer resident in the grasslands west of Apache Pass but rare on the Site.

Black Hawk (Buteogallus anthracinus).- One record: one flew south over Site on 11 October 1975 (MH).

Golden Eagle (Aquila chrysaetos).- Rare resident of the area. Eagles hunt over large areas including the Site and several pairs are known to nest in the Chiricahua Mts.

Marsh Hawk (Circus cyaneus).- Uncommon migrant and winter visitant.

Prairie Falcon (Falco mexicanus).- One record: a bird at Apache Pass on 27 January 1972 (MH). The species nests in the Chiricahua Mts. and others migrate through the area, thus it is to be expected.

Merlin (Falco columbarius).- One record: a bird on 8 October 1971 in Siphon Canyon (MH). A rare migrant in southeastern Arizona.

American Kestrel (Falco sparverius).- Uncommon resident and migrant. The species did not nest on the Site in 1976 but may do so occasionally.

Scaled Quail (Callipepla squamata).- Uncommon resident of grasslands in vicinity of the Site and occasionally observed on it (MH).

Gambel's Quail (Lophortyx gambelii).- Abundant resident in all habitats; in coveys from fall into spring.

Montezuma Quail (Cyrtonyx montezumae).- An uncommon resident of oak-woodlands at higher elevations and recorded on the Site only in winter (MH).

Killdeer (Charadrius vociferus).- Uncommon, in any season. Killdeer are attracted to stock tanks with mud banks; a pair nested at Apache Pass Tank in summer 1972 (MH).

Spotted Sandpiper (Actitis macularia).- One record: one bird at Apache Pass Tank on 18 August 1972 (MH). The species is a common migrant through the area but the Site lacks appropriate habitat for it (and other shorebirds).

Lesser Yellow-legs (Tringa flavipes).- One record: one individual on 29 August 1972 at the stock tank at the parking lot (MH). An uncommon transient in southeastern Arizona.

Band-tailed Pigeon (Columba fasciata).- Uncommon resident in general area; they may be seen in oak woodlands or flying over the Site. Not present every year.

White-winged Dove (Zenaida asiatica).- Common summer resident throughout Site but reaching greatest density in riparian habitats. Arrives in early April, nests May - July, and departs by late August (a few may remain into September).

Mourning Dove (Zenaida macroura).- Common throughout year; nesting usually from April through August. May occur in all habitats but must fly to water to drink (as must White-winged Doves).

Roadrunner (Geococcyx californianus).- Uncommon resident of area but has not been found nesting on Site.

Common Screech Owl (Otus asio).- Found on Site only in September 1975 but should be expected at any season, especially in riparian community and woodland. Fairly common resident in Chiricahua Mts.

Great Horned Owl (Bubo virginianus).- Fairly common resident foraging over all habitats and occasionally nesting on the Site.

Elf Owl (Micrathene whitneyi).- Fairly common summer resident, nesting in 1976 in lower Siphon Canyon. Probably also occurs in woodland.

Spotted Owl (Strix occidentalis).- One record, 28 August 1976, on a roost in a gully on the north side of Overlook Ridge (TBJ). A rare resident in the Chiricahua Mts.

Long-eared Owl (Asio otus).- One record: one bird stayed at Apache Spring for about two weeks in early April 1972 (MH). The species occasionally nests in the Sonoran zones in southeastern Arizona.

Whip-poor-will (Caprimulgus vociferus).- One record: a bird called at the pump house, 1 May 1972. The species is a common summer resident in the Chiricahua Mts. at higher elevations.

Poor-will (Phalaenoptilus nuttalli).- Common from spring through autumn, fairly common in winter. Nests in all habitats and may be heard calling in any month.

Common Nighthawk (Chordeiles minor).- Fairly common in summer over Second Fort Bowie site but there is no evidence of nesting.

Lesser Nighthawk (Chordeiles acutipennis).- Uncommon transient, to be expected in open situations.

Vaux's Swift (Chaetura vauxi).- One observed (SMR) over mesquite

grassland on 20 September 1975. The species is probably a rare migrant over the Site.

White-throated Swift (Aeronautes saxatalis).- One record: two flew over site on 21 May 1971 (MH). The species may be expected in any month; it is a common breeding bird in the mountains and wanders extensively over lowlands.

Lucifer Hummingbird (Calothorax lucifer).- Henshaw collected one at Fort Bowie on 8 August 1874 (Phillips et al, 1964). There have been no subsequent records of this rare species on the Site.

Black-chinned Hummingbird (Archilochus alexandri).- Common summer resident, nesting (June, July) in the riparian community.

Costa's Hummingbird (Calypte costae).- Occasionally seen in late April and early May (MH).

Anna's Hummingbird (Calypte anna).- The only records (MH): 13 October into November 1971; from March to mid-April, and in October, 1972. Zimmerman (1973) documented the eastern spread of the range of this species.

Broad-tailed Hummingbird (Selasphorus platycercus).- Fairly common migrant throughout Site.

Rufous Hummingbird (Selasphorus rufus).- A fairly common fall migrant, occurring from mid-July to mid-September.

Rivoli's Hummingbird (Eugenes fulgens).- One record: a female on 24 May 1972 (MH) .

Belted Kingfisher (Megaceryle alcyon).- The species is a rare migrant through the Site, recorded in March and September.

Common Flicker (Colaptes auratus).- Fairly common migrant and winter visitant in riparian and oak-juniper woodlands (mid-September to early May).

Gila Woodpecker (Centurus uropygialis).- Uncommon winter visitant in riparian community.

Acorn Woodpecker (Melanerpes formicivorus).- A common breeding bird in oak woodlands of the Chiricahua Mts., but rarely seen on the Site (July, October 1971; MH).

Lewis' Woodpecker (Asyndesmus lewis).- One record: 30 October 1971, one bird at Apache Spring (MH).

Yellow-bellied Sapsucker (Sphyrapicus varius).- Fairly common transient and winter visitant in riparian communities.

Williamson's Sapsucker (Sphyrapicus thyroideus).- One record: a female in oaks at Apache Spring on 15 April 1972 (MH). .

Ladder-backed Woodpecker (Dendrocopos scalaris).- Common resident in all habitats.

Western Kingbird (Tyrannus verticalis).- Uncommon transient on Site; it breeds nearby at lower elevations and in the Sulphur Springs grasslands.

Cassin's Kingbird (Tyrannus vociferans).- Common summer breeding

species in riparian community and adjacent slopes. Numbers may increase in spring and fall with passage of migrants.

Wied's Crested Flycatcher (Myiarchus tyrannulus).- One individual was present 10 June 1974 in tall trees in Siphon Canyon (SMR). The species nests in cavities, as do other members of the genus, and may occasionally breed on the Site.

Ash-throated Flycatcher (Myiarchus cinerascens).- Common summer resident in all habitats, arriving in April and departing in September.

Black Phoebe (Sayornis nigricans).- Rare winter visitant, recorded in January.

Say's Phoebe (Sayornis saya).- Uncommon resident, nesting in fort ruins.

Gray Flycatcher (Empidonax wrightii).- Uncommon transient (in riparian communities in April, May, September).

Western Flycatcher (Empidonax difficilis).- Fairly common transient; prefers riparian communities.

Unidentified Empidonax flycatchers. Many flycatchers of the genus Empidonax are difficult to identify in the field. Included here are E. oberholseri, wrightii, hammondii, and traillii. Collectively they may be considered uncommon transients.

Western Wood Pewee (Contopus sordidulus).- Common summer bird, occurring in all habitats but most commonly in Siphon Canyon, undoubtedly

nests. Occurs from mid-April into October.

Olive-sided Flycatcher (Nuttallornis borealis).- One record, a bird in Siphon Canyon 7 May 197? (MH).

Violet-green Swallow (Tachycineta thalassina).- Fairly common migrant. The species nests commonly at higher elevations and is to be expected from March to October on the Site.

Rough-winged Swallow (Stelgidopteryx ruficollis).- Uncommon fall migrant (to be expected in spring, also).

Barn Swallow (Hirundo rustica).- One record: one bird flew over ruins on 11 May 1972 (MH).

Cliff Swallow (Petrochelidon pyrrhonota).- One record: 21 May 1971, flying over Site. The species nests under bridges in a number of places in southeastern Arizona.

Steller's Jay (Cyanocitta stelleri).- Steller's Jays nest in mixed coniferous forests in the mountains of southern Arizona and wander extensively. They have been observed on the Site in December, January, May, and June.

Scrub Jay (Aphelocoma coerulescens).- Common resident. May occur in all habitats but most frequently in riparian and oak-juniper woodlands.

Mexican Jay (Aphelocoma ultramarina).- Uncommon but present throughout the year, usually in riparian or pinyon-oak woodlands. The species is more common at higher elevations in Siphon Canyon. In some years the

species probably nests on the Site.

Common Raven (Corvus corax).- Individuals fly over the Site at any season but the species is uncommon.

White-necked Raven (Corvus cryptoleucus).- This raven nests in nearby grassland communities but has been observed on the Site only in flight. The two raven species are notoriously difficult to recognize in the field. The White-necked Raven is probably the more common and may occur in any month.

Piñon Jay (Gymnorhinus cyanocephala).- The only observation (TBJ, SMR) of the species occurred 20 September 1975 when a flock of about 66 individuals flew across Overlook Ridge. Winter movements of the species are closely associated with Pinyon Pine cone production and they are to be expected on the Site only every few years.

Clark's Nutcracker (Nucifraga columbiana).- One record: one bird near Headquarters on 24 November 1972 (MH). Nutcrackers move about erratically and in autumn 1972 they wandered extensively over the Southwest.

Plain Titmouse (Parus inornatus).- A pair foraged in the oak-juniper woodland on 21 September 1975 (TBJ) but the species has not been recorded subsequently. The species is typical of pinyon-juniper woodlands further north in Arizona and is rare in the Chiricahua Mt. area.

Bridled Titmouse (Parus wollweberi).- Uncommon throughout the year

in riparian and oak-juniper woodlands. It probably nests on the Site.

Verdin (Auriparus flaviceps).- Common permanent resident, occurring in all habitats.

Common Bushtit (Psaltiriparus minimus).- Common in all habitats throughout year but has not yet been found nesting. Birds aggregate into flocks of up to 50 individuals in fall and winter.

White-breasted Nuthatch (Sitta carolinensis).- Fairly common winter visitant recorded late October to March; also 28 August 1976 (TBJ). Common nesting species in forests and denser woodlands of the Chiricahua Mts. but the Site probably lacks sufficient large trees for them.

Brown Creeper (Certhia familiaris).- Uncommon transient and winter visitant.

House Wren (Troglodytes aedon).- Uncommon migrant in riparian thickets.

Bewick's Wren (Thryomanes bewickii).- Common resident throughout Site.

Cactus Wren (Campylorhynchus brunneicapillus).- Common resident in all habitats.

Canon Wren (Catherpes mexicanus).- Uncommon summer resident on steep rocky slopes above lower Siphon Canyon. The species probably winters somewhere in the vicinity of the Site.

Rock Wren (Salpinctes obsoletus).- Common resident throughout Site. Most vocal and consequently most conspicuous in spring.

Mockingbird (Mimus polyglottos).- Common throughout the year; nesting. Breeding individuals may be replaced by winter visitants. Occurs throughout the Site but is most conspicuous in shrub grassland.

Bendire's Thrasher (Toxostoma bendirei).- Two records: a bird at Apache Spring on 3 January 1972 and another in Siphon Canyon 20 October 1972 (MH). The species nests in the San Simon Valley and should be expected occasionally on the Site.

Curve-billed Thrasher (Toxostoma curvirostre).- Common resident in riparian community and scrub grassland.

Crissal Thrasher (Toxostoma dorsale).- Common resident in thickets in all habitats but most conspicuous near Siphon Canyon.

Sage Thrasher (Oreoscoptes montanus).- Uncommon winter visitant (November - February).

American Robin (Turdus migratorius).- Common transient and winter visitant. Robins nest commonly in the Chiricahua Mts. and all robins move about extensively during the non-breeding season.

Hermit Thrush (Catharus guttatus).- Fairly common migrant and winter visitant in riparian habitat and thickets.

Swainson's Thrush (Catharus ustulatus).- Uncommon spring migrant, most likely in riparian community in May.

Western Bluebird (Sialia mexicana).- Uncommon winter visitant usually in oak-juniper woodland.

Mountain Bluebird (Sialia currucoides).- Recorded only on 30 November, 1 December 1972 (MH). Probably an uncommon winter visitant (but not occurring every year).

Townsend's Solitaire (Myadestes townsendi).- Uncommon winter visitant (October-March) in riparian and oak-juniper woodlands. The species may be common in some winters.

Blue-gray Gnatcatcher (Polioptila caerulea).- Uncommon summer resident in Siphon Canyon riparian community.

Ruby-crowned Kinglet (Regulus calendula).- Fairly common transient and winter visitant throughout the Site.

Cedar Waxwing (Bombycilla cedrorum).- Fairly common winter visitant; numbers vary from year to year.

Phainopepla (Phainopepla nitens).- The Phainopepla may be fairly common at any season if mistletoe berries are available. The species is noted for its almost nomadic movements in southern Arizona. In some years it may nest on the Site.

Loggerhead Shrike (Lanius ludovicianus).- This shrike is uncommon in winter and during migration. The species nests in adjacent grasslands and could occasionally nest on the Site.

Starling (Sturnus vulgaris).- One record: one bird at Headquarters on 20 May 1974 (MH).

Bell's Vireo (Vireo bellii).- Uncommon summer resident in riparian community of Siphon Canyon. Adults attended a fledgling on 10 June 1974. The species was not found on the Site in 1976.

Gray Vireo (Vireo vicinior).- A.K. Fisher collected one 17 May 1894 in the vicinity of the Fort and S.M. Russell saw one in oak-juniper woodlands on the Site on 20 September 1975. The species is probably a rare migrant through oak-juniper woodlands on the Site.

Solitary Vireo (Vireo solitarius).- Uncommon transient through all habitats.

Warbling Vireo (Vireo gilvus).- Uncommon migrant throughout Site.

Orange-crowned Warbler (Vermivora celata).- Uncommon migrant, to be expected in all habitats.

Nashville Warbler (Vermivora ruficapilla).- Uncommon migrant in all habitats.

Virginia's Warbler (Vermivora virginiae).- One record: 10 July 1972 at Apache Spring (MH). To be expected occasionally as a transient.

Lucy's Warbler (Vermivora luciae).- Common summer resident, nesting in Siphon Canyon riparian community and foraging into adjacent habitats. Breeds in May and early June and most depart before August.

Yellow-rumped Warbler (Dendroica coronata).- Fairly common transient and winter visitant in all habitats.

Black-throated Gray Warbler (Dendroica nigrescens).- Uncommon transient. This species nests in pinyon-juniper associations in the Chiricahua Mts. and could be expected to do so on the Site.

Townsend's Warbler (Dendroica townsendi).- Uncommon transient, to be expected in all habitats.

Northern Waterthrush (Seiurus noveboracensis).- A single individual foraged along the trickle of water below Apache Spring on 10 June 1974 (SMR). The species is to be expected as an uncommon transient at the spring.

MacGillivray's Warbler (Oporornis tolmiei).- Fairly common transient throughout the Site.

Yellowthroat (Geothlypis trichas).- One record: a female at Apache Spring on 8 October 1971 (MH).

Yellow-breasted Chat (Icteria virens).- Uncommon transient in riparian habitat.

Wilson's Warbler (Wilsonia pusilla).- Fairly common transient through riparian community.

House Sparrow (Passer domesticus).- Recorded a few times in the vicinity of the Site Headquarters in January, February and March (1972, 1973; MH).

Meadowlark (Sturnella sp. ?).- Marina Hoy observed a meadowlark in the ruins area in the 1975-76 winter. Both Eastern (S. magna) and

Western (S. neglecta) Meadowlarks may be expected in winter.

Hooded Oriole (Icterus cucullatus).- Common summer resident in riparian community and in thickets elsewhere.

Scott's Oriole (Icterus parisorum).- Uncommon transient. Should be expected as an occasional nesting species in mesquite grassland and ruins areas.

Northern Oriole (Icterus galbula).- The only records from the Site are of two pairs that remained at Headquarters for several days in April 1974 and a second year male at Headquarters on 13 July 1976 (TBJ).

Brown-headed Cowbird (Molothrus ater).- Present in small numbers from early spring to late summer and are undoubtedly brood parasites on local birds.

Bronzed Cowbird (Tangavius aeneus).- Uncommon summer visitant, probably occasionally parasitizing local birds.

Western Tanager (Piranga ludoviciana).- Common transient through the larger trees of Siphon Canyon.

Summer Tanager (Piranga rubra).- Uncommon summer resident in lower Siphon Canyon and Apache Spring area.

Cardinal (Cardinalis cardinalis).- Common resident; most birds occur in the riparian community and thickets close to it.

Pyrrhuloxia (Pyrrhuloxia sinuata).- Uncommon winter visitant in

thickets in all habitats.

Rose-breasted Grosbeak (Pheucticus ludovicianus).- One record, a male in Siphon Canyon on 13 May 1976 (TBJ).

Black-headed Grosbeak (Pheucticus melanocephalus).- Common transient, preferring riparian communities.

Blue Grosbeak (Guiraca caerulea).- Uncommon in summer but to be expected following substantial July rains when it may nest in washes or grassland.

Lazuli Bunting (Passerina amoena).- Uncommon transient throughout Site.

Painted Bunting (Passerina ciris).- Henshaw (1875) stated this species was "present at Camp Bowie" but it has apparently been recorded only once subsequently. Marina Hoy studied a female in Siphon Canyon on 11 April 1973.

Evening Grosbeak (Hesperiphona vespertina).- One record: a female in Siphon Canyon on 7 April 1973 (MH).

House Finch (Carpodacus mexicanus).- Common throughout the year, nesting (May-June) in habitats other than oak-juniper woodland. Small flocks are frequently encountered when they are not nesting.

Pine Siskin (Spinus pinus).- Recorded twice: several on 15 November 1971 and 8 April 1972 (MH). A common and widespread transient and winter visitant in the area.

Lesser Goldfinch (Spinus psaltria).- Present from June through September in small numbers in Siphon Canyon, but nesting has not been established. Uncommon in winter.

Green-tailed Towhee (Chlorura chlorura).- Common, sometimes abundant, migrant and winter visitant in thickets throughout the Site.

Rufous-sided Towhee (Pipilo erythrophthalmus).- Common as transient and winter visitant in riparian thickets (October to mid-May).

Brown Towhee (Pipilo fuscus).- The most common and widely distributed resident species.

Lark Bunting (Calamospiza melanocorys).- Fairly common transient and winter visitant. This is a flocking species when present; it is abundant in some winters in adjacent grasslands and desertscrub. The first fall migrants may arrive in early July.

Savannah Sparrow (Passerculus sandwichensis).- M. Hoy saw several near Apache Spring on 9 September 1972 and T. Johnson saw one individual there 19 September 1975. The species is probably an uncommon migrant.

