

Preliminary Report

BIOLOGICAL RESEARCH  
in the  
GRAND CANYON REGION

Museum of Northern Arizona  
for the  
National Park Service

PREPUBLICATION

W O R K I N G D R A F T

NOT A PUBLICATION



United States Department of the Interior  
National Park Service

Preliminary Report

**HISTORY AND BIBLIOGRAPHY  
OF BIOLOGICAL RESEARCH  
IN THE GRAND CANYON REGION  
WITH EMPHASIS ON THE RIPARIAN ZONE**

The Museum of Northern Arizona

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## INTRODUCTION

The Grand Canyon of the Colorado River is of a unique design and provides unlimited research opportunities for almost any scientific discipline. The study area encompassed in this bibliographic and historic survey of biological research includes 673,575 acres of Grand Canyon National Park, 32,665 acres of Marble Canyon National Monument and 198,280 acres of Grand Canyon National Monument, giving a total area of 904,520 acres in all. Included in the study area are 285 miles of the Colorado River from Lee's Ferry, Coconino County, to Grand Wash Cliffs, Mohave County, Arizona. Also encompassed within this area are many miles of secondary tributaries, several of which have well-developed riparian vegetation (e.g., Havasu Canyon, Tapeats Creek, Deer Creek, Clear Creek and to a lesser extent, the Little Colorado River).

Rivers, with their associated vegetation, have long been recognized as vital sources of food, water, shelter and other resources for animals, including man himself. Water resources are especially critical in arid and semi-arid regions of the earth. There is strong evidence that prehistoric man was dependent on river systems for his very existence in many southwestern areas. Throughout the world historic records demonstrate that rivers were the decisive factor in the establishment of entire civilizations often composed of complex agricultural systems and flourishing cities. It is surprising then, that with the number of peoples that have explored, traveled and settled along riverine systems, biologists have so neglected the

study of the ecology of this delicate and limited natural resource.

One of the most important functions of the administrators of National Parks and National Monuments is to innovate management programs designed to preserve the existing natural environment for future generations of man. By definition, this means that the wildlife associated with the reserve areas is also guaranteed a domain within which to live and reproduce, hopefully unaffected by man.

It is imperative in sound management practices that the park or monument managers have a thorough understanding of the ecological complexities of their reserved areas. Only then are they prepared to deal with their responsibilities in assessing the degree of human impact an area can tolerate without sustaining undue destruction of its pristine or natural condition. Ideally then, one hopes that more applied research will be undertaken in order to provide land managers with the informational tools necessary for them to protect our natural heritages.

It is unfortunate that the scientific community did not provide such support when it allowed the wild Colorado River to be controlled by Glen Canyon Dam without prior knowledge of the existing ecological conditions of the river and its associated riparian vegetation below the Dam-site itself. Once the flood-gates of Glen Canyon Dam were closed the changes that eventually followed within the Colorado River and on its sandy banks were phenomenal. Before the Dam, the river was

perpetually muddy. Frequent floods rampaged the river with uncontrolled energy in spring and late summer. It was not uncommon during this seasonal runoff for the banks of the Colorado River to be scoured clean of whatever vegetation had managed to become established in that uncertain habitat. In addition, variation in water temperature was such that it became cold enough to freeze in winter, and was warmed to tepidity by late summer. The heavy sediment load of the murky water continually created and destroyed new and old beach areas. It was a dynamic, powerful and unpredictable river. All of these factors presented unique adaptive problems to the river's associated wildlife. Unfortunately, we have no way of knowing exactly how the wildlife responded to these formidable challenges. We have no baseline data from pre-Dam times in regard to kinds, distribution or abundance of wildlife species that lived in harmony with the dramatic and unpredictable features of that ecosystem. The Colorado River has now been controlled. There are no longer the powerful, scouring floods; the water is clear and cold in summer and slightly warmer in winter. The absence of sediment-laden floods are beginning to tell in that there is now more erosion of the sandy beaches than there is deposition of new material.

On the Colorado River we have recently witnessed the establishment of a young but expanding riparian habitat. With the resulting stabilization of a vegetative community, we should expect a dramatic increase in the kinds and densities of other life forms, particularly of insects and land vertebrates. In addition, the once warm-muddy, now cold-clear River itself

presents some challenging biological problems in terms of the consequent changes in primary productivity and the concomitant effects on planktonic forms and fish. This situation presents the scientific community with a unique and exciting opportunity to investigate and document this community succession along the banks of the Colorado River. Of prime importance in any research study is the initial perusal of the available literature dealing with the subject to be studied. We have begun that effort as reflected in later sections of this paper.

#### A Brief History of the Recent Exploration of Grand Canyon

Apparently, the first white man to see the Grand Canyon of the Colorado was a Spanish officer with Coronado, Captain Don Garcia Lopez de Cardenas. Coronado penetrated this region in 1540. Actual exploration of the river, however, was not to be undertaken for more than 300 years thereafter when John Wesley Powell led his historic voyage in 1869. Powell, being principally a geologist, concerned himself little with the flora and fauna along the river. Nevertheless, some state of the wilderness can be inferred from notations regarding the difficulty his hunters encountered in filling the expedition's cooking pots.

Between the time of the first Spanish exploration and Powell's expedition, several people worked near the Canyon, but not necessarily in it. In 1853, the United States Department of War sent a survey team into the southwest to find a good railroad route to the Pacific Ocean. The expedition was headed by Lieutenant A. W. Whipple and included a botanist, J. M.



Bigelow (see Whipple, 1856). Although the team did not reach the Colorado River itself, much work was done in the San Francisco Peaks area and in the Ponderosa Pine forests of the South Rim. Mr. Bigelow made extensive collections and notes on the vegetation seen during the trip. He included descriptions of such factors as soil types, general climate, plant descriptions and economic uses. He also drew a transectional vegetation map showing the change in species at different altitudes from New Mexico to Utah. His efforts seem to have foreshadowed C. Hart Merriam's work concerning life zones and the attendant relationships of temperature variations with changes in altitude and latitude.

In 1861, again under the direction of the Secretary of War, an expedition led by Lieutenant J. C. Ives covered essentially the same route as that of Whipple's party eight years before (see Ives, 1861). In this case, however, the trip was to be an exploration of the southwest rather than a railroad survey. Botanical investigations were pursued by Gray, Torrey, Thurber, and Engelman. Zoological studies were conducted by Baird. Following Ives' trip, John Wesley Powell made his famous exploratory voyage down the Green and Colorado Rivers in 1869. This voyage did much to spur interest in the area. He then made a second trip in 1871.

Shortly thereafter, the United States Government sent a team of scientists into the southwest to perform geographical surveys. This expedition was under the direction of First Lieutenant G. M. Wheeler. The survey took four years to complete and, though the Grand Canyon region and the Colorado

River Gorge were excluded, extensive notes on the flora and fauna of the San Francisco Peaks and the Little Colorado River were again taken (Wheeler, 1878). All areas were assessed for possible agricultural use. The data collected were little more than checklists of plants and animals, but interestingly enough, included in their report were pleas for conservation measures to save the Southwest - especially the forests - from the destruction that had occurred in the eastern United States.

Nineteen years later, C. Hart Merriam did his classic life zone survey of the area (Merriam, 1890). Though the life zone theory is not universally applicable and has now been replaced with other community classification systems, Merriam's work was the first significant vegetational study of the area. His divisions effectively separated the vegetation into workable units that could be easily visualized. Since then several papers have been written dividing the Grand Canyon region into broad vegetational units. These units are, for the most part, simply new names for Merriam's life zones.

From the time of the preliminary explorations of the nineteenth century, until the present, very little actual biological research has been pursued in Marble Canyon or Grand Canyon National Monuments. Of the several checklists that have been compiled few deal with the entire region. Even those works with titles referring to the Grand Canyon area actually concern themselves principally with Grand Canyon National Park and exclude much of the vast areas to the west and east of the park boundaries. Clover and Jotter (1944) mention

vegetational structure in Marble Canyon, as does Martin (1971). The first mammal collections in these areas were made in 1964 by Joe Hall (pers. comm. to Carothers). A short bird list was compiled in 1939 by L. M. Huey for the Mount Trumbull region in Grand Canyon National Monument and McClintock (1952a) did some botanical work in the Toroweap Valley of the Monument area.

Finally, from 1969 to the present, Carothers and the biology staff of the Museum of Northern Arizona have collected small mammals along the Colorado River and the two Monument areas while working with problems of distribution and population density in riparian habitats. Also, Hoffmeister and Durham (1971) published a checklist of mammals occurring in the Arizona Strip which includes part of the Grand Canyon National Monument. Aside from those enumerated, little significant biological research has been conducted in the area.

Scientific research in the Grand Canyon Region seems to have occurred in "waves". The first wave started with Powell and Whipple, both of whom were concerned with geological surveys and railroad interests. The second wave began in the late 1920's and continued until the early 1940's. During this time, many observations were noted and compiled into a monthly publication, Grand Canyon Nature Notes. Many of those observations were written by park employees and their wives. G. B. Sturdevant, Park Naturalist; V. Bailey, Biological Survey; F. M. Bailey, wife of V. Bailey, and E. D. McKee made, by far, the greatest contributions to the knowledge of the biology of the Grand Canyon Region during that period. Had there been no Grand Canyon Nature Notes, most of the information about the

park area during the 1920's and 1930's would have been lost. Thereafter, perhaps because of the wars, there was a lack of manpower and/or funds, and biological research activities slowed to a near standstill. It remained at a low ebb until the third wave of interest which swelled in 1970 and has continued to the present. Almost as much research work has been done in the first part of this decade as was done during several of the preceeding decades combined.

In the report that follows, we have searched the available literature for records or publications dealing with Grand Canyon biology. From this we have emphasized the riparian habitat and compiled record lists for plants, insects\* fish, amphibians and reptiles, birds, and mammals. After a short review of previous studies concerning these life forms, we give brief recommendations as to what further investigations require immediate attention.

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\*Although some collecting has been conducted, there is not sufficient data available at this time for the compilation of an insect checklist.

VASCULAR PLANTS, INSECTS, FISH AND  
LAND VERTEBRATES OF THE RIPARIAN  
HABITAT OF THE GRAND CANYON REGION

## BOTANY

The first checklists of plants of the Grand Canyon National Park was compiled by Hawbecker (1936) and Patraw (1936) and Dodge (1936). The former paper contained a description of each species as well as distribution data. The latter, a checklist of trees, also included information on distribution of tree species and problems with deer, insects, and tree parasites. The most complete checklist of plants was compiled by McDougall (1947, 1964, and McDougall and Stockert, 1966). Most of the other works are either incomplete, being the result of a short visit to a small area, or specialized, such as McHenry's Canadian Zone Plants on the South Rim of Grand Canyon (1934). Some of these smaller lists are very helpful, however, in that the flora has been broken down into distributional units. One of the most useful is that written by Clover and Jotter (1944). This paper contains, among other things, a checklist of plant species of the Inner Gorge and riparian habitat of the Colorado River.

As far as botanical research beyond simple inventories is concerned, very little has been done. McKee (unpubl. ms.) and Bailey (1929) both divided the canyon into life zones. McKee used, principally, breeding birds to delineate his zones while Bailey used vegetation and soil types. Interestingly enough, both came up with four zones which are almost identical. Rasmussen (1941) divided the Kaibab Plateau into a total of seven vegetational communities. In his paper, he summarizes the history of the plateau, including the problems with the deer population and attempted a full biotic analysis

of his communities. Clover and Jotter (1941) worked with problems of distribution of cacti in the Inner Gorge. They determined that running water (in the form of flood waters and runoff from the cliffs) was the major factor aiding dispersal. Clover and Jotter (1944), again working in the Inner Gorge, divided the riparian habitat into local habitats and listed the plants found on each. Also investigated were methods of plant dispersal along the riparian zone. Further botanical work was concentrated on the rims until the third wave of interest in the 1970's.

Darling (1966), Jameson et al. (1962), Kimmel (1969), Merkle (1952, 1953, 1954, and 1962) and Rand (1965) all analyzed some aspect of the rim vegetation. Darling analyzed a stand of Pinyon-Juniper for biomass productivity. Jameson compared a grazed portion of land with land on Fishtail Mesa which remained untouched. He attributed slow recovery of grazed portions to soil compaction by livestock and a reduction of burrowing rodents. Kimmel worked on pond succession on the Kaibab Plateau sink holes. Merkle was concerned chiefly with soils and exposure. Rand related available soil moisture and moisture stress within the seedlings to the distribution of Ponderosa and Pinyon pines. She found that the Ponderosa required more moisture than Pinyon seedlings during the crucial stages of growth, restricting its distribution to higher, cooler elevations or protected micro-habitats.

Finally, more than twenty years after Clover and Jotter, some work was again started on the river and inner canyon gorge.

Schwartz, et al, (1968) initiated a study of the ecology of the Unkar Delta. These authors were primarily interested in the archaeology of the delta but found an ecological analysis essential to understanding the prehistoric environment. The area was analyzed from the river's edge to just below the canyon rim, and was divided into two subareas: the "canyon" and the "delta". The delta, in turn, was separated into four microenvironments: the river, the beach, the dunes and the terraces. The dunes were separated into the "sand dunes" proper and the "semidunes" which contained a more developed soil. In each area the plants were named and per cent cover estimated. Some collecting of reptiles, amphibians, and mammals was effected and brief bird censuses were taken. The work is essentially a checklist of species present in different microhabitats on the delta but it gives a firm base from which to commence further a more detailed ecological study.

Lastly, Paul S. Martin (1971) did a follow-up report to Clover and Jotter's work. Essentially an annotated checklist, Martin's paper gives a good comparison of pre- and post-Glen Canyon Dam vegetation and habitat structure along the river. He found that many of the typical riparian trees of low elevations in Arizona, that is, Cottonwood, Ash, Willow, and Tamarix, were spreading along the newly exposed sandy shores of the river, allowing tree growth where it had not occurred before. Phreatophytes, such as Cat-claw Acacia, Mesquite, and Desert Broom were moving downwards from the old floodline, and pioneering along the new floodline with the Willows and



Tamarix. Die-offs at the old floodline were expected to occur, but, if they do not, these species will experience an extension of their ranges.

Tamarix, an introduced species from Eurasia, is spreading along the river at a very rapid rate competing heavily with native species for growing space.

Little work has been done with non-vascular plants in the Grand Canyon area. Mills (1929) mentions the role of mushrooms in the diet of Kaibab squirrel and mule deer; McKee (1929) noted the presence of some lichens; Haring (1941; 1946) published a checklist of bryophytes found in the Park. Thiers, in 1971 (no ms.), collected over 1000 specimens of fleshy fungi from the Kaibab Plateau. Of special concern are various parasitic non-vascular plants such as Melampsorella, or Witch's Broom, on Spruce (Pody, 1942) and a rust growing on pine needles (Miekle, 1946 and Keener, 1956), and the possible harmful effects on the vegetation of the Grand Canyon.

#### Possible Areas For Future Investigation

##### 1) Plant Distribution and Migration Mapping

A relatively complete checklist of plants in the riparian zone of the Colorado River has been amassed over the years by a number of biologists participating in Canyon river trips. However, distribution and migration of these plants has been touched upon only lightly. Distribution of plant species oftentimes indicates current climatic and hydrologic conditions. Migration can indicate a change in these conditions.

Maps showing the present distribution of plant dominants and predominants along the river should be made. These maps should be repeated annually, biennially or on a five year basis to facilitate visualization of changes in distribution and plant migration. A study of this nature would also document changes in vegetation through time in response to the control of the Colorado River by Glen Canyon Dam.

## 2) Effects of Camping and Campers on Beach Areas

Many weedy species of plants seem well adapted to a disturbed habitat and oftentimes are the first plants to invade such an area. Campers and camping tend to degrade an environment by denuding the soils of vegetation, opening up the area for invasion by new, undesirable plants such as Thistle (Cirsium sp.) and Vetch (Vicia sp.).

Permanent study areas should be established, both impact and control areas, in an attempt to document changes in vegetational profiles through human impact. Camping areas should be analyzed both before and after the river running season to measure the amount of damage and the amount, type, and success of recovery. This should be done for several years in order to determine the permanency of some of the aspects of change.

## 3) Mapping of Introduced Plant Invasion

Tamarix (Tamarix pentandra) and Camel-thorn (Alhagi camelorum) are two phreatophyte plants, introduced from Eurasia, that occur along the Colorado River. They seem to be well established and are spreading rapidly into the sandy

areas exposed by the lowering of the water level since the completion of Glen Canyon Dam. The ready and rapid invasion of these hardy species seems to be to the detriment to native plant species of Willow (Salix spp.) and Cottonwood (Populus spp.). The extent of occurrence of these foreign species need mapping as preliminary data in determining the rate and success of their invasion. This would also aid in plant successional studies in the riparian zone and in ascertaining successional differences, if any, between a habitat of introduced species and that of native flora.

#### 4) Use of Introduced Plants by Fauna

With the invasion of foreign species of phreatophytic plants, marked changes in the vegetation of a riparian habitat occur. These changes in vegetation cause changes in the associated faunal types. A general paucity in faunal forms utilizing a habitat made up of chiefly foreign plant species has been noted but not yet studied. Without a systematic study, changes in the environment caused by foreign species, whether beneficial or detrimental, are unknown.

As Tamarix has been readily spreading into newly exposed sands along the Colorado River, the effect of the dominance of this species on faunal populations needs investigation. An inventory should be taken of the species, number and density of vertebrates using the new environment. The insect populations, a potential source of food for vertebrates, also needs study.

## Vascular Plant Checklist

The following is a list of plants occurring in the riparian zone of the Colorado River and its tributaries and on the canyon walls up to about 4000 feet. Information to compile this list was drawn from several sources. Each is indicated by an initial following the location of the plant. These sources are: Phillips (1973) (P); McDougall (1947) (MD); Kearney and Peebles (1964) (KP); Clover and Jotter (1941, 1944) (CJ); and Martin (1971) (M). Herbaria where a specimen of the plant can be found are indicated if known. These are: California Academy of Sciences Herbarium (CAS); Museum of Northern Arizona (MNA); and Grand Canyon Herbarium (GC).

### Family - POLYPODIACEAE

Adiantum capillus-veneris Maidenhair Fern. Phantom Canyon, Bright Angel Trail at 3000 ft., Havasu Canyon (MD-GC); Rampart Cave area (P)

Cheilanthes wootoni. Bright Angel Trail at 3300 ft. (MD-GC)

Cheilanthes parryi. Rampart Cave area (P)

Pelleae limitamea Cloakfern. Clear Creek Canyon (KP)

Pelleae longimucronata Cliffbrake. Bright Angel Trail at 3500 ft. (MD-GC)

Woodsia mexicana Woodsia. Bright Angel Trail at 4000 ft. (MD-GC)

### EQUISETACEAE

Equisetum laevigatum. Bright Angel Creek (MD-GC)

### PINACEAE

Pinus monophylla Singleleaf Pinyon. Bright Angel Canyon near Roaring Springs (MD)

CUPRESSACEAE

Juniperus monosperma One-seeded Juniper. m. 268.4 (P-MNA)

Juniperus scopulorum Rocky Mountain Juniper. North Kaibab  
Trail to base of Redwall (MD-GC)

Juniperus osteosperma Utah Juniper. Tiger Wash, Vasey's Para-  
dise, Elves Chasm, Granite Canyon (M)

EPHEDRACEAE

Ephedra nevadensis Joint Fir. South Kaibab Trail at 3500 ft.  
and 3700 ft. (MD-GC); downstream from Bright Angel Creek (M)

Ephedra torreyana. Near Roaring Springs, Havasu Canyon (MD-GC);  
Lee's Ferry, mouth of Little Colorado River, Cardenas Creek,  
Salt Creek, Granite Rapids (M); Emery Falls Water Sampling  
Station (P)

Ephedra viridis. Havasu Canyon (MD-GC); 205 mile Canyon, Sep-  
aration Canyon (CJ); Rampart Cave area (P)

GRAMINEAE

Agrostis semiverticillata Water Bent-grass. Roaring Springs (MD-GC)

Andropogon barbinodis Bluestem. Havasu Canyon (MD-GC)

Andropogon glomeratus Bluestem. Mouth of Bright Angel Creek (CJ)

Aristida adscensionis Three-awn grass. Mouth of Bright Angel  
Creek (CJ); Rampart Cave area (P-MNA)

Aristida hamulosa. Bright Angel Trail (MD-CAS)

Aristida longiseta. Pine Creek (MD-GC)

Aristida parishii. Rampart Cave area (P)

Bouteloua aristidoides Bluegrass. Havasu Canyon (CJ)

Bouteloua barbata. Clear Creek Trail (MD-GC)

Bouteloua trifida. Hermit Trail at 3800 ft. (MD-GC); Rampart  
Cave area (P)

Bromus anomalus Brome. Bright Angel Trail (MD-GC)

Bromus arizonicus. Rampart Cave area (P)

Bromus purgans. Bright Angel Trail at 4000 ft. (MD-GC and CAS)  
Bromus rubens. Bright Angel Trail, Indian Gardens, Havasu Canyon  
(MD-GC)  
Calamagrostis scopulorum Reed Grass. Kaibab Trail to Roaring  
Springs (KP-CAS) endemic  
Cenchrus pauciflorus Sandbur. Havasu Canyon (CJ)  
Cynodon dactylon. Bermuda Grass. Havasu Canyon (MD)  
Dactylis glomerata Orchardgrass. Havasu Canyon (MD)  
Digitaria sanguinalis Crabgrass. Havasu Canyon (CJ)  
Echinochloa crusgalli var. zelayensis Barnyard Grass. Havasu  
Canyon (CJ)  
Elymus triticoides Wildrye. Near Santa Maria Spring (MD)  
Erogrostis diffusa Lovegrass. Havasu Canyon (CJ)  
Festuca arizonica Fescue. Havasu Canyon (MD-GC)  
Festuca octoflora. Hermit Rapids (CJ); Rampart Cave area (P-MNA)  
Heteropogon contortus Tanglehead. Clear Creek Trail (MD); Rampart  
Cave area (P-MNA)  
Hilaria jamesii Galleