

A GENERAL REPORT ON THE VERTEBRATES
OF
PINNACLES NATIONAL MONUMENT

by

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Summer, 1958

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VERTEBRATES OF PINNACLES NATIONAL MONUMENT

Introduction

Pinnacles national Monument is maintained by the National Park Service under the Department of the Interior of the United States Government. The area was proclaimed a national monument by Theodore Roosevelt in 1908. It was set aside for its geological importance as well as for its aesthetic values. It is located in the Gabilan Range which forms a part of the Coast Ranges of Central California. The monument is almost entirely within San Benito County, but a small portion of the western fringe lies in Monterey County.

The area is not a sample of any static conditions of the Coast Ranges, but it contains all the elements and qualities necessary to demonstrate the nature of the interaction of the natural processes which occur at one point. These processes are dynamic and they change continually, as they have always changed and as they will continue to change. They involve the water, the land, the plants, the animals, and all the atmospheric and radiant forces of climate. In addition, let us not forget the importance of man's interference by his presence and improper activities.

As the study of the area is presented, and as the area is further studied, it should be the aim not directly to preserve any specific objects now occurring in the park, but primarily to insure

freedom for all the natural features and the wildlife "in such manner and by such means as will leave them unimpaired for the enjoyment of future generations". This involves a degree of understanding and appreciation of those processes which are admittedly difficult to comprehend, but must be maintained for correct sound control.

A primary study of the area has been undertaken from April 1, 1958, through September, 1958. The emphasis has been placed on the animal life and its relation to the environment.

General Features of the Area

Pinnacles National Monument lies almost exactly in the middle of the State of California, north to south. It is about 80 miles inland from the coast and about one-third of the way from the Mexican border to the Canadian border of the United States.

The coast ranges, which form the western rim of the great valley, is wholly different in origin and structures from the Sierras. They are composed of rocks which have been bowed up into great arches or anticlines; the Sierras are great blocks of the earth's crust which have tilted to the west. The Gabilan Range, however, was formed in still a different manner. Thirty million years ago, volcanic action built up a high range 8000 feet in height. The Pinnacles region consists of this worn down material. Old exposed breccias and rhyolites, as well as granite and basalts, eroded through the millions of years, left standing majestic spires which gave the name to the monument.

The Coast Ranges are approximately parallel to each other and to the coast with narrow valleys between.

The elevations differ very little within the monument. Chalone Creek is the lowest point (1000'); while Chalone Peak, in the southwestern portion, rises to 5505 feet above sealevel. Although there is a variation of only 2500 feet, the topography is varied throughout. This results in a very rich flora and fauna. Because of this varied topography, the access to the land is quite difficult and only one-eighth of the land is observable from the roads and trails.

There are many factors involved in determining the various kinds of animals and plants that occur here and their modification to the land. A slight slope toward the morning or afternoon sun greatly increases the warmth of certain land masses. Adding to this, the various ridges are effective in deflecting the course of the wind so as to produce many types of climate locally within the 12,000 acres. There are many high ridges that afford ample protection for the creek habitats. The high peaks, which lie in the central northern half of the monument, act as a determining factor for the flora and fauna. The influence of these high rocky spires not only allow for additional habitats, but also deflect and moderate the habitats about its shadows.

ENVIRONMENTAL RELATIONS OF THE INVERTEBRATES

Climate

The climate of San Benito County is generally characterized by wet winters and very dry summers. The latitude, the surrounding relief, and the proximity to the Pacific Ocean give the area a mild yet diversified climate. Precipitation varies considerably within the county and within the monument proper. Pinnacles has an average rainfall of 16.3 inches per year, while Hollister, 35 miles to the north, has 13 inches. Two weather stations are maintained in the monument during the summer months and one throughout the year. For an average month of an average year, contrasting the two stations, the Chalone Peak mean August temperature was 72 degrees. The Bear Gulch, or headquarters, station averaged 85 degrees. The relative humidity for the same month at Chalone Peak was 39.5% and 26.5% at Bear Gulch headquarters. Examination of other points in the Coast Ranges show San Jose with a mean precipitation of 14.3 inches, Los Gatos, at the foot of the Santa Cruz Mountains, 29.6 inches, and Lick Observatory, on Mt. Hamilton, 28.6 inches.

Weather

I will use the dictionary definition of weather for the present discussion. It is the state of the air or atmosphere with respect to heat or cold, wetness or dryness, ~~calm~~ storm, clearness or cloudy, or any other meteorological phenomenon. During the summer months the ordinary daily changes in weather are likely

to be almost as great as the whole range of climate in a year at Pinnacles.

The monument is affected by the winds, rains, fog, and the over-all exposure to the weather. The tops of the ridges are nearly always affected by the winds which are, at times, quite severe in the late afternoons and subside toward evening and in the morning. The cold breezes cause the warmblooded animals to seek concealment and the decrease of insect activity seriously hampers their predators. On occasional days when fog engulfs the peaks effects on the animals are noted. It hinders their vision as well as cutting off the sunshine from the land and cooling the air. This causes the vertebrates, as well as the invertebrates, to respond directly in their activities.

With the coming of fog or cloudy weather there is a general cooling of air. Therefore, the animals seek a warmer locality. Some may actually withdraw from the area. Others may be hampered in their foraging methods as with the birds; or they may proceed to hunt in an entirely different manner on these occasions. It was not learned if this actually brought about a change in the numbers of vertebrates to the area. It does not seem that, in seasons of less food abundance than the past one, this factor might easily cause a reduction in bird population.

Rain tends to drive the smaller animals to cover and even the larger ones if the rain is severe. Insects and many small burrowing animals drastically are affected by abnormal rains. Such a

rain was experienced through the winter of 1957-58. The rainfall of 1958, through June, added up to 18 inches, and by September 12, 1958, 22.68 inches. The normal year's rainfall is 16.3 inches.

Last, but certainly not least, the dry rainless summers are an extreme controlling factor. Although the creeks were overflowing in April and May, rainless summers produce a land of little water. Until the wet winter, the monument is baked in dry, hot days throughout the summer. During the first week of September, 1958, a survey was taken on the many streams and water-courses that held water only a few months earlier. Only a few offered watering locations for the inhabitants. The findings were as follows:

1. The largest body of water was, of course, the Bear Gulch Reservoir. The high point during the past winter was a full reservoir with maximum depth of 40 feet. The overflow was considerable. The September check showed the level at less than 11 feet.
2. The next greatest water supply was that at Chalone Creek, just north of the bridge on the entrance road. There is a spring that can be definitely regarded as flowing from a specific place. While along the creek is considerable seepage as well. This area has water for about 150 yards running under the bridge for several yards to the south. The willows, rushes, and similar water-indicator plants are dominate along this course.
3. There is an important watering area at the mouth of the Bear Gulch "caves". A check-dam holds the water forming a small pool about a quarter acre in size.
4. Willow Spring is important in the sense of location. Here, in the eastern central part of the monument is a fine watering location with a great deal of protective importance. It is a source for the drinking water for Chalone Creek campground as well. There is about 700 feet of moving water which forms very few pools before sinking into the gravels.
5. Moses Spring along the north side of Bear Gulch provides year-around flowage necessary for life.

6. On the west side of the monument, near the campground, at the end of the Soledad Road, is a small spring. About it is good cover and browsing for wildlife.

7. Juniper Canyon Spring, also on the west side, is located near the mouth of Juniper Canyon and has served well in past years as a water source for the CCC occupation. The moisture seeping about the spring allows for some animal use, but this region can be well developed in future years for human use.

There are also several small springs found throughout the canyons and gullies that are oftentimes forgotten. These small seepage areas are important water sources during the dry months. Even if for only a few small potholes or pools here and there, the land is able to sustain a higher population of wildlife than would otherwise be able to live in this dry land.

One spring was found in Frog Canyon just north of Mt. Defiance. Here is water in a different location than previously known. Other locations for such important water holes are in Condor Gulch; along Chalene Creek a few hundred yards south of the Old Pinnacles Campground; and along the lower portion of Bear Gulch where water remains above the surface throughout the year. These small watering locations may well be the most important ones in the monument. For these are the survival values of the country. It is also very likely that many more such water holes persist about the monument. Few are known, but even these few sustain a great abundance of animal life through the hot, dry summers for which Pinnacles is known.

Habitat Divisions

The vertebrates which live at Pinnacles come to be there by several different ways. Some are born and reared on the area and may occupy it for many successive generations without moving outside the area. This applies especially to the amphibians, reptiles, and some of the mammals. Generally, these are the ones whose food habitats and restricted locomotion tend to keep them on a fixed location. Some of the species of the area come there for short or long periods, but may occupy their habitats for only a part of their activities. A good many of the species in the area are residents only in the migratory status. These migrants, mostly birds, may live on the area only during the breeding season; they may come for the winter; or they may be only transients that are present for only a few minutes or for many weeks in spring or fall.

The geographical location of the area mainly determines what animals come to it, but whether or not each individual stays after it has arrived is largely dependent upon the nature of the surroundings at the time of its arrival. The present discussion is concerned with those qualities which make it habitable by terrestrial vertebrates.

For a better description of the monument and the environmental relations of the vertebrates, it is necessary to divide the area into different biotic habitats. There are four important communities. The riparian habitat is that along the creeks. It is characterized by the particular plants found there, which include western

sycamore Plantanus racemosa, willow Salix, cottonwood Populus, wild rose Rosa californica, California blackberry Rubus vitifolius, mule fat Laccharis viminea, and rushes Juncus. Although the riparian habitat itself is a very insignificant percent of the entire land mass involved, it is of great importance in the distribution of the fauna during much of the year.

About three percent of the total area can be regarded as oak woodland. This habitat is a very important biome for the fauna of the monument. Many animals find food, shelter, and nesting space here. The characteristic plant life in this community includes Coast live oak Quercus agrifolia and blue oak Quercus douglassii, holly-leaf cherry Prunus ilicifolia, toyon Photinia arbutifolia, red-berry Rhamnus crocea, California buckeye Aesculus californica, and Digger pine Pinus sabiniana.

It is very difficult to separate the true wooded areas from the ecotone areas, or those of grassland that are invaded by the woodlands. Many times it is not the trees that influence the distribution of the fauna, but the mixture of each, or the slope and the woodlands, or again the rocky outcrops that can be found in a true woodland community.

Chaparral refers to many kinds of plants. It is a large community of living things and over 80% of all the plant life of Pinnacles can be found in this particular biotic community. Chamise Adenostoma fasciculatum is by far the most abundant species of this group. Buck-brush Ceanothus cuneatus and manzanitas Arctostaphylos are also chaparrals.

The rocky regions, that give Pinnacles its name, make up the fourth biotic community. Few plants are found growing on the spires and steep walls. Lichen is common here as well as rock lettuce Cotyledon laxa.

Now that separate communities have been established, it is easy to see that each has particular plants that are found in their respective habitats, and the same theory applies to the vertebrate animals of the monument. Each species of animal, whatever it may be, has a preferred place to live. These areas are predicted by several welfare factors. These include the food supply, water supply, the cover, and many special factors such as gravel to lie upon, dust for dust baths, mud, hibernation places, caves, deep water, wind-swept knolls, or sandy areas. All of these may influence an animal to stay for a short time, permanently, or to move on to another habitat.

Since the entire monument is located in the Upper Sonoran life zone, it can be predicted what animals frequent each particular biotic community. Along the streams is an extremely fine place for the animal population, because here is water, cover, and food. The few fish that can be found in the monument live here as well as the amphibians that live nearby or in the water for at least part of their lives. Here, too, are the many animals that are able to move about from place to place. Many birds come from miles around to drink at a certain spring or a large mammal may develop habitual watering hours in which he frequents the water courses. Many predator animals seek smaller prey along the thickly populated creeks.

More time will be spent on each species of animal under the accounts of species, but here is to be a brief description of what lives in each respective habitat. Frogs are abundant along the waterways, as well as at the reservoir. Many mice and other small mammals serve for food to the night-prowling raccoons Procyon lotor. Bats, flycatchers, and quail are common residents in the riparian habitat.

The oak woodlands harbor many of the monument's animals. Generally speaking, the north slopes hold most of the woodland regions. It is a place that is shaded throughout the year. Therefore, the temperature is fairly constant compared to the sunny slopes and ridges. Throughout the state, the oak woodlands have the highest rainfall (15-40 inches) and the lowest temperature (29-42 degrees in winter) of any wildlife region.

The influence of the oaks on the vertebrates is considerably greater than their numerical proportion would warrant. Because of the many evergreens interspersed among the oaks, it provides for an annual presence of insect food and thus an active feeding area for many animals. The foliage is especially favorable during the flowering in the spring. In years of little growth, and during the dry summers, the foliage saves the lives of many deer, and the bark may be eaten by smaller animals. Numerous pits on the stems reveal winter feeding activities of sapsuckers. During the fall months, the oaks are the center of activity. When the acorns ripen, they serve as food stuff for hundreds of vertebrates. The acorn woodpecker Melanerpes formicivora store thousands of acorns for the rest

of the year. Their diet, during harvest time, consists of as much as 95% acorns. He is not the only bird that enjoys the acorns. The scrub jays Aphelocoma coerulescens also eat the acorns and the small hummingbirds prefer the sweet liquid material about the fruit, as do the mice, wood rats, and bush-tits Psaltiriparus minimus.

The small acreage of grasslands is included in the oak woodland biota. Some of the grassy regions are very small and some are of considerable size. These are the browsing lands for deer, and during the mornings and late afternoons the deer are sometimes abundant feeding in the open grasslands. From the standpoint of needs of the animals, the grasslands, which are about and under the oaks, exhibits several features which contrast markedly with other habitats. They range all the way from the tall dense grasses, up to four feet high, to low, sparse grass on hard-packed ground. Some animals get all their food directly on the ground surface or within reach as they stand on the surface. Others cling to the stems of the low plants while they eat the leaves, or the seeds, or the other animals they find there. A great many find it profitable to burrow or scratch beneath the surface to reach the roots or soil-inhabiting small animals.

In general, animals that are active in this habitat in the daytime are subjected to more extreme physical conditions than in the other parts of the monument. The light is more brilliant; on warm days, it is hotter; on cold days it may be colder; the wind is stronger on the ridgetops of grasslands than where the plants are

taller and act as a windbreak. The advantage of the woodlands is to be near a protected area and yet have the possible food materials. Many animals prefer this oak-grassland relationship such as the rabbits, California ground squirrel Spermophile beecheyi, and lark sparrow Chondestes grammacus.

In many ways the grasslands pertain to the open chaparral regions. To generalize, these habitats all have the same types of habitats among the larger more defined plant community. Again, it is difficult to absolutely determine the preference factor of each biome. Although the most widespread community is the chaparral, this does not mean that this particular community accounts for the greatest population of animal life. It is very important to the vertebrates of the study area in many ways. Not only does it provide excellent cover for many animals that use this area for concealment, but it is also available feeding area for deer and other mammals. The 80 to 100 percent cover provides protection and nesting sites for many types of birds. The California quail Lophortyx californicus is prominent in these areas where there is a heavy protective cover from their many enemies. Whether or not they live in the same habitat throughout the year is another factor, for with a lack of water during the dry months, they more than likely prefer the cool and moist riparian habitats. Therefore, the winter months may be responsible for the importance of the chaparral, but when the hot, dry summer days arrive the chaparral is much less selective.

The content of this habitat is crowded much nearer the ground than in the woodlands and is generally more densely filled with limbs and the foliage of plants. These conditions favor the power to escape from predators. Wrens and wrentits Chamaea fasciata, as well as woodrats and many species of mice live here. Brush rabbits Sylvilagus sp. can find shelter from a pursuing predator. Even the deer find this type of cover fine protection moving about the region to and from water or lush grass.

Hawkins Peak rises 2685 feet above sealevel in the center of the high peaks. During the summer months turkey vultures Cathartes aura and violet-green swallows Tachycineta thalassina soar about the rocky spires. Here, too, the prairie falcon Falco mexicanus finds an occasional mouse or woodrat. The high cliffs and rocks do not offer much as a home for tree-dwelling animals or water lovers, but it is an area that serves as a niche for a great abundance of creatures. The lizards that live among the high peaks do so not because they will starve there, but because of the ample food supply of insects and other small animals. Rocky crevices offer many nesting sites for falcons, finches, swifts, swallows, and woodrats.

This habitat is very different than those previously mentioned. It is a peculiar living place that may always be in the full exposure to the weather. All the forces of the climate work away at the very house of the inhabitants. The crevices and ledges may serve as shelter and runways for many animals that do not persist in any other location than in the rocky areas.

Predation

The old concept of predators was "Predators eat game birds and mammals. Those that the predators eat are not left for us to kill. Therefore, the predators should be killed . . .". Since the time this philosophy was popular, we have changed our beliefs considerably. We now realize that predators are necessary in a well organized animal community. Predation is necessary to produce a population of game that is healthy, wealthy, and wise. Healthy in the sense that only the sickly and the poorest physical specimens are taken as prey by their predators. Wealthy animals are those that have enough food, shelter, and water to persist and to reproduce. A high population of animals in any given region will lead to disease, famine, and drought if the population tends to increase. The wise animal may be that one of age that has learned by experience where the water hole happens to be during the hot summer months, or where best to give birth to its young.

"Game" cannot be game in the true sense of the word in the National Park Service, because it is an object of the service to protect the wildlife. This may allow, in a few cases, to have those animals removed from a large area if they become too abundant and the normal pressures from the outside does not balance the controlling number. We must consider it this way. There are five decimating factors that take the individual of an animal population. These are hunting, starvation, disease and parasites, accidents, and predators. Environment, weather, and economical activities are called influences

and are not a natural decimating factor. Since the monument does not allow hunting within its boundary, and accidents are of a rare nature, the rest is left to three things. Starvation persists only after predation has failed as do disease and parasites. Both are effective at about the same time. Usually, when the population has expanded to a degree that disease sets in, and there is no deferment from natural causes, starvation comes about. This is a natural happening after an over-population of animals has almost denuded the land and its food stuffs.

This leaves only one thought of decimation that is correct and good, at least in this particular case. That is predation. There is much that may determine the loss of animals through this factor. First, the density of the population, as well as the density of the predators. Under a normal situation, each will balance each other. Also, predators have a natural food preference. This may tilt the population of different species for a short time. The physical condition of the game is a factor as well. A healthy deer will very seldom fall to a lion, but if there is a sickness and the deer is weak, physically and mentally, then more deer will be taken, probably by more predators. One other factor may influence the depredation in our study area. This is the abundance of Buffer species. As an example, a fox may prey upon woodrats, but if he finds quail are easier prey, the woodrat population may increase at least until the quail are cut down to normal. And so the balance goes from one to another depending on many variables.

I It is difficult to say that any certain species of animals are predators while others are not. For all species, with the exception of plant consumers, prey upon others. Since the average park visitor is interested in only those animals found in the day time and usually those large enough to notice, let us discuss those that affect him.

Probably the gray fox Urocyon cinereoargenteus and the bobcat Lynx rufus are the most abundant large predators in the monument. Both have been given a common status in the past. On two occasions during the past few months I observed a gray fox acting in his role of predator. On July 17, 1958, one crossed the road a few yards from the entrance station carrying a woodrat in his mouth. On another day, toward evening, about the last of July, a gray fox was observed hunting along the rocky outcrop, at the mouth of Gopher Gulch.

One day in the middle of August, I saw a bobcat crossing the road near the entrance pylons carrying what was probably a woodrat or a small rabbit.

A coyote Canis latrans was seen outside the monument on one occasion. On two separate nights I heard a coyote calling not far from the headquarters area. This is an animal that has the power to take a weak, sickly deer if given the chance. On April 16, 1957, I watched a coyote kill a deer on the Coe Ranch above Morgan Hill, California. After examining the deer it was found to have blood lesions along the central nervous system. The deer was a three- or four-year old buck, but was no larger than a yearling.

On August 30, 1958, a mountain lion Felix concolor was seen at the Chalone Creek Campground. He disappeared soon after, but about three weeks later I found a lion kill along the creek. There was little of the animal left for a careful examination, but observing the teeth compared to the runted size of the beast, I suspect that the deer had been badly diseased. The population of lions in the Pinnacles is not permanent, but return again and again. They are known to travel in a circuit and repeat every 15 to 18 days. Seventy five percent of a lion's diet may consist of deer, while the rest is of smaller mammals and birds; or even grasshoppers at times.

There are a few birds that can be discussed here. These are the larger predators, such as the hawks and owls. There are several owls that have been observed during the past summer months. Of course, it is difficult to prove the diet, but one was actually found with proof that it had been eating mice, rats, and small birds. A barn owl Tyto alba nest was discovered along the Kim Trail on September 10, 1958. At the base of the cliff where the hole entered the rock crevice I found several fresh pellets and many old ones. After examination of these, the remains consisted of the following: 9 Peromyscus, 5 Neotoma, 3 Rheithrodontomys, 1 Microtus, 1 possible Dipodomys, and 1 Passerine.

The most common hawk in the monument is the Cooper's Hawk Accipiter cooperi. Although I have never actually seen one catch a bird, their continuous actions of diving and swiftly flying over the ground in search of birds must payoff enough to allow the bird to

stay alive. Also, the prairie falcons in the higher portions of the monument must take ample food to live.

On April 26, 1958, I watched a golden eagle Aquila Chrysaetos carry a rabbit high above the Chalone Creek area toward Old Pinnacles. The red-tailed hawk Buteo jamaicensis is another large predator. One nests on the east slope of Conder Gulch.

Last, but certainly not least, and probably he accounts for more small birds than any other predator, is the scrub jay. On actual observation or predation, this bird is by far the most common small bird predator in the monument. I have seen it carrying or taking out of nests, eggs and young of warblers, vireos, goldfinches, sparrows, towhees, and finches. Frogs and mice also serve as food.

All the before-mentioned animals are native to the monument. The house cat Felis domesticus, is one of the most destructive animals that lives at Pinnacles. During the past six months, four different cats were seen along the roads in the monument. These animals become very wild and stay very shy, but still do a tremendous amount of damage. If these animals start to become too abundant, it may lead to the death of all the natural predators. They have very few natural predators themselves. The house cat can become so abundant that he can completely take over the predator status. This would, of course, subtract much from the abundance of wild animal popularity that Pinnacles now enjoys.

Accounts of Species

This report is based not only on those past few months that I have been at Pinnacles, but also on the reports that have been kept during Previous years. Although many of these earlier records are very sparse and may times deceptive, this will contain all those species that have by some manner been observed by creditable sources. As for personal observation and research, the trips to the field have totaled 64 on which were kept complete records as to observations. Also, throughout the six-month period, many notes were taken for single or numerous accounts of mammal, bird, amphibian, reptile, and fish.

All of the previous information in this report is related to the following pages, the accounts of species. That is the weather, climate, topography, and all the other environmental relations, negative as well as positive. The inter-relations of the ecosystem of the study area tends to predict the species found in each community and relative habitats.

Since it was impossible to be everywhere throughout the region during an entire year, I will not pretend that this study includes all the species that have ever been seen on the area, or even that I have recorded all those species that were about during the six months. Therefore, the species that follow are what I believe to be the normal population of the monument and can be greatly enlarged by future study and research. I hope that this is just a beginning for future progress of knowledge about the vertebrates that can and will be found in this specific area.

Fish

Pinnacles can certainly not boast about an abundance of fish. Only two species have been definitely recorded for the monument, although persons that I have talked to tell me about "way back when" there were trout in the reservoir stream. I doubt that there were ever fish in the reservoir mainly because it has not been a reservoir for many years and because the water practically dries up on certain years. Only the following species have been definitely noted.

1. Sucker Catostomus sp.: After the rains that swept the California region during the early spring days of 1958, there were many ponds and waterways that have not been opened on relative normal years. This may or may not account for the three large suckers that were observed by myself not far upstream from the Willow Spring. This was on July 31, 1958. On my next trip, September 10, 1958, the water had all dried up and I supposed the three suckers had died. I spent time looking about the creek bed and finally found a part of one of them -- a skull. This I brought into the museum collection.

2. Threespine stickleback Gasterosteus aculeatus: Literally millions of these fish persist in the stream courses of the monument - even in small pools that are about dry. I have not found any above the caves, but they are seen, occasionally, in the caves and in the check dam at the cave entrance. Several were collected for the monument and also some were sent to San Jose State College as a new locale record.

Amphibians

California red-legged frog - Rana aurora draytonii (Baird & Girard)
California yellow-legged frog - Rana b. boylei (Baird)
Pacific tree frog - Hyla regilla (Baird & Girard)
Arboreal salamander - Anaxides l. lugubris (Hallowell)
Worm salamander - Batrachoseps a. attenuatus (Escholtz)
Western spadefoot toad - Scaphiopus h. hammondi (Baird)
California toad - Bufo boreas halophilus (Baird & Girard)
Bullfrog - Rana catesbeiana

1. California red-legged frog: first identified at Pinnacles in 1946 by Robert C. Stebbins. It is one of the most abundant frogs of the monument having been recorded throughout the summer months in 1958.
2. California yellow-legged frog: quite common along the streams and waterways throughout the monument although not as abundant as the above species.
3. Pacific tree frog: first identified by Robert C. Stebbins. It has been observed throughout the year. I have found that this small species is common along the stream at each end of the caves in Bear Gulch. Also, it has been observed often throughout the monument.
4. Arboreal salamander: Robert C. Stebbins identified this species in 1946. Other observations have been recorded for this amphibian.
5. Worm salamander: As the above, this species was first identified to be at Pinnacles by Robert C. Stebbins. On July 17, 1958, 214 of this species were found in a decayed Digger pine by A. C. Reneau.

6. Western spadefoot toad: One record of this species in June 11, 1955, by A. C. Reneau. This animal was observed hopping in driveway in front of CCC building. I observed one below the caves at the Old Pinnacles on September 16, 1958.

7. California toad: Observed on May 18, 1954, by Mr. and Mrs. Earl Jackson. It appeared from a rodent hole near the superintendent's quarters and was taken and identified.

8. Bullfrog: many about reservoir, and tadpoles are abundant as well.

Supplementary list of those species expected to be at Pinnacles but not as yet seen:

Newt - Triturus torosus
Eschscholtz's salamander - Desmognathus eschscholtzi
Tiger salamander - Ambystoma tigrinum

Reptiles

Pacific pond turtle - Clemmys marmorata
 Coast horned lizard - Phrynosoma coronatum frontale
 Western fence lizard - Sceloporus occidentalis occidentalis
 Stansbury swift ~~etc~~ - Uta stansburiana hesperis
 Yucca night lizard - Xantusia vigilis
 Western skink - Lamproscincus gilberti
 Western whiptail - Cnemidophorus tigris maudslayi
 Foothill alligator lizard - Gerrhonotus multicarinatus multicarinatus
 Racer - Coluber constrictor nortoni
 King-necked snake - Diadophis amabilis
 Spotted night snake - Hypsiglena ochrorhynchos
 Common king snake - Hypsiglena torquata *Lawson's*
 Gopher snake - Pituophis catenifer catenifer
 Long-nosed snake - Rhinocrodon lecontei
 Common whipsnake - Masticophis flagellum piceus
 California striped whipsnake - Masticophis lateralis
 Common Garter Snake - Thamnophis sirtalis fitchi
 Northwest ~~garter~~ snake - Thamnophis ordinoides atratus
 Western rattlesnake - Crotalus viridis oreganus

1. Pacific pond turtle: during the summer of 1958 two turtles were seen along the stream in the Bear Gulch campground. They have also been reported, by ~~mean~~, from Willow Spring and in Bear Gulch near the Superintendent's residence.
2. Coast horned toad: This species has been observed throughout the monument. For the most part, they prefer the creek beds, but have been seen on the high peaks trail. A. C. Meneau records young of the year on July 28, 1954, and August 14, 1953.
3. Western fence lizard: first identified at innacles by Robert W. Stebbins. A. C. Meneau called it the "most abundant lizard on the monument".
4. Stansbury swift or Sideblotched lizard: reported by Robert W. Stebbins on October 4, 1946. It has been recorded frequently throughout the monument.

5. Yucca night lizard: The American Mid. Naturalist, 39.1: pg96 first published on the Pinnacles' Xantusia. It was first found in this area by Brighton C. Cain. The nearest previous record was 165 airline miles from here. According to Robert C. Stebbins, this new distribution records was called a new race. Since that time, this species has been observed many times and has been taken and identified and recorded from Pinnacles on many occasions.
6. Western Skink: A specimen was collected very early at Pinnacles by T. L. Rodgers and H. S. Fitch and is now at Stanford Natural History Museum. A few specimens have been found since. This subspecifically is gilberti.
7. Western whiptail: Robert C. Stebbins first identified this species for the monument. Through the summer of 1958 this species has been very common throughout the monument.
8. Foothill alligator lizard: observed on a few occasions in the monument. There is no authoritative identification for this species, but since it has been described as part of the range in Stebbins, it can be included.
9. Racer: past records of this species shows that there has been considerable confusion between this and the genus Masticophis. Therefore, there has been no real authoritative record of this species, but the genus has been used. Since Stebbins lists this species as resident in this location, I will here add same. A so-called red racer has been observed on several occasions in the monument during this summer of 1958

10. Ring-necked snake: A.C. Rensau recorded this species twice in 1953.
11. Spotted night snake: first observed by Robert C. Stebbins on October 4, 1946. Since then, it has been recorded about the monument on a few occasions.
12. Common king snake: one was collected for the museum during the summer of 1958. It has been observed on many occasions during the past few years.
13. Gopher snake: probably the most common snake of the monument. A 59-inch specimen was found by R. F. Smith in 1956. A large one was collected during the summer of 1958.
14. Long-nosed snake: the first record of this species was on June 21, 1954, when one was found dead near Moses Spring by A. C. Rensau, Jr. I found one along the same trail early in June of 1958.
15. Common whipsnake: Often confused with the Coluber snakes. This particular species has been recorded by A. C. Rensau, Jr., in 1954. Also, one was collected during the 1958 season.
16. California striped whipsnake: As the above, it is confused in the past. It was recorded by R. F. Smith in 1956. Also, it was observed by myself in June, 1958.
17. Common garter snake: A. C. Rensau calls this species the most common snake of the monument. It has been observed many times in the past as well as during the summer of 1958.

18. Northwest garter snake: A specimen of this was collected from Pinnacles and identified by the California Academy of Science.

19. Western rattlesnake: this species has been collected on a few occasions and identified by authoritative sources. Six were reported for the summer of 1958.

Birds

The listing and discussions of the birds of Pinnacles will not be complete here. Another report will be added to this list in the future. The additional report is to be published and therefore a copy of same will be forwarded at that time.

1. Green heron - *Burorides virescens anthonyi* (Mearns)
2. Canada goose - *Branta canadensis* (Linnaeus)
3. Mallard - *Anas platyrhynchos platyrhynchos* (Linnaeus)
4. Pintail - *Anas acuta* (Linnaeus)
5. Wood duck - *Aix sponsa* (Linnaeus)
6. Common merganser - *Mergus merganser americanus* (Cassin)
7. Turkey vulture - *Cathartes aura teter* (Friedmann)
8. Sharp-shinned hawk - *Accipiter striatus velox* (Wilson)
9. Cooper's hawk - *Accipiter cooperii* (Bonaparte)
10. Red-tailed hawk - *Buteo jamaicensis calurus* (Cassin)
11. Red-shouldered hawk - *Buteo lineatus elegans* (Cassin)
12. Swainson's hawk - *Buteo swainsoni* (Bonaparte)
13. Rough-legged hawk - *Buteo lagopus johannus* (Gmelin)
14. Golden eagle - *Aquila chrysaetos canadensis* (Linnaeus)
15. Marsh hawk - *Circus cyaneus hudsonius* (Linnaeus)
16. Prairie falcon - *Falco mexicanus* (Schlegel)
17. Peregrine falcon - *Falco peregrinus anatum* (Bonaparte)
18. Sparrow hawk - *Falco sparverius sparverius* (Linnaeus)
19. California quail - *Lophortyx californicus californicus* (Shaw)
20. Virginia rail - *Rallus limicola limicola* (Vieillot)
21. Killdeer - *Charadrius vociferus vociferus* (Linnaeus)
22. Common snipe - *Capella gallinago delicata* (Ord)
23. Least sandpiper - *Erolia minutilla* (Vieillot)
24. Band-tailed pigeon - *Columba fasciata monilis* (Vigors)
25. White-winged dove - *Zenaida asiatica mearnsi* (Ridgway)

26. Mourning dove - *Zenaidura macroura marginella* (Woodhouse)
27. Roadrunner - *Geococcyx californianus* (Lesson)
28. Barn owl - *Tyto alba pratincola* (Bonaparte)
29. Screech owl - *Otus asio bendirei* (Brewster)
30. Great horned owl - *Bubo virginianus saturatus* (Ridgway)
31. Pygmy owl - *Glaucidium gnoma grinnelli* (Ridgway)
32. Burrowing owl - *Speotyto cunicularia hypugaea* (Bonaparte)
33. Long-eared owl - *Asio otus tuftsi* (Godfrey)
34. Short-eared owl - *Asio flammeus flammeus* (Pontoppidan)
35. Saw-whet owl - *Aegolius acadicus acadicus* (Gmelin)
36. Poor-will - *Phalaenoptilus nuttallii californicus* (Ridgway)
37. White-throated swift - *Aeronautes saxatalis saxatalis* (Woodhouse)
38. Black-chinned hummingbird - *Archilochus alexandri* (Bourcier)
39. Costa's hummingbird - *Calypte costae* (Bourcier)
40. Anna's hummingbird - *Selasphorus sasin sasin* (Lesson)
41. Allen's hummingbird - *Calypte alla* (Lesson)
42. Belted kingfisher - *Megasceryle alcyon aurina* (Brinnell)
43. Red-shafted flicker - *Colaptes cafer collaris* (Vigors)
44. Acorn woodpecker - *Melanerpes formicivorus bairdi* (Ridgway)
45. Lewis' woodpecker - *Asyndesmus lewis* (Gray)
46. Yellow-bellied sapsucker - *Sphyrapicus varius daggetti or nuchalis*
47. Hairy woodpecker - *Dendrocopos villosus* (Linnaeus)
48. Downy woodpecker - *Dendrocopos pubescens* (Linnaeus)
49. Nuttall's woodpecker - *Dendrocopos nuttallii* (Gambel)
50. Western kingbird - *Tyrannus verticalis* (Say)
51. Ash-throated flycatcher - *Myiarchus cinerascens cinerascens*
(Lawrence)
52. Black phoebe - *Sayornis nigricans semiatra* (Vigors)
53. Say's phoebe - *Sayornis saya yukonensis* (Bishop)
54. Traill's flycatcher - *Empidonax traillii brewsteri* (Oberholser)
55. Western flycatcher - *Empidonax difficilis difficilis* (Baird)
56. Western wood pewee - *Contopus serripennis veliei* (Coues)
57. Oliver-sided flycatcher - *Nuttallornis borealis* (Swainson)
58. Horned lark - *Bremophila alpestris actia* (Oberholser)
59. Violet-green swallow - *Tachycineta thalassina lepida* (Mearns)
60. Tree swallow - *Iridoprocne bicolor* (Vieillot)
61. Bank swallow - *Riparia riparia riparia* (Linnaeus)
62. Rough-winged swallow - *Stelgidopteryx ruficollis serripennis*
(Audubon)
63. Cliff swallow - *Petrochelidon pyrrhonota pyrrhonota* (Vieillot)
64. Steller's jay - *Cyanocitta stelleri carbonacea* (Grinnell)
65. Scrub jay - *Aphelocoma coerulescens californica* (Vigors)
66. Yellow-billed magpie - *Pica nuttalli* (Audubon)
67. Common raven - *Corvus corax sinuatus* (Wagler)
68. Common crow - *Corvus brachyrhynchos hesperis* (Ridgway)
69. Chestnut-backed chickadee - *Parus rufescens barlowi* (Grinnell)
70. Plain titmouse - *Parus inornatus inornatus* (Gambel)
71. Common bushtit - *Psaltiriparus minimus minimus* (Townsend)
72. White-breasted nuthatch - *Sitta carolinensis aculeata* (Cassin)
73. Red-breasted nuthatch - *Sitta canadensis* (Linnaeus)

74. Wrentit - *Chamaea fasciata intermedia* (Grinnell)
75. House wren - *Troglodytes aedon parkmanii* (Audubon)
76. Winter wren - *Troglodytes troglodytes pacificus* (Baird)
77. Bewick's Wren - *Thryomanes bewickii correctus* (Grinnell)
78. Canon wren - *Catherpes mexicanus conspersus* (Ridgway)
79. Rock wren - *Salpinctes obsoletus obsoletus* (Say)
80. California thrasher - *Toxostoma redivivum redivivum* (Gambel)
81. Robin - *Turdus migratorius caurinus* (Grinnell)
82. Varied thrush - *Ixoreus naevius naevius* (Gmelin)
83. Hermit thrush - *Hylocichla guttata slevini* (Grinnell)
84. Swainson's thrush - *Hylocichla ustulata ustulata* (Bottall)
85. Western bluebird - *Sialia mexicana occidentalis* (Townsend)
86. Townsend's solitaire - *Myadestes townsendi townsendi* (Audubon)
87. Blue-gray gnatcatcher - *Polioptila caerulea amoenissima* (Grinnell)
88. Ruby-crowned kinglet - *Regulus calendula grinnelli* (Palmer)
89. Cedar Waxwing - *Bombycilla cedrorum* (Vieillot)
90. Phainopepla - *Phainopepla nitens lepida* (Van Tyne)
91. Loggerhead shrike - *Lanius ludovicianus gambeli* (Ridgway)
92. Hutton's Vireo - *Vireo huttoni huttoni* (Cassin)
93. Bell's vireo - *Vireo bellii pusillus* (Coues)
94. Solitary vireo - *Vireo solitarius cassinii* (Xantus)
95. Warbling vireo - *Vireo gilvus swainsonii* (Baird)
96. Orange-crowned warbler - *Vermivora celata lutescens* (Ridgway)
97. Nashville warbler - *Vermivora ruficapilla ridgwayi* (van Rossem)
98. Yellow warbler - *Dendroica peteegia morcomi* (Coale)
99. Myrtle warbler - *Dendroica coronata hooveri* (McGregor)
100. Audubon's warbler - *Dendroica auduboni auduboni* (Townsend)
101. Black-throated gray warbler - *Dendroica nigrescens* (Townsend)
102. Townsend's warbler - *Dendroica townsendi* (Townsend)
103. Hermit warbler - *Dendroica occidentalis* (Townsend)
104. Northern waterthrush - *Seiurus noveboracensis linnaeus* (McCabe)
105. Macgillivray's warbler - *Oporornis tolmiei* (Townsend)
106. Yellowthroat - *Geothlypis trichas* (Linnaeus)
107. Yellow-breasted chat - *Icteria virens auricollis* (Deppé)
108. Wilson's warbler - *Wilsonia pusilla chryseola* (Ridgway)
109. Western meadowlark - *Sturnella neglecta confluenta* (Rathbun)
110. Redwinged blackbird - *Agelaius phoeniceus mailliardorum* (van Rossem)
111. Bullock's oriole - *Icterus bullockii* (Swainson)
112. Brewer's blackbird - *Euphagus cyanocephalus* (Wagler)
113. Brown-headed cowbird - *Molothrus ater obscurus* (Gmelin)
114. Western tanager - *Piranga ludoviciana* (Wilson)
115. Black-headed grosbeak - *Pheucticus melanocephalus mauculatus* (Audubon)
116. Lazuli bunting - *Passerina amoena* (Say)
117. Purple finch - *Carpodacus purpureus californicus* (Baird)
118. House finch - *Carpodacus mexicanus frontalis* (Say)
119. Pine siskin - *Spinus pinus pinus* (Wilson)
120. American goldfinch - *Spinus tristis salicamans* (Grinnell)
121. Lesser goldfinch - *Spinus psaltria hesperophilus* (Oberholser)
122. Lawrence's goldfinch - *Spinus lawrencei* (Cassin)

123. Green-tailed towhee - *Chlorura chlorura* (Audubon)
124. Rufous-sided towhee - *Pipilo erythrophthalmus falcifer* (McGregor)
125. Brown towhee - *Pipilo fuscus crissalis* (Vigors)
126. Lark sparrow - *Chondestes grammacus strigatus* (Swainson)
127. Rufous-crowned sparrow - *Aimophila ruficeps ruficeps* (Cassin)
128. Sage sparrow - *Amphispiza belli belli* (Cassin)
129. Oregon junco - *Junco oreganus pinosus* (Loomis)
130. Chipping sparrow - *Spizella passerina arizonae* (Coues)
131. Black-chinned sparrow - *Spizella atrogularis caurina* (Miller)
132. White-crowned sparrow - *Zonotrichia leucophrys nuttalli* (Midway)
133. Golden-crowned sparrow - *Zonotrichia atricapilla* (Gmelin)
134. Fox sparrow - *Passerella iliaca* (Merrem)
135. Song sparrow - *Melospiza melodia merina* and *gouldii*

Mammals

Mammals are, for the most part, a very stationary group of animals. That is, they are usually permanent residents, as far as the land forms are concerned. Therefore, except for bats and a few mammals that may occasionally drift out of the monument boundaries, they are stationary. Much of the habitats of mammals have been discussed in preceding pages and so any faunal position or zonal analysis will be taken care of in the respective discussion of each species.

Mammals, more than any other kind of animal, have been influenced by man's behavior. This may affect the particular mammal positive or negative. As an example, there are more deer in California since man has appeared on the scene than any time in the past. His taking of the land and plowing, fencing, furrowing, and clearing has for the most part benefited the deer, not hampered him. On the other hand, coyotes, bobcats, and foxes were seriously harmed by man's intervention on the land which is no more in a complete natural state.

Of course, the park service is aimed to keep this "natural" state. But how is a natural state achieved when trails, roads, and houses are built into a wilderness area? Only a long-range census, an index count, can give the answer to the problem of shortening our wilderness.

Human activities affect all the animals, not just the mammals. This influence is mostly indirect, resulting in the modification of the habitat. It often can result in the removal of one or more species. Sometimes the operation acts to attract additional species (the feral goats) or it may result in just a shift of routine. Changes are results of burns, clearings, cutting of trees, sometimes the saving of trees (or at least that is what we humans like to call it), accumulation of piles of dead wood, unused or used roads, refuse left by picnic parties, and additional changes. While some of these may add to the shelter of a species or add to the food availability of a species, such as rubble piles and picnic grounds, this is not a natural happening.

Directly, the presence of people along the trails and roads frighten the animals feeding there or resting. The roadways are often the final resting places for skunks, ground squirrels, lizards, and birds. This influence by man is caused by the effort of man to become better acquainted with true nature. But it is but an artificial nature. The National Park Service is not here to conserve, but to protect. And since the people are the prime factors of the parks and their details, a stable balance of natural and artificial nature must

be kept. With certain controls, and backing of same, the native animals can be partly natural. The native animals must stay at the expense of dogs, feral cats, goats and cattle, or it will be another burro/situation of Death Valley or goat situation of Hawaii.

List of Mammals of Pinnacles National Monument

1. Opossum - *Didelphis marsupialis*
2. Broad-handed mole - *Scapanus latimanus*
3. California myotis - *Myotis californicus*
4. Western pipistrelle - *Pipistrellus hesperus*
5. Western mastiff bat - *Eumops perotis*
6. Brush rabbit - *Sylvilagus bachmani*
7. Desert cottontail - *Sylvilagus audubonii*
8. Black-tailed jack rabbit - *Lepus californicus*
9. Merriam's chipmunk - *Eutamias merriami*
10. California ground squirrel - *Spermophilus beechyi*
11. Botta's pocket gopher - *Thomomys bottae*
12. California pocket mouse - *Perognathus californicus*
13. Big-eared kangaroo rat - *Dipodomys elephantiinus*
14. Western harvest mouse - *Reithrodontomys megalotis*
15. California mouse - *Peromyscus californicus*
16. Deer mouse - *Peromyscus maniculatus*
17. Brush mouse - *Peromyscus boylii*
18. Pinon mouse - *Peromyscus truei*
19. Dusky-footed wood rat - *Neotoma fuscipes*
20. California vole - *Microtus californicus*
21. Coyote - *Canis latrans*
22. Gray fox - *Urocyon cinereoargenteus*
23. Raccoon - *Procyon lotor*
24. Long-tailed weasel - *Mustel frenata*
25. Badger - *Taxidea taxus*
26. Striped skunk - *Mephitis mephitis*
27. Mountain lion - *Felis concolor*
28. Bobcat - *Lynx rufus*
29. Mule deer - *Dama hemionus columbianus* (Black-tailed deer)

Details of Mammal Observations

1. Opossum: this primitive mammal is not native to California but was planted about the San Jose area in 1910. Since that time they have worked their way throughout the coast ranges and finally into the monument. This is the first year that one has actually been seen in the monument proper. I did see a small animal along the road near the entrance pylons during the last of August, 1958, and one was found in Beary Gulch Campground during September. This species is not terribly destructive, but being omnivorous, it preys upon birds and eggs, fish, frogs, and all kinds of fruits. It is a slow moving nocturnal mammal that will probably not affect the normal population of animals at present.
2. Broad-handed mole: several burrows have been observed in the past. The only positive identification comes from a dead animal that was identified by A. C. Reneau. Workings of these animals are fairly common about the monument, especially in the cleared open areas.
3. California myotis bat: soon as the sun sets and darkness comes on, hundreds of these mammals appear about the trees and openings catching insects. Several were collected and are presently in the museum collection. On one occasion, one was collected after a truck backing into an oak tree and a bat fell out from under a leaf, presumably where it had hidden for the day.
4. Western pipistrelle bat: the only record of this species comes from a dried up specimen that I found on the approach road during the first of July. It is now part of the collection.

5. Western mastiff bat: although there has not been an actual specimen taken from Pinnacles, I am sure of the identification of this animal. During the first two week of April, 1958, a few were observed flying along the Bear Gulch area.

6. Brush rabbit: This species is one of the characteristic animals of the monument. It is closely related to the chaparral regions and during the mornings and evenings is quite common during much of the year. Whatever type of thicket, if it provides enough shelter, it satisfies the brush rabbit. The sprinklings of droppings on the ground is ~~xxxx~~ co-existent with the brushlands.

7. Desert cottontail: like the above species, it is largely distributed according to the brushland areas. This species is the most common of the two cottontails. They are common along the roads throughout the monument. For the most part, these animals are nocturnal; however, crepuscular tendencies are common. This may be influenced by the abundance of predators during the night hours relative to the daylight, or may refer to the possibility for a slight food shortage necessitating a longer feeding period during certain months of the year. Man's intrusions on the area may have influenced the abundance of Sylvilagus. Edge effects, as along roads and clearings, greatly influence the distribution and numbers.

In one case the supervisory ranger found that his gourd plant was being consumed by this rabbit. Not only during the night hours, but also during the hours of sunlight. Man's activities, in previous years, to kill many coyotes, bobcats, foxes, and other pre-

dator animals about the country, may have seriously changed the way of life for this creature. However, at present, the monument animals are very well in check and there seems to be a very well proportioned number of rabbits. Then, too, the predators about the monument are of sufficient abundance to keep down any eruption.

8. Black-tailed jackrabbit: here is an animal that is a permanent resident of the monument in great numbers. Anytime during the 24 hours, night or day, several jacks can be found along the roads. The abundance of jacks is not local to the point of finding them only about the Pinnacles in such great numbers. During the early spring and summer months, they were even more abundant than in the later part of the summer. On one occasion, from Paicines (25 miles north) I counted 87 jacks along the road. On September 12, 1958, from Paicines to Pinnacles, only 24 were seen. This was typical.

Like the above species, they are greatly predicted in habitat by ecotone areas. Roadsides, fields surrounded with much brush, woodland hillsides scattered with available sheltered places or trails are all expected feeding places for the jacks. Scattered droppings can be expected not only in open grassy places, but also in outcrops of rock that allows even a small grassy vegetation to appear.

Shelter is a very important item to these animals. Not only are they prey for larger animals, on the ground, but also from the sky, where eagles, red-tails, and many times Cooper's hawks, as well as the larger falcons in the rocky regions, hunt. During the night hours, owls prey upon the active nocturnal animals. Even snakes, house cats, and other small predators may take the helpless or semi-helpless young.

9. Merriam's chipmunk: this is one of the few diurnal mammals of the monument. It is not an abundant species, but his distribution is certainly spread out. I have seen him along the creek in the lower portion of the monument as well as along the high peaks trail. The distribution factor seems to be the presence of brush and trees. Wherever one can find a tangle of brush and other woody flora, the chipmunk can usually be found. Probably, because of its speed and ingenuity, it is seldom prey for another larger species. Also, the presence of many buffer species allows this to go undisputed.

10. California ground squirrel: the campground and like areas are places that these animals prefer. However, in the native state, as on the hillsides and rocky slopes of the monument, they are abundant as well. In places where the human habitation has added and detracted from the natural way of things, these omnivorous mammals flourish in great numbers. Some even become so tame as to eat out of the hands of visitors to the monument.

On a few occasions, park service personnel have killed many of these small rodents, but this does not keep the population in check. It probably invigorates the next season's reproduction rate. Young were observed and collected during the first two weeks of May, 1958.

In the natural state, this species prefers a ground where there is low grass and open park-like environment. This allows a good view of the surrounding terrain and sky. Because of Pinnacles lacking much of this openness, most of the ground squirrel population lives along the open slopes and in the campground areas. Here their abundance is quite noticeable. Literally, hundreds of holes and mounds

mark their distribution. Along the trail, too, they often dig alongside and throw dirt and rocks out along the trails and in a few cases seriously dig up the trail in such a way that may be dangerous to man's activities.

11. Botta's pocket gopher: A. C. Reneau found an adult pocket gopher that had been swallowed by a rattlesnake on June 29, 1953. The snake was taken and dissected to identify the specimen. Throughout the summer of 1953 many workings have been in evidence about the monument. These were observed along Chalone Creek a few times as well as in the canyons and slopes.
12. California pocket mouse: one record of this species dates from June 11, 1954. One adult was caught near the buildings that were being wrecked in Bear Gulch and identified by A. C. Reneau.
13. Big-eared kangaroo rat: there is no specific name for this kangaroo rat. He has often been seen along the road in the lower portion of the monument, but on no occasion has one been taken for a definite identity. Probably, there are two species in the monument. One for sure, according to Ingles, is elephantinus, and hermanni is undoubtedly to be found as well.
14. Western harvest mouse: several of this species were taken along the creeks in the monument.
15. California mouse: this species was also taken along the creeks during trapping.
16. Deer mouse: this is probably the most abundant species of Peromyscus in the monument.
17. Brush mouse: one was taken along the dry creekbed at Chalone Creek about the edge of the chaparral during the summer of 1953.

18. Pinon mouse: this species is also found about the chaparral regions of the monument.

19. Dusky-footed wood rat: although there is a relative lack of wood rat houses in the monument, the population of these rodents is very great. Five were taken during the few days that I did any trapping. They live not only in the woody portions but also in the rocky cliffs. A few of these being well scattered throughout the higher portions of Pinnacles. If one is observant, he can see hundreds of "whitewashes" from the wood rats along the cliffs. Some of these may be from birds, but for the most part they are caused by the wood rats. Also, such as along the trail at "the route of a root", scats are common that have either been cleaned out of a wood rat shelter or it may have run over being so full. In places like this, a cave may show evidence of wood rat inhabitation. Here you can find skulls of animals either eaten there or collected from the surrounding terrain.

The wood rat serves as a substantial food for most of the predators about the area. Some of these that prey upon the rat include bobcats, coyotes, foxes, house cats, mountain lions, and many of the large predator birds.

20. California vole: On several occasions I have observed this species near the check dam below the caves. Also, a skull was found in a pellet from a barn owl mentioned earlier.

21. Coyote: In 1955 Jackson wrote in the Pinnacles records:

"Coyotes presumably are missing from the Pinnacles National Monument since 1080 poison stations outside the boundaries were operating several years ago. However, on the Marcus Ranch (now Bradford), which lies just east of the boundary, the Marcus' granddaughter heard a coyote howling on January 31, 1955")

I believe, since these poison stations no longer exist, that the coyote population is on an increase. Santa Clara County declared that their coyote increase had been tremendous during the past few years. I have heard coyotes call on two separate nights during July of 1958, both times within the monument. This may or may not have been the same animal. I did not hear more than one at each time. One personal observation of this species was recorded this summer. However, it did not occur within the monument. On June 17, 1958, one very shaggy looking coyote was seen crossing the road near the Webb ranch about five miles from our boundary. These animals should certainly be protected, not only because of the national Park Service, but because of their importance as a predator.

22. Gray Fox: It has been estimated that in areas of chaparral that allows a great food abundance for the foxes that there may occur as many as four foxes per square mile. This is very likely in the Pinnacles region. Since three-quarters of the monument is chaparral, the approximately 18 square miles of country will hold a population of 72 animals. With the lack of the coyotes about the

area, it is also likely that there be even more foxes than six dozen. Coyotes, foxes and bobcats are direct competitors and the absence of one can very easily increase the population potential of another. Even raccoons can directly compete with the gray fox.

During June, several foxes appeared about the entrance station. They were seen throughout the 24 hours. At times they ran around the station chasing each other and rolling about in the sand. Although I did not find a den, I believe that a den existed (at least during the summer of 1955) up the small draw to the east of the entrance station. The foxes would always appear from there and leave by the way of this gully. On several occasions I have found one of these canines stretched out on a sandy bar along the creek near the station. Four animals were the most I saw at one time about the station. Three were young, the other an adult.

Nearly every night of the summer a gray fox passed my residence in Bear Gulch. Many times food was placed along the side of my house which he consumed and went his way.

23. Raccoon: in 1955 Reneau wrote in the records that this animal was abundant along the creek and in the residence area. Again, like the California ground squirrel, here is an animal that is greatly influenced by the human element. If it were not for the campground and the abundance of campers, the population of raccoons would be much smaller, or at least would be more dispersed rather than crowded into the few areas as at present. Although the nightly activities center about the camping areas, the population as a whole

is more widely dispersed than appears. Tracks along all the creeks and watering regions show that he is found throughout the monument. However, there are probably two factors that tend to influence the distribution of this animal. This is, of course, water and food. The food and water is easy to obtain frequently in the camping grounds. Tracks are found on the trails in the high peaks region during the winter months when there is water available, but during the hot, dry summer, when the high pools and springs are dry, then I have not been able to find tracks except within a short traveling distance from water.

There is no doubt that some raccoons never visit a campground during their entire life, but again, I would suspect that there are those that seldom eat their main food stuff anywhere else. An easy handout becomes quite habitual to a semi-tame wild animal. A wild animal has to work too hard for a diet of good food in the wild not to accept this easy way of life.

I wonder how the raccoons will adjust to the influx of opossums which are predicted within a few years. No doubt the raccoon population will decrease because of this competitor, but the opossum will certainly not push out the dominate raccoon.

24. Long-tailed weasel: only one record of an actual observation in the monument comes from A. C. Reneau on July 22, 1953. This was observed 100 yards west of the junction of the west fork of Chalone Creek. I very suspect that these animals are more abundant than this one record indicates.

25. Badger: four observations show that this is positively a recorded species for the monument. Each record reference is from the same locality, including one by myself on July 10, 1968, along the approach road near the pylons.

26. Striped Skunk: for the most part, this animal has been observed along the creeks in the lower reaches of the monument. One record for Bear Gulch tells about a skunk caught in a garbage can which sprayed the Jackson children before the skunk ran under the house "where his odor wafted gently through the floor to add to the childrens'" No time during the past summer have skunks been detected about the monument. Their silent way many times eliminates observation records.

Although this is the only species that has been recorded in the past, I am sure that the spotted skunk Spilogale gricilis also is a resident in the rocky portions of the monument.

27. Mountain lion: lions have been reported through the years. Although very few authentic observations have been recorded, there is no doubt about the presence of these cats in the monument even though they are not permanent residents here. They travel much, and very likely move through Pinnacles often because of the abundance of food. The road and trails aid their movements.

28. Bobcat: Pinnacles is one of the choice homes for bobcats. I have never seen an area that could boast so large a population of these cats. During the first half of the summer on two or three evenings weekly, it was common to see a bobcat walking along the road past

the residences in Bear Gulch. Even during the daytime this cat would walk about and lie on the rock ledges in front of the office or across the road. One time he climbed a small tree and sat on a branch in plain sight for half an hour. Jim Alfson, seasonal ranger during the 1958 summer, observed three young in a tree outside of his house one evening in August.

Bobcats subsist on their natural diet of quail, rabbits, wood rats, mice, and small birds. During the days when the temperature was not too high, they seemed more common about the Bear Gulch area. When the days grew warmer, they became quite rare about the same area. The temperature factor is probably the prime cause of their scarcity toward the middle of the summer, but it also may be due in part to the human habitations, although I doubt that this is the main reason. This influence did not seem to disturb him during the early summer days. Then, the family duties no doubt may have taken more of his time. All of these factors can be reasons for his infrequent daylight visits. It was very easy for this animal to adjust his feeding hours after heat and people invaded his domain.

29. Black-tailed deer: this species is really but a sub-species of the mule deer; therefore, it is listed as such at the beginning of the mammal accounts. Deer are a very important part of the fauna of this National Monument. For deer are the basic factor to most visitors as to the wilderness of a park. During the early spring days, a trip to the Hollister highway from the headquarters area showed two or three animals. Toward the middle of the spring and

into summer a few more were seen, but, in general, the deer population did not appear to be too abundant. As the water holes and the small subsequent streams dried up in the high places, the deer seemed to appear along the highways and trails in much greater numbers. On a day in the first half of August, I counted 75 deer by ~~driving~~^{driving} along the highway from Bear Gulch to the Airline Highway, a distance of five miles. As the days became drier and the food stuff became harder to find, it brought out the population of deer even more. During these dry days in the fall, the watering places quite predict the deer populations throughout the monument.

Very few subspecies are used throughout this report, but in this case I feel as though it is needed. It is the same genus as the Rocky Mountain mule deer and therefore the different subspecies separates it in at least a phylogenetic way. This animal of the Pacific Coast, once classed as a distinct species, but now as a subspecies, has many characteristics the same: the antler type and the same bounding gait, but it has a flat wide tail like that of the white-tailed deer yet smaller and black on the upper surface.

Although this animal can not be considered a "game animal" in its present location as resident of a national monument, it does have the ability to move out of the study area and is therefore susceptible to a standard of "game animal". I would, therefore, like to discuss it as such. Much has already been said about this in the portion called "predation". To consider these animals as part of a game population we must discuss the properties of game management.

The most important property is the density limitation. That is, the maximum number of individuals per unit area. Since the land we are studying is protected, and since we have only the natural means of productivity of the herd, the decimating factors must prevail to hold the animals in check. The land itself can hold only so many animals, no more. Since we have used several habitat types, let us examine these and find the kinds of land the monument possesses. It has already been stated that 75% of the 12,000 acres consists of chaparral, or 9000 acres. This is not good deer land, at least for their entire subsistence. About 15% of the land is of the oak woodland type, or 1800 acres. This is rich land, for it supports good food plants as well as cover. The 10% we have left is roughly rocky or barren land. The creek or riparian lands take up so little it is not practical to figure. As mentioned earlier, this fraction of the percent greatly influences that land about it; therefore, let us estimate that there is about 30 miles of waterway in the monument proper.

On a previous paper I found that in like terrain the acres needed per deer in good feeding country was about 24/1. Therefore, postulating that this is also correct for Pinnacles, we can add 1800 acres of the woodlands to about 1000 acres of that called rocky and barren to about 1000 acres that can be called usable for average feeding purposes and come up with about 3800 acres of fair to good deer land. I refer to the deer land as that used for browsing and grazing, not cover. This then can be figured to about 160 animals.

Now let us also consider the mobility of an individual. This is a very important factor in the case of Pinnacles National Monument. Much of the surrounding land is very good deer land, good for browsing and grazing, as the land on the west side and along the east entrance. This means that the population in the monument can be somewhat higher because of the mobility averaging about 900 yards a day for a black-tailed deer, unless, of course, there is water and good food near this place in the monument that has such a fine cover.

We can not forget the tolerance of the animals toward environmental changes. Earlier it was stated that the areas that have been cleared and other ecotones invigorate these animals in many ways, or the close contact of humans can, of course, disturb them enough to deter a natural population. Other properties here include the minimum unit of the range and the tolerance of one species toward another, as well as sex habits, composition, and age.

Looking over these factors that we have slightly discussed, it is my opinion that the first figure of 150 individuals is a close guess. For sake of an overall guess, let us say that Pinnacles has a population of 150 to 200 deer. This is the mean total. If we could count all the animals that are about in the middle of the summer, then toward the fall, we would find a great difference. Fawns are born in great numbers during April and May, and the population does not completely adjust to this by die-offs, disease, etc., until the late fall. The land can support only a specific number of individuals.

It is my opinion that the ring-tailed cat Bassariscus astutus is also a member of the mammal population of Pinnacles. At present, however, this species has not been recorded.

Summary

By looking over the back material I realize that this is a very meager start for an analysis of the vertebrates of Pinnacles. It is next to impossible for a man trained in one or two fields to attempt to compute the numbers, distribution, and ecology of all of these animals. As I mentioned at the start of this report, this is just a start, and someday I hope someone can use this information to further progress of the vertebrate animals of the monument.

I well suspect that in the very near future many more mammals, birds, and the rest of these creatures will become a recognized member of the fauna of Pinnacles. At present, 2 fish, 8 amphibians, 19 reptiles, 165 birds, and 29 mammals can be truthfully and positively listed as Pinnacles' fauna.