Vesper Sparrow (Pooecetes gramineus).- Uncommon transient and winter visitant. Abundant in nearby grasslands in winter.

Lark Sparrow (Chondestes grammacus).- Fairly common summer resident and transient, usually in riparian growth and grassland. The species may be expected in winter.

Rufous-crowned Sparrow (Aimophila ruficeps).- Common resident of

rocky slopes of oak-juniper woodland and ruins area.

Botteri's Sparrow (Aimophila botterii).- The Botteri's Sparrow has been found only on 20 September 1975 (TBJ, SMR) in mesquite grassland. The species is probably a rare migrant: but may occasionally nest after unusually heavy summer rains.

Black-throated Sparrow (Amphispiza bilineata).- Common to abundant throughout the year in all open habitats; breeds following spring or summer rains. Individuals may wander if not nesting, and form small flocks.

Dark-eyed Junco (Junco hyemalis).- Common winter visitant wherever there is a combination of grass and cover.

Gray-headed Junco (Junco caniceps).- Uncommon winter visitant (November-May).

Yellow-eyed Junco (Junco phaeonotus).- One individual was present 30 January 1976 in a flock of Dark-eyed Juncos in oak-juniper woodland. The species is probably an uncommon winter visitant.

Chipping Sparrow (Spizella passerina).- Common to abundant from August to May throughout the Site, often in flocks.

Brewer's Sparrow (Spizella breweri).- Common to abundant as transient and winter visitant in all habitats but prefers grassland. The species is present from late August to late April and often associates with Chipping Sparrows.

Black-chinned Sparrow (Spizella atroquularis).- Fairly common from late August until March in Siphon Canyon, on the steep north slope of Overlook Ridge, and in the oak-juniper woodland.

White-crowned Sparrow (Zonotrichia leucophrys).- Common transient and winter visitant throughout Site.

White-throated Sparrow (Zonotrichia albicollis).- Two records: one on 1 January 1972 and another 27 January 1972 (MH). This eastern species appears frequently in southeastern Arizona in winter.

Fox Sparrow (Passerella iliaca).- One record: two birds at Apache Spring on 13 November 1972 (MH).

Lincoln's Sparrow (Melospiza lincolni).- Uncommon transient and winter visitant in thickets.

Song Sparrow (Melospiza melodia).- The species is an uncommon transient and winter visitant in thickets of the riparian community.

Table 1. Occurrence of bird species (individuals per transect kilometer) in four major habitats on the Fort Bowie National Historic Site, September 1975-August 1976. Symbols are as follows: W=wash-riparian, =mesquite-grassland, =oak-juniper woodland, R=ruins area and arid ridges. See map and text for further explanation.

	Fall				Winter				Spring				Summer			
	W	G	W	R	W	G	W	R	W	G	W	R	W	G	W	R
Turkey Vulture	9.4								1.6						0.2	
Cooper's Hawk	P			P			0.2		0.2				0.5		0.5	
Red-tailed Hawk						0.2									0.2	
Golden Eagle								0.1				0.3				
Gambel's Quail	21.9		3.1		3.1	2.6	5.4		2	5.8	3.8	5.8	2.1	2.7	6.4	1.2
White-winged Dove									4.7	0.7	0.2	0.3	0.8		0.2	0.2
Mourning Dove					0.2		1		2.3	1.1	0.2	0.6	4.9	0.5	2.8	2.6
Poor-will				P								P				0.2
Black-chinned Hummer	P								3.7			0.3	7.8	0.5	1	1.4
Common Flicker			1.5		0.6	0.2										
Gila Woodpecker					0.4											
Yellow-bellied Saps.					0.4											
Ladder-backed Wpkr.					0.8	0.7	0.4	0.1	1.2	0.2	0.2		0.8	0.5	0.2	

Table 1 (continued)

	Fall				Winter				Spring				Summer			
	W	G	W	R	W	G	W	R	W	G	W	R	W	G	W	R
Cassin's Kingbird	P			P					1.4			P	1.3			0.6
Ash-throated Flyc.	0.8								0.2	0.7	0.8	0.4	P	P	P	0.4
Say's Phoebe								0.3				0.6		P		P
Gray Flycatcher		1.5														
Western Flycatcher	P								0.6							
Empidonax (unid.)									0.6		0.4	0.3				
Western Wood Pewee	0.8		0.8						1		0.4		1.6			
Violet-green Swallow				P					1.4	1.1	1.2					
Scrub Jay	14.8		4.6	0.4	1.6	0.2	1.5	0.6	0.6		0.4	0.4	0.3		2.6	0.8
Mexican Jay	P		P	P						0.2	P		0.3	1	3.3	0.4
Plain Titmouse			1.5													
Bridled Titmouse			P						0.2		0.4					
Verdin	P	P	P	0.6	0.8	0.6		0.3	2.3	0.5		0.3	1.3	0.5		1.4
Common Bushtit	51.6														P	
Bewick's Wren			0.8	1.2	0.2		0.6		0.6	0.2	0.2		1		1	
Cactus Wren	3.1	0.7	1.5	P	2.9	0.7	0.8	0.1	2	0.6	0.6	0.6	3.4	2	0.8	P

Table 1 (continued)

	Fall				Winter				Spring				Summer			
	W	G	W	R	W	G	W	R	W	G	W	R	W	G	W	R
Canon Wren													0.5			0.2
Rock Wren	0.8		1.5	1.2				0.7			P	0.6	0.3		0.2	1.6
Mockingbird	P				0.2	0.2		0.7	0.2		0.6	0.4	P	0.2	P	P
Curved-bill Thrasher	5.5				2	0.6			1.4	0.4		0.2	0.5			
Crissal Thrasher	2.3		P	P	1		0.2		0.6				1.6	0.5	0.2	0.6
American Robin													0.3			
Hermit Thrush					1				0.4							
Ruby-crowned Kinglet	0.8				0.6	0.4	0.8	0.3			0.2					
Phainopepla	0.8				0.2	0.6	0.4	0.3					0.8			0.4
Loggerhead Shrike		0.7	0.8													
Solitary Vireo									0.4	0.2	0.2					
Warbling Vireo	0.8		P						0.4	0.2			0.8			
Orange-crowned Warbler	P								0.2	0.4		0.2				
Lucy's Warbler	P								2.5	0.6	0.2					
Yellow-rumped Warbler	P								0.6	0.2	0.2					
Black-throated Gray W.			P							0.2	0.2					

Table 1 (continued)

	Fall				Winter				Spring				Summer			
	W	G	W	R	W	G	W	R	W	G	W	R	W	G	W	R
Townsend's Warbler									0.4	0.2						
MacGillivray's Warbler	0.8			P					0.2	0.6	0.4	0.2				
Yellow-breasted Chat	0.8															
Wilson's Warbler	1.6								0.4	0.9	0.6	0.2				
Hooded Oriole									0.4		0.2		3.1			
Scott's Oriole	0.8															
Brown-headed Cowbird									1.0	0.6	0.4	0.4			0.2	
Western Tanager	3.2										0.6		0.3	0.75		
Summer Tanager	1.6								P				P			
Cardinal	3.9				6.6	0.6			3.9		0.8	0.4	5.2	0.5	0.2	
Pyrrhuloxia					0.2	0.4		0.1								
Rose-breasted Grosbk.									0.2							
Black-headed Grosbk.									1.4	0.4			0.8			0.2
Blue Grosbeak																0.2
Lazuli Bunting	0.8								0.2							
House Finch	0.8	0.7			0.2			3.3	1.6			0.3	0.3			1.2

Table 1 (continued)

	Fall				Winter				Spring				Summer			
	W	G	W	R	W	G	W	R	W	G	W	R	W	G	W	R
Green-tailed Towhee	10.9	4.5	1.5		0.6		0.2	0.1	0.8	0.2		0.6				
Rufous-sided Towhee					3.7	0.2	0.6		0.2							
Brown Towhee	11.7	0.7	3.8	1.8	3.9	2.4	0.8	2.2	1.0	2.2	0.2	0.6	3.0	1.2	0.5	1.4
Lark Sparrow	P	P									P				P	0.8
Rufous-crowned Spar.			2.3	1.2			P	P			P	P			1.3	1.6
Black-throated Spar.	1.6	P		1.8		6.0		1.9	0.4	0.9		1.2	1.8	4.5	0.5	2.0
Dark-eyed Junco					5.3	2.4	4.2	0.1								
Mexican Junco							0.2									
Chipping Sparrow			3.8		6.0	11.0	4.2					1.0		0.2	0.5	0.2
Brewer's Sparrow	3.9	18.6	2.2		3.5	9.9	1.5	2.8								
Black-chinned Sparrow	0.8				0.2	0.6	0.4									
White-crowned Sparrow	P	P			5.8	3.7	4.2	13.5								

SUMMARY AND CONCLUSIONS

This report cites 156 species from the Fort Bowie National Historic Site. At least 35 of the species nest more or less regularly (i.e., every year) and a few additional species may nest in some years. Undoubtedly the total list will increase considerably through the addition of transients and rare or accidental species.

More bird species have been found in the riparian communities than elsewhere, a pattern typical of southern Arizona. The taller trees and denser thickets of the flood plains attract not only a great number of sedentary species, but also birds that nest or roost there and forage in adjacent habitats.

None of the habitats or bird species at Fort Bowie is unique to that locality. All occur elsewhere, in more typical form or greater abundance. But in view of the limited area of the Site, the avifauna is rich and representative of several major habitat types. No rare or endangered species occur at Fort Bowie. A number of bird species, rare or local elsewhere, do occur in numbers on the Site and could be studied there conveniently.

Birds are highly visible, consequently an increasing number of persons have become interested in "bird watching". The Site will appeal to many visitors for its natural history as well as its human history. The birds that are present are there because of past human disturbance and in spite of it. The ruins and grassland communities are attributable to man and offer some birds a niche not available elsewhere on the Site. Other species are tolerant of human activity, which is less now than 100

years ago.

Management of the Site to increase its visitor use would not be detrimental to birds, except possibly at Apache Spring and in Siphon Canyon. The spring is utilized by great numbers of birds and an increase in visitor use, particularly during drier months, would intimidate many birds. The problem could be alleviated by making some water available in the immediate area but off of the main visitor's route. Lower Siphon Canyon is also rich in bird species, particularly larger or more secretive species. Any extensive development contemplated in Siphon Canyon, such as a campground or parking area, should be placed as far north in the canyon as possible to minimize human disturbance. Preferably (for the benefit of wildlife) there should be no campgrounds in Siphon Canyon; there are good sites available in the western portion of the Site.

Grazing at moderate levels has little adverse effect on bird life. The extent of grazing should be adjusted annually and based on the condition of the range. It is perhaps of no advantage to completely eliminate cattle; they prevent excess shrub growth to some extent and also reflect conditions of the last century when probably even more livestock used the area.

Periodic surveys of the birds of the Site, made at intervals of years, would provide a useful record of the changes that occur. Temperature and precipitation data gathered on the Site would be helpful in interpreting changes.

ACKNOWLEDGEMENTS

Park Service personnel stationed at the Fort Bowie National Historic Site have been most helpful in our survey. We wish to especially thank Marina and Bill Hoy and Dick Ferdon. Marina Hoy has done a commendable job of learning the local flora and fauna and has kept useful records. This inventory benefited immensely from her knowledge.

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A SURVEY OF THE REPTILES AND AMPHIBIANS
OF THE
FORT BOWIE NATIONAL HISTORIC SITE

by

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Fort Bowie National Historic Site

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Introduction

The amphibian and reptile populations on the historic site occupy habitats in three major biotic communities as discussed below under Biotic Communities and Habitats. A fourth habitat type, a man-made and essentially edificarian habitat, is represented by the ruins and vicinity of Fort Bowie (Fig. 1). The areas of the ruins of the two forts are in desert grassland, the potential climax for those parts of the historic site.

Field work on amphibians and reptiles was initiated in September 1975. Previous work in Apache Pass and on both flanks of the Chiricahua and Dos Cabezas Mountains has been conducted by personnel of the University of Arizona since 1950. During the period of on-site survey in 1975-76, observations on the amphibian and reptile populations were made on the historic site during Spring (May-June), Summer (July-August), Autumn (September-October), and Winter (January).

The objectives of the Park Service for the vertebrate faunal surveys on the Fort Bowie historic site

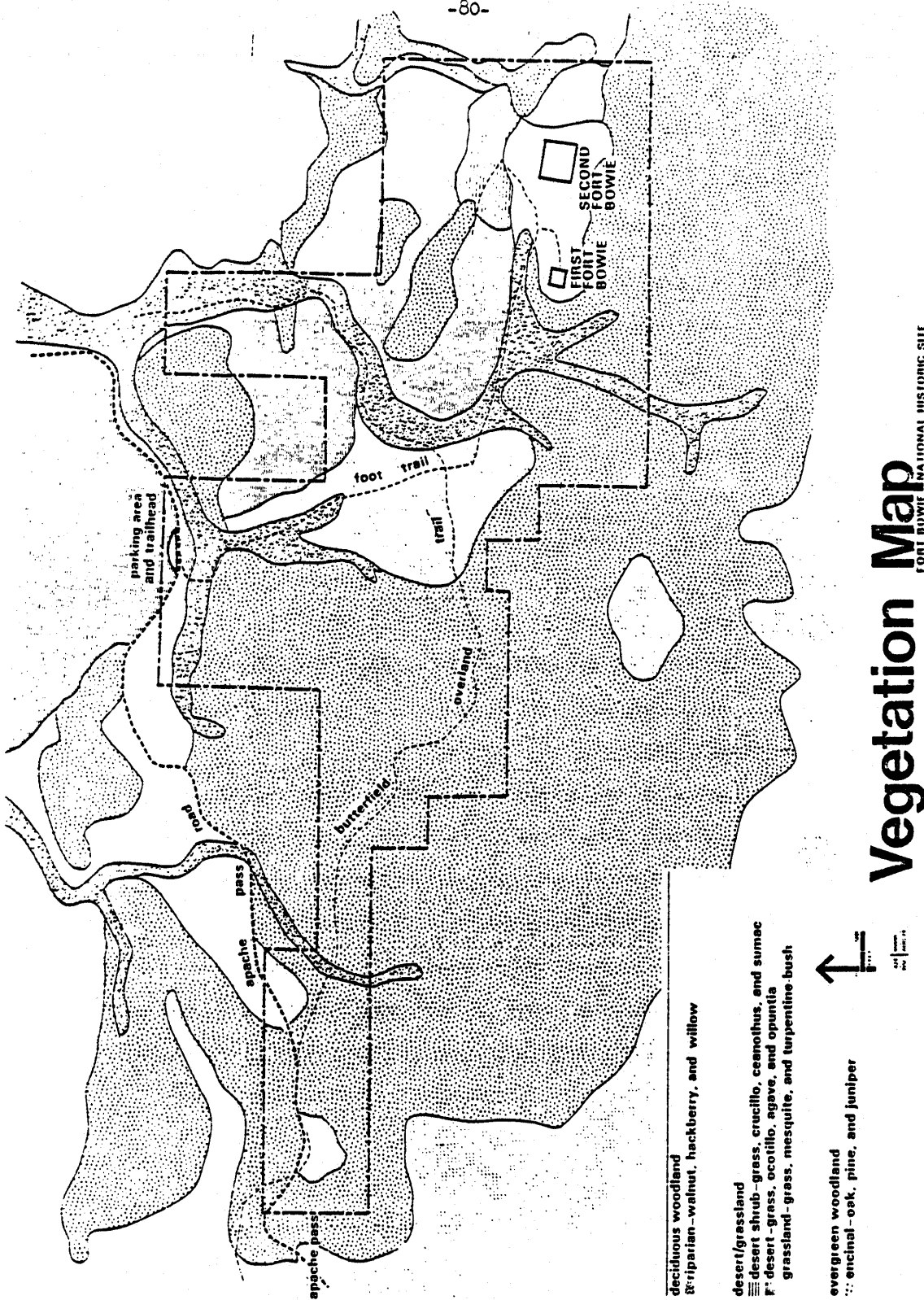


FIG. 1. FORT BOWIE NATIONAL HISTORIC SITE, IN MASTER PLAN, NATIONAL PARK SERVICE, 1975. SITE BOUNDARIES, PLACE NAMES, AND MAJOR BIOTIC COMMUNITIES. VEGETATION MAPPING PARTLY INCORRECT; SEE FIG. 2 AND TEXT.

include--for an annotated inventory of the vertebrate species of the historic site--(1) a list of all species known to occur within its boundaries, (2) estimates of relative abundance useful for management recommendations, (3) estimates of probable seasonal fluctuations in numbers, (4) habitat preferences in terms of major biotic communities, and (5) management recommendations if appropriate. The data reported are, of course, preliminary. While the study on site to date has been too brief to be concluded at this time, additional field work is designed to clarify during 1977 the few specific species questions remaining.

The strip-transect route described under Methods (see Fig. 2) for the field investigation of amphibians and reptiles, is the same transect used by T. Johnson in the bird survey reported by Russell and Johnson (1976). This arrangement for field work was both efficient and necessitated by the cost-benefit limitations of the Park Service budget provided for the on-site survey of vertebrate populations.

We thank Arlene Lowe, John Cross, Marina Hoy, Wilton Hoy, Richard Ferdon, and George Duran for assisting us during our survey of the historic site. The aerial photograph for Fig. 2 was provided by the U. S. Geological Survey, Menlo Park, California.

Methods

Field work was conducted in the major biotic communities and habitats described below. The design for investigation of the amphibian and reptilian populations consists of two principal parts: (1) repeated sampling on a continuous transect census route, and (2) spot sampling by search in additional habitat areas. A total of 30 field days were spent on-site during the survey period.

Most of the data were obtained from the strip-transect route mapped in Fig. 2. The transect is approximately 5.6 km in length. It is walked during daylight (primarily morning) hours. Total transect lengths (distance) within major habitats are as follows:

<u>Habitat</u>	<u>Distance (km)</u>
Desert Grassland	2.10
Evergreen Woodland	1.30
Savanna (ecotone)	
Riparian Woodland and	1.28
Scrub	
Fort Ruins	0.92

The additional careful search of the habitats on site and directly off site was conducted during the day and during the night during all seasons. Apache Pass road was also driven during the day and night.

Species vouchers for the herpetofauna were collected on site, or as otherwise noted, and are deposited



at the University of Arizona, in the Department of Ecology and Evolutionary Biology (Amphibian and Reptile Collection). Nomenclature does not follow Stebbins (1954, 1966) or Lowe (1964), none of which are current.

Biotic Communities and Habitats

Old Fort Bowie is located in desert grassland in Apache Pass, between the Chiricahua Mountains to the south and the Dos Cabeza Mountains to the north (Fig. 1). The present historic site is at the lower elevational end (4600-5200 ft el) of an ecological gradient on the northern end of the Chiricahua Mountains, between Bowie Mountain (6943 ft el)¹ and Apache Pass. High on the gradient, evergreen woodland is well developed on the slopes of Bowie Mountain and Helen's Dome (6377 ft el)¹ directly south of the historic site.

The photographic record for the Southwest reveals for any given locality, slight to dramatic changes in the landscape vegetation and flora. In the major biotic communities in southeastern Arizona that are also represented on the Fort Bowie National Historic Site, such biotic changes in the natural landscape have been dramatic to moderate in desert grassland and in riparian communities, much less so in Madrean evergreen woodland (Lowe 1964b, Hastings and Turner 1965).

¹ Cochise Head Quadrangle, USGS 15 min series, 1950.

Desert Grassland (352.3).²--Most of the historic site area is desert grassland (= semidesert grassland), and several distinctive desert grassland plant communities occur on site. All are faciations of two principal community types: (1) mesquite savanna and (2) scrub grassland variously comprised, in climax stand, of communities with dominance shared by perennial grasses and dry-tropic shrubs and shrubby species.

The dry-tropic species in the desert grassland here in Cochise County in southeastern Arizona are essentially Chihuahuan in affinity. As noted elsewhere (Lowe and Brown 1973), this is an extreme northwestern extension of a highly distinctive Chihuahuan Desert Grassland of vast extent in northern Mexico that is positioned, in general, slightly above Shreve's (1942) Chihuahuan Desert; these two Chihuahuan formations broadly overlap and interdigitate under complex edaphic controls, as more clearly seen off site, e.g., down-gradient between Old Fort Bowie and San Simon River, and in the San Simon Valley.

Evergreen Woodland (332.2).--The limited areas of woodland on site, where the evergreen trees are near their lower elevational limits, are essentially restricted to riparian situations. There are large areas of woodland-grassland ecotone that is a varied oak-juniper-pinyon

² Brown and Lowe (1974, b) digital system.

savanna, primarily of oaks, junipers, broad-sclerophyll and dry-tropic shrubs and shrubby species. Most of this savanna-like ecotone is incorrectly designated as woodland in Fig. 1. Part of the study transect is located there, as indicated in Fig. 2; it is designated Oak-Juniper Savanna (332.2-352.3 ecotone).

Riparian Forest, Woodland, and Scrub (333.1., 342.4, and others).--Within the overall basin-and-hill topography of, the historic site, the generally sandy washes, steeper gullies, and their floodplains support diverse riparian plant communities. Variation in composition and structure includes riparian forest stands of broadleaf deciduous trees, riparian woodland configurations of evergreen and/or deciduous trees, and diverse riparian scrub communities dominated variously by shrubby species characteristic of chaparral and woodland, desert grassland and riparian desertscrub. As seen in Fig. 2, riparian vegetation is well-developed on the washes and floodplains in Siphon Canyon and on several lesser drainage lines.

The gradient in structural diversity on channels and floodplains reaches greatest development in closed canopy riparian forest as in parts of Siphon Canyon and in the vicinity of Apache Spring. The canopy is characterized by various mixtures of broadleaf trees, including velvet ash, Arizona walnut, and netleaf hackberry. As noted

above under Evergreen Woodland, oak-dominated woodland on the historic site is essentially restricted to riparian habitats--a riparian evergreen woodland within desert grassland at the north base of the Bowie (Chiricahua) Mountain gradient.

Summary.--The classification itself for the vegetation mapped in Fig. 1 (USNPS 1975) is correct for the historic site and is at a meaningful level for representation of the principal biotic (plant-animal.) communities that occur there (desert grassland, evergreen woodland, deciduous woodland). however, as noted above, the mapping of these community units in Fig. 1 is not always correct. Park Service personnel are currently mapping the natural vegetation of the historic site.

Depending on the observer's objectives, criteria, familiarity with northern Mexico etc., more than 30 natural vegetation "communities" or "associations" can be readily recognized on the Fort Bowie historic site. Such fine resolution represents "plant communities" within the major biotic (plant-animal) communities or major habitat types for both plants and animals.

Based on the (1) sources of the faunal and floral elements (geographic elements) in the derivative Madro-Tertiary assemblages present on the historic site, (2) the gradient position of the site on the overall Chiricahua

Mountain gradient, and (3) the local topographic and edaphic characteristics of the site, the following habitat concepts are meaningful for first-order assessment of the terrestrial vertebrate populations present:

Desert Grassland habitats

Evergreen Woodland habitats = Savanna ecotones

Riparian habitats

Edificarian habitats

Results

The data for amphibians and for reptiles are given in separate tables (Tables 1-4), with maintenance of the same column heads within tables. It is to be stressed that the data reflect the situation only as observed on site or directly adjacent to the historic site and during the period September 1975 to October 1976, unless other wise specified in the Accounts of Species that follow. Field observations in January revealed no surface activity of amphibian or reptilian species, as expected.

Abbreviations for column heads in all tables are (1) DG, desert grassland, (2) OJ, oak-juniper savanna, (3) RH, riparian habitats, and (4) FR, fort ruins.

Ranking of Relative Abundance.--Field data were obtained for estimates of relative density (= relative abundance). Relative abundance is reported in Tables 1-4 for amphibians (toads and frogs), lizards, and snakes. The

usual five-category system is used for ranking population density. All of the terms for rank (Abundance, Very Common, Common, Uncommon, Rare) refer to observed relative abundance. For example, the term "Rare" means "rarely observed on site." The rank numbers (1-5) are used for tabulating the data (Tables 1-4) for relative density.

In the species accounts, a sixth category noted for occurrence on site is "hypothetical." Species that are noted as hypothetical in occurrence fall into one of two principal groups. For some the habitat on site is, or appears to be, marginal. For other species the habitat is, or appears to be, ample, but the period of intensive investigation was too short for encountering one or more individuals of the species; this is especially true for snakes.

Amphibians.--Peak activity occurs on wet summer nights. The following numbers are relative, in terms of all of the known amphibian species on site. They indicate, and are based on, what the observer may expect to see during a nocturnal visit to a particular habitat on site during the mid-summer rainy period (July-August).

<u>Rank No.</u>	<u>Rank</u>	<u>Abbr.</u>	<u>Interval^{1/}</u>
1	Abundant	A	$X > 20$
2	Very Common	VC	$20 \geq X > 10$
3	Common	C	$10 \geq X > 3$
4	Uncommon	UC	$3 \geq X \geq 1$
5	Rare	R	$1 > X$

Lizards.--Ordinarily the peak surface activity of lizards occurs during morning hours of warm-season days. A second and lesser peak of activity may occur in the afternoon. During Spring and Autumn, diurnal lizard activity begins conspicuously later in the morning and may extend more or less evenly across mid-day. Activity may be affected favorably or negatively by rain or preceding day (s) and/or night(s).

The relative densities (intervals) for lizards indicate, and are based on, what the observer may expect to see during an activity peak for a particular species. The intervals for lizards on site differ slightly from those for amphibians (above).

¹ Reference to less than 1 (<1) individual animal results from averaging observation data.

<u>Rank No.</u>	<u>Rank</u>	<u>Abbr.</u>	<u>Interval</u>
1	Abundant	A	$X > 25$
2	Very Common	VC	$25 \geq X \geq 15$
3	Common	C	$15 \geq X \geq 1$
4	Uncommon	UC	$5 \geq X \geq 1$
5	Rare	R	$1 > X$

Snakes.--During the period of survey, snakes were not encountered frequently enough to provide equivalent estimates of relative abundance for all species. They are ranked within-group from the most to the least commonly encountered species. The data are summarized in Table 4.

It is to be stressed that all quantitative population estimates generated in the survey for reptiles and for amphibians are for observed relative density. For snakes in particular, the reader should bear in mind that, due to differences in diurnal-nocturnal behavior, body size and secretiveness of snakes, the data in Table 4 do not necessarily reflect for all species the true relative density of the populations on site; see Accounts of Species.

Amphibians.--All amphibian species on site are anurans--toads and frogs. No population of the tiger salamander (Ambystoma tigrinum), native or introduced, has been observed on the historic site.

Table 1. Estimated relative abundance of species of amphibians observed in the major biotic communities and habitats on the Fort Bowie National Historic Site during the seasons of activity in 1975-1976. Habitats: DG, Desert Grassland; OJ, Oak-Juniper Savanna; RH, Riparian Habitat; FR, Fort Ruins. Abundance classes: 1 = A, abundant (>20 individuals expected per night in appropriate habitat); 2 = VC, very common ($20 \geq X > 10$); 3 = C, common ($10 \geq X > 3$); 4 = UC, uncommon ($3 \geq X \geq 1$); 5 = It, rare ($1 > X$).

Species	<u>Spring</u>				<u>Summer</u>				<u>Autumn</u>			
	DG	OJ	RH	FR	DG	OJ	RH	FR	DG	OJ	RH	FR
Scaphiopus hammondi					2	2	2	2	5	5	5	5
Bufo cognatus					4	3	3	3	5	5	5	4
Bufo punctatus						3	4	4		5	5	5
Rana pipiens		3				1				2		

Data by species are given in Table 1, for habitats and for relative abundance observed on site. While the data are for observations during all seasons, only one species (Leopard Frog, Rana pipiens) was observed during the Spring season. With minor exceptions, such as Rana and Hyla, the anuran activity in the area commences with the onset of the summer monsoon, ordinarily in July.

Local weather conditions can be mitigating for the investigation of the herpetofauna over a short time span. This is especially true for the southwestern anuran fauna. Local on-site weather in 1975 and 1976 was not favorable for especially high population production, nor for lengthy periods of nocturnal surface activity. Precipitation on site in 1976, the principal year of observation in the present study, was both below normal and late in initiation; moreover, it was a generally colder year (fide Marina Hoy, FBNHS). All of these factors reduce the probability of field contact during a given search event.

Reptiles.--The reptilian species known on site are lizards and snakes. The Box Turtle (Terrapene ornata) has not been observed on site; one or more local populations of T.ornata may be expected. The Desert Tortoise does not occur on site or near it. Absence of dependable (permanent or intermittent) stream or pond water on site--other than

the seep at Apache Spring--appears to preclude the presence today of mud turtles (Kinosternon).

Data by species are given in Tables 2-4 for habitats and for relative abundance observed on site. The data are for all seasons. As expected, no reptiles were observed during mid-winter (January). Activity on sunny winter days by the side-blotched lizard (Uta stansburiana) would be expected here as elsewhere in its broad southwestern geographic distribution, but the species is not known to occur on the historic site.

As also noted above under Amphibians, local weather conditions cause perturbations in reptilian behavior and surface activity during all seasons. The resulting effects at the population level are most often observed during subsequent seasons and years. The period of survey study did not encompass a period of high population levels for any reptilian species on site. Neither was the period of study notable for a preceding or concomitant catastrophic climatic event.

During 1975 and the first half of 1976, the area experienced a mild drought, as also evidenced elsewhere in the desert grassland in southeastern Arizona, where stock tanks (repressos) dried prior to the onset of summer rains in 1976. It is of interest in this regard that the quantitative data for reptiles on site during autumn 1976,

[illegible]

Table 3. Estimated relative abundance of species of lizards observed in the major biotic communities and habitats on the Fort Bowie National Historic Site during the seasons of activity in 1975-1976. Habitats as in Table 1. Abundance classes: 1 = A, abundant ($X > 25$ sightings expected per day in appropriate habitat); 2 = VC, very common ($25 \geq X > 15$); 3 = C, common ($15 \geq X > 5$); 4 = UC, uncommon ($5 \geq X \geq 1$); 5 = R, rare ($1 > X$). Estimates include data prior to 1975; see text.

Species	Spring				Summer				Autumn			
	DG	OJ	RH	FR	DG	OJ	RH	FR	DG	OJ	RH	FR
<i>Crotaphytus collaris</i>		4				3				3		
<i>Holbrookia texana</i>	3	3	2	2	2	2	1	2	2	2	1	2
<i>Sceloporus clarki</i>		3	3	4		3	2	4		3	3	4
<i>Urosaurus ornatus</i>	3	4	3	5	3	4	2	5	3	4	3	5
<i>Phrynosoma douglassi</i>	5			5	5			4	5			4
<i>Phrynosoma cornutum</i>				5				5				5
<i>Phrynosoma modestum</i>				4				3				3
<i>Eumeces obsoletus</i>			5	5			4	4			4	4
<i>Cnemidophorus tigris</i>	5		5		4		5		5		4	
<i>Cnemidophorus sonora</i> + <i>uniparens</i>	2	3	2	2	1	2	1	1	3	4	3	3
<i>Gerrhonotus kingi</i>			5				5				5	

Table 4. Species of snakes observed in the major biotic communities and habitats on the Fort Bowie National Historic Site during 1975-1976. Estimated overall relative abundance rankings, from most commonly observed species (1) to the least commonly observed species (9). Habitats as in Table 1.

Species	DG	OJ	RH	FR	Rank
<i>Thamnophis crytopsis</i>		X			6
<i>Masticophis bilineatus</i>	X	X	X	X	1
<i>Masticophis flagellum</i>	X				9
<i>Salvadora hexalepis</i>	X	X	X	X	4
<i>Elaphe triaspis</i>			X		7
<i>Pituophis melanoleucus</i>	X	X	X	X	2
<i>Tantilla yaquia</i>			X		8
<i>Crotalus atrox</i>	X		X	X	3
<i>Crotalus molossus</i>		X	X	X	5

compared to the data for autumn 1975, show a significantly lower hatchling success for lizards (Cnemidophorus, Holbrookia) in 1976.

Accounts of Species

The following species accounts give the status of each species as we know it from on-site investigation by us and by others. The first term following the species name is a current estimator for observed relative abundance on site (see Results).

As noted above, the ecologic and geographic position of the site is marginal for a few species that are not yet verified as occurring on site at this writing. These and other unverified species ("hypothetical") may have local populations on the historic site. Due to behavioral and habitat specializations, the two least likely species--among those designated as hypothetical in occurrence--for representation on site may be the mountain spiny lizard (Sceloporus jarrovi) and the banded rock rattlesnake (Crotalus lepidus).

Emigrant Canyon and Flatlands.--The Emigrant Canyon area east and northeast of the historic site is readily accessible and fairly well-known biotically. Our reference to Emigrant Canyon and Emigrant Canyon flatlands, refers specifically to a relatively large adjacent area off site, from the East Gate of the historic site and the extreme

lower (= north) Siphon Canyon areas, north and east toward the San Simon Valley. In general this is a progressively lower elevated area, as one goes northward and eastward and hence downgradient at the northeast end of the Chiricahua Mountains. The area is a dissected and complex mosaic of habitats characterized principally by creosotebush communities, desert grassland communities, and riparian scrub communities.

Amphibians =- Toads and Frogs.

1. Scaphiopus couchi. Desert Spadefoot Toad. Hypothetical on Site. No sight records or specimens from the historic site. Abundant nearby in the Emigrant Canyon flatlands, especially at and near dirt stock tanks (re-pressos). May occur on site, especially in extreme Lower Siphon Canyon where creosotebush communities just enter the historic site.

2. Scaphiopus bombifrons. Plains Spadefoot Toad. Hypothetical on Site. Widespread off site in desert and plains grassland. To date, all observations of spadefoots on the historic site have been of the following species, the Western Spadefoot grassland

3. Scaphiopus hammondi. Western Spadefoot Toad. Very Common on Site. Individuals seen in all four major habitats

in Summer, though sporadically, as expected, away from the actual breeding sites. Voucher pairs in amplexus from the Apache Pass Tank and the Trailhead Parking Lot Tank. Encountered (rarely) in all habitats on rainy evenings in the Fall; last date September 19, 1975 in Siphon Canyon wash at Tevis Rocks. Species becomes even more abundant than the desert spadefoot (*S. couchi*) in choruses (congresses) at stock tanks in the Emigrant Canyon flatlands.

4. *Bufo cognatus*. Great Plains Toad. Common on Site. Seen in all four major habitats on site in Summer; a few Fall records. Most frequently encountered on site in riparian sandy washes in rolling hills topography of oak-juniper and/or mesquite-grassland, especially the Willow Gulch, Cutoff Canyon, and Siphon Canyon areas. Becomes more common off site toward and into the Emigrant Canyon flatlands, where more stock tanks are also located.

5. *Bufo punctatus*. Red-spotted Toad. Uncommon on Site. Occurs on rocky hillsides and wash cuts. Seen calling and in amplexus at Apache Pass Tank and Trailhead Parking Lot Tank. On site it is most frequently encountered in the Oak-Juniper Savanna where it seems to be slightly more abundant, in Lower Siphon Canyon near Tevis Rocks, and in the Ruins area on the rocky hillside by the "Ice Machine." Occasionally seen (uncommon) in the Emigrant Canyon flatlands.

6. Bufo debilis. Green Toad. Rare on Site. One adult individual seen on July 16, 1973 at the wash near Ranger station headquarters. Correctly described on FBNHS record card as "yellow-green with black spots and bare creamy throat," a female seen by Wilton and Marina Hoy. Marina Hoy remembers one other sight record from the same area, during that same year or possibly the next.

7. Hyla arenicolor. Canyon Treefrog. Rare on Site. Marina Hoy saw one individual in the very wet summer of 1973, in the Apache Pass area. Species has not been seen since.

B. Rana catesbeiana. Bullfrog. Hypothetical on Site. Sight record (identification uncertain) at Apache Pass Tank on August 30, 1972. Not seen since. The bullfrog is an introduced (non-native) species in Arizona.

9. Rana pipiens. Leopard Frog. Common to Abundant on site, depending on season and year. At present they are only at the Apache Pass Tank in the Oak-Juniper rolling hills where the only permanent water supply is found in pond form. Marina Hoy remembers a few from the wetter years at the Trailhead Parking Lot Tank; it is a seasonal pond.

Reptiles -- Turtles

1. Terrapene ornata. Western Box Turtle. Hypothetical on Site. No specimen or sight record on the historic site, but occurs as a rare resident of the grasslands both west of Apache Pass and in the Emigrant Canyon flatlands to the north and east. One or more local populations may occur on site.

Reptiles -- Lizards

1. Heloderma suspectum. Gila Monster. Rare on Site. Several sight records from the site proper. Voucher from the Emigrant Canyon flatlands. Most sightings have been in the headquarters and dump area in July after the onset of the summer rains. Others are from the mesquite-grassland around the Butterfield Stage Station, and the Lower Siphon Canyon riparian area up to the Apache Spring area. Not seen on site this year (1976); all records are from Wilton and Marina Hoy and other personnel on site.

2. Coleonyx variegatus. Banded Gecko. Rare on Site. One sight record from the headquarters area at entrance to an old mine shaft; by M. Hoy on July 31, 1971.

3. Crotaphytus collaris. Collared Lizard. Common on Site, but localized. Only along the Apache Pass Road cut, and the pipeline easement from the Trailhead Parking Lot area

to just across Apache Pass. This is mostly very open terrain, of rocky hillsides and scattered oak-juniper; or, more commonly, widely scattered mesquites, oaks, and a few junipers. More common on southerly-facing hillsides.

4. Holbrookia texana. Greater Earless Lizard. Abundant or very common on Site. This is the most frequently seen species on the site. Most common in the sandy, broad washes with medium rocks available for perches, especially in Siphon Canyon and Willow Gulch. Also on open hillsides along the washes coursing through the mesquite-grassland and oak-juniper.

The greater earless lizard is apparently seen more frequently by visitors than any other species of animal, because of its preference for perching on the rocks that are placed as borders to the foot-trail throughout the trail course. In a warm Autumn (e.g., 1975) there is a hatchling or an adult on about every third rock along the entire foot-trail, from the trail head to the Ruins. In the Second Fort Ruins area, it is the most conspicuous reptile in any season except Summer, when its abundant presence on the surface is rivaled by the whiptails. In the oak-juniper it is more restricted to the washes, being especially numerous in the Wagon Train Massacre area.

5. Callisaurus draconoides. Zebra-tailed Lizard. Hypothetical on Site.

Though uncommon to common in the Emigrant Canyon, flatlands it was not found on the site: in 1975-1976. Marina Hoy believes that one was observed in extreme Lower Siphon Canyon on the north edge of the site, where the creosote bush community barely enters FBNHS. This is the most likely habitat on site for the species.

6. Sceloporus jarrovi. Mountain Spiny Lizard. Hypothetical on Site. No specimens or sightings on site. Elsewhere the species occurs on rocks and rock faces in desert grassland down to 4700 ft el. Closest record is a sight record by M. Hoy up on the Helen's Dome ridge, August 19, 1971. May be found to occur, eventually, in the rocky cliffs toward Apache Pass; however, the slopes in question are north-facing.

7. Sceloporus clarki. Sonora Spiny Lizard. Common on Site. In all riparian areas, especially at Apache Spring and throughout Siphon Canyon. Less common in the encinal or oak-juniper. Becomes uncommon in the Second Fort Ruins area, though there are always a few very large ones to be seen perching on the walls themselves. While seen more or less throughout the site, it is not out in the mesquite-grassland; also absent from open hillsides. Mr. George Duran (Site maintenance) believes that this

species, by digging in the walls, causes some problems in erosion control of the walls; wall erosion is a principal problem in the preservation of the historic site.

8. Sceloporus magister. Desert Spiny Lizard. Hypothetical on Site.

Expected on site, especially in the extreme Lower Siphon Canyon area with Callisaurus. The only record to date is a sight record by M. Hoy on June 25, 1971 of a large lizard running up a telephone pole in front of the headquarters trailer-house, which is at about 5200 ft. el; the lizard in question may have been Sceloporus clarki.

9. Urosaurus ornatus. Tree Lizard. Common on Site. Throughout the riparian areas, becoming either less common or more easily overlooked in the mesquite-grassland. Becomes uncommon in the oak-juniper and rare in the Ruins area, where trees are also sparse.

10. Phrynosoma douglassi. Short-horned Lizard. Rare or Uncommon on Site. Barely qualifies as uncommon in the Second Fort Ruins. Otherwise, seen only in sandy washes in the mesquite-grassland around the Butterfield Stage Station and the Parke Camp Site. More frequently seen than the following species, P. cornutum.

11. Phrynosoma cornutum. Texas Horned Lizard. Rare on a Site. Seen only in the area of the East Gate on rocky

hillside around the rocky wash. This is 5/8 mile northeast of the headquarters and toward the Emigrant Canyon flatlands, at about 4500 ft. Only once have more than one been seen in one day; on August 1, 1971, according to W. Hoy.

12. Phrynosoma modestum. Round-tailed Horned Lizard. Uncommon to Common on Site. Barely qualifies as common in the Second Fort Ruins area and onto the very open and somewhat denuded ridges or hillsides around them, especially the south-facing slope of Overlook Ridge. Perhaps the only valid reason to regard it as common rather than uncommon is to stress the fact that, in terms of relative abundance, it is more frequently encountered than is the Short-horned Lizard, and far more so than is the Texas Horned Lizard.

13. Eumeces obsoletus. Great Plains Skink. Uncommon on Site. Most frequently seen around the headquarters and dump area where there is some brush accumulation, and rocks, in the washes. In the wash-riparian of Lower Siphon and Lower Cutoff Canyons it is found around Nolina clumps in the riparian or oak-juniper areas. Becomes more conspicuous after the onset of the rainy season, being seldom seen before that time.

Cnemidophorus species. Whiptails; Whiptail Lizards.

Abundant (as a group) on Site. One or more species of whiptail lizards are found throughout the site area. They are most conspicuous and noisy in the leaf litter along Siphon Canyon, where they can be heard rummaging along in the debris. Three species are verified on site. A fourth, the Chihuahua Whiptail (C. exsanguis) was not encountered on site during the survey.

Contrary to current belief, accurate field identification without handling is not difficult for the adults of the whiptail species occurring on site. Non-adult individuals of C. sonorae and C. uniparens can be confused at distance, especially when the observation is not more than a whiptail "flash" as it is seen. Accordingly, the quantitative data in Tables 2 and 3 for the two species in the sexlineatus group (sonorae and uniparens) are lumped for totals observed.

The whiptails lumped as a group (the genus Cnemidophorus), i.e., lumped as a "species" as a visitor would do, probably are equal in abundance to Holbrookia texana, the greater earless lizard, which is the most abundant lizard species on the historic site. Whiptails clearly outnumber earless lizards at higher elevations in the oak-juniper savanna, especially on south-facing slopes, and also on the ocotillo and nearly denuded slopes in the desert

grassland, as on Overlook Ridge and around the Trailhead Parking Lot.

14. Cnemidophorus uniparens. Desert-grassland Whiptail. Common on Site. The most common whiptail species in desert grassland habitats, especially in mesquite savanna. More commonly seen away from riparian development than either the Sonora Whiptail or the Western Whiptail. Voucher specimens from desert grassland and riparian habitats in Siphon Canyon. This is an all-female (parthenogenetic) species.

15. Cnemidophorus sonorae. Sonora Whiptail. Common on Site. Not restricted to riparian habitats but more frequently seen there on site. Relatively more abundant than the Western Whiptail, which is also seen on site more frequently in sandy washes of riparian habitats. This species is the most frequently encountered whiptail at higher elevations in the oak-juniper savanna. Voucher specimens from riparian woodland in Siphon Canyon. This is an all-female (Parthenogenetic) species.

16. Cnemidophorus exsanguis. Chihuahua Whiptail. Hypothetical on Site. Not identified on site during survey. Verification of the presence of the Chihuahua Whiptail on the historic site would not be surprising inasmuch as it occurs elsewhere in the Chiricahua Mountains. However, the ecological metropolis of C. exsanguis in the Chiricahua

Mountains is at generally higher elevation, and the site area appears to provide only marginal habitat for this species. This is an all-female (parthenogenetic) species.

17. Cnemidophorus tigris. Western Whiptail. Rare on Site. Observations increase to uncommon in Summer in the extreme Lower Siphon Canyon where the wash is broad and sandy with many shrubs and rocks, especially on the islands of sand in the wash itself. Otherwise only seen in the mesquite-grassland at the Butterfield Stage Station and Parke Camp Site area, where there are many sandy washes that come together as they emerge into Siphon Canyon Wash. Voucher specimens from sandy wash habitats in Siphon Canyon. This is a bisexual species.

18. Gerrhonotus kingi. Arizona Alligator Lizard. Rare on Site. Several sight records over the last few years; from Apache Spring to the Lower Siphon Canyon-Tevis Rocks area; one was seen in October 1975 "diving" into a woodrat nest (pers. comm. E. Roth). In addition to observations in riparian habitats within the desert grassland, the alligator lizard is undoubtedly present on site in oak-grass habitats near 5000 ft el, as it is elsewhere in the Chiricahua, Huachuca, and other mountain ranges. While seldom seen (indicated "rare" above) without turning rocks, logs, and/or breaking logs open, when present it is often a locally abundant species.

Reptiles -- Snakes

1. Thamnophis cyrtopsis. Black-necked Garter Snake.

Observed in Upper Siphon Canyon near a water seep. Found at stock tanks (Apache Pass and Trailhead Parking Lot).

2. Heterodon nasicus. Western Hognose Snake. Hypothetical on site. No specimens or sight records from on site. A specimen from the Enigrant Canyon flatlands; specimen now at Chiricahua National Monument.

3. Masticophis bilineatus. Sonora Whipsnake. Most commonly encountered snake on site; seen in all habitats throughout area.

4. Masticophis flagellum. Coachwhip. One sight record from the mesquite-grassland near the Butterfield Stage Station. None have been seen on site by resident personnel. This is a fairly conspicuous species where present in numbers. Few are seen in this part of Cochise County. We have placed it last on the list in terms of relative abundance.

5. Salvadora grahamiae. Mountain Patch-nosed Snake.

One sight record (May 18, 1972, by M. Hoy). Seen in Siphon Canyon Wash, and was very distinctly marked.

6. Salvadora hexalepis. Western Patch-nosed Snake. Many sight records. Has been seen in all habitats on site.
7. Elaphe triaspis. Green Rat Snake. Several sight records on Site. Two old sightings: July 4, 1974 in the headquarters trailer-house area; October 6, 1972 in same general area but toward the East Gate along the very rocky arroyo with much shrub development. Two sightings this year on May 16 and 17, 1976 at the East Gate and by the pumphouse at the HQ trailer-house respectively. All observations are along same rocky arroyo.
8. Diadophis punctatus. Ringneck Snake. One seen on site August 19, 1972 by M. Hoy at the HQ trailer-house; not seen again. Ringnecks are secretive snakes and are seldom seen in the open. A fairly large population may occur on site.
9. Pituophis melanoleucus. Bull Snake. Considered to be the second most common snake. It occurs in all biotic communities throughout the site.
10. Lampropeltis getulus. Common King Snake. Hypothetical on Site. No specimens or sight records. Off site in desert grassland and riparian habitats. Nocturnal and diurnal; surface activity notable during and after rainstorms.

11. Rhinocheileis lecontei. Long-nosed Snake. Hypothetical on Site. No specimens or sight records. Desert grassland and desertscrub habitats; a nocturnal species.

12. Trimorphodon lyrophanes. Southwestern Lyre Snake. Two sight records by Marina Hoy. At Apache Spring (May 24, 1973) and in Siphon Canyon (May 16, 1976).

13. Tantilla yaquia. Yaqui Black-headed Snake. One specimen, collected on site; no others seen. Found in Lower Siphon Canyon just up-wash from the Tevis Rocks, where the canyon wall is steep and rocky down to the sandy wash, which was damp from recent rains in Table 4 this species is listed ahead of the Coachwhip (see above:) for which there is also one observation on site. Black-headed snakes are secretive and more difficult to locate than are coachwhips when present in numbers; most black-headed species also have relatively dense populations locally.

14. Micruroides euryxanthus. Sonora Coral Snake. Hypothetical on Site. One sight record near site, on northwest-facing slope of Bowie Mountain on June 30, 1973, at ca. 5500 ft el; on rocky slope with beargrass and mountain yucca. Seen by Wilton and Marina Hoy and confirmed by Messrs. Sipes and Marble from Chiricahua National Monument.

15. Crotalus atrox. Western Diamondback Rattlesnake. The third most commonly encountered snake on site. May be the most commonly met snake by visitors, due to its reluctance at times to move. Also frequently encountered along the foot-trail, especially the segment from the Butterfield Stage Station in mesquite-grassland to the Apache Spring riparian which represents the Middle Siphon Canyon area. Present in mesquite savanna, and occurs more or less throughout the site including part of the Oak-Juniper Savanna.

16. Crotalus molossus. Black-tailed Rattlesnake. In rocky and wooded canyons throughout the site. No observation in open mesquite-grassland. Apparently one or more always in residence at Apache Spring, which accounts for the relatively high incidence of snake-visitor encounters. Also observed in the Second Fort Ruins area.

17. Crotalus scutulatus. Mohave Rattlesnake. Hypothetical on Site. We have no verified records for this species on site. Three observed in grasslands at 2 to 10 miles west of the historic site. It is possible that some of the existing sight records for the Western Diamond Rattlesnake may refer to this species on site.

18. Crotalus lepidus. Rock Rattlesnake. Hypothetical on Site. None seen. Habitat marginal.

Summary and Conclusions

The historic site, in Apache Pass between the Chiricahua and Dos Cabezas mountains, is on the lower end of an ecological gradient at the north end of the Chiricahua Mountains. Desert grassland, oak-juniper savanna (ecotone), and riparian woodland and scrub are the principal natural biotic communities and habitats present on site. All major biotic communities were examined carefully during the survey for the presence of amphibian and reptilian populations, as were the disturbed areas at and associated with the ruins of the two forts; the forts were built in desert grassland. Field work was conducted during the period September 1975-October 1976 within the major habitats represented on the historic site, permitting assessment of relative abundances of amphibian and reptilian species. Species vouchers were collected and deposited at the University of Arizona.

Data are reported for relative abundance within habitats, and for estimated relative abundance over the entire historic site. Seasonal variation in activity and observed density is reported.

A total of 6 species of amphibians and 26 species of reptiles are known to occur on the historic site. The data are preliminary. The possible presence on site of an additional 14 species (3 amphibians, 11 reptiles) is discussed. Accordingly, species accounts are given for a total of 46 taxa.

All amphibian species known from directly on-site are anurans (toads, frogs). All reptiles are either lizards or snakes.

Of the six species of anurans verified on site, the two most broadly distributed ecologically are the two most frequently encountered, (1) the Western Spadefoot Toad (Scaphiopus hammondi) and (2) the Great Plains Toad (Bufo cognatus), in that order. The three least frequently encountered species are more ecologically restricted and/or considerably less abundant, (1) the Green Toad (Bufo debilis), (2) the Canyon Treefrog (Hyla arenicolor), (3) the Leopard Frog (Rana pipiens). The Red-spotted Toad (Bufo punctatus) is intermediate; while restricted to rocky situations, usually in canyons, arroyos, and washes, it is more broadly distributed and more abundant on site than is the leopard frog and canyon treefrog.

The hypothetical occurrence on site of the two other spadefoot species (Desert Spadefoot Toad, Scaphiopus couchi, and Great Plains Spadefoot Toad, Scaphiopus bombifrons) is judged on the basis of two factors: (1) presence on site suitable if marginal habitat, (2) the existence of offsite but neighboring populations.

While no species of turtle or tortoise is known to occur on the historic site, the Western Box Turtle (Terrepenne ornatus) may eventually be encountered, as there are resident populations in habitats adjacent to the site.

The four most abundant lizards on site are (1) earless lizards (Holbrookia texana), (2) whiptail lizards (Cnemidophorus), (3) tree lizards (Urosaurus ornatus), and (4) spiny lizards (Sceloporus clarki), in that order. The four kinds of lizards most commonly encountered by visitors are the same as listed above, except that the Sonora Spiny Lizard and the Tree Lizard is reversed. The smaller and concealingly bark-colored Tree Lizard is less conspicuous to the usual visitor.

Seven species of lizards on site form a second recognizable group, each of which is less abundant or generally less conspicuous, and more local in its occurrence than are the preceding four: (1) Gila Monster (Heloderma suspectum), (2) Collared Lizard (Crotaphytus collaris), (3) Short-horned Lizard (Phrynosoma douglassi), (4) Texas Horned Lizard (Phrynosoma cornutum), (5) Round-tailed Horned Lizard (Phrynosoma modestum), (6) Great Plains Skink (Eumeces obsoletus), (7) Arizona Alligator Lizard (Gerrhonotus kingi), and (8) Banded Gecko (Coleonyx variegatus).

The occurrence of four additional species of lizards on site is possible, i.e., occurrence is hypothetical. Occurrence on site is estimated on the basis of habitat and existing off-site but neighboring populations; on-site habitat appears to be marginal for some of these species: (1) Zebra-tailed Lizard (Callisaurus draconoides), (2) Desert Spiny Lizard (Sceloporus magister), (3) Mountain

Spiny Lizard (Sceloporus jarrovi), and Chihuahua Whiptail (Cnemidophorus exsanguis).

The apparent absence of the lesser earless lizard (Holbrookia maculata) and the side-blotched lizard (Uta stansburiana), anywhere on the historic site thus far examined, is noteworthy.

The snakes most commonly encountered on site are (1) whipsnakes (Masticophis), (2) bull snakes (Pituophis), (3) rattlesnakes (Crotalus), and (4) patch-nosed snakes (Salvadora), in that order. Although snakes are generally a relatively inconspicuous element in the fauna, the preceding snakes are much more conspicuous on site than are the following: (1) Black-necked Garter Snake (Thamnophis cyrtopsis), (2) Green Rat Snake (Elaphe triaspis), (3) Ringneck Snake (Diadophis punctatus), (4) Southwestern Lyre Snake (Trimorphodon lyrophanes), and (5) Black-headed Snake (Tantilla yaquia).

The occurrence of the following six species of snakes (listed as hypothetical) is unverified on site at present: (1) Western Hognose Snake (Heterodon nasicus), (2) Common King Snake (Lampropeltis getulus), (3) Long-nosed Snake (Rhinocheilus lecontei), (4) Sonora Coral Snake (Micruroides euryxanthus), (5) Mohave Rattlesnake (Crotalus scutulatus), and (6) Rock Rattlesnake (Crotalus lepidus). The Glossy Snake (Arizona elegans) has not been observed

and is also not listed as hypothetical in occurrence. Topography and soil type on site may preclude its local presence there.

Three poisonous and potentially dangerous species of reptiles are verified on site. Two species of rattlesnakes, the Western Diamondback Rattlesnake (Crotalus atrox) and the Black-tailed Rattlesnake (Crotalus molossus), and the Gila monster (Heloderma suspectum) occur in several parts of the site.

The occurrence of additional poisonous and potentially dangerous species on the historic site is probable (first and second species) or possible (third species) as follows: (1) Mohave Rattlesnake (Crotalus scutulatus), (2) Sonora Coral Snake (Micruroides euryxanthus), and (3) Rock Rattlesnake (Crotalus lepidus). Species accounts are given also for these and other species (harmless) judged "hypothetical in occurrence" on site.

Recommendations

There are two primary and related recommendations to be made for resource management on the historic site, viz., (1) restrict access, and (2) enforce regulations.

1. Catastrophic events aside, the single greatest catalyst for negative impact on the historic site during the present and in the future is Access. This most important recommendation to the Park Service, regarding animal and plant populations in Parks, Monuments, and Sites, cannot be overstressed. Restrict road and trail access to an essential minimum. Determine that minimum early on and incorporate it in the Master Plan. Then, do not change the plan.

Impact and site destruction on the new historic site should remain approximately proportional to trail and road access development.

2. Enforce existing National Park Service regulations that are already in effect (1) that prohibit on-site collecting of animals, plants, and other objects without proper written permit, and (2) that prohibit destructive and potentially destructive acts including the use of off-road vehicles.

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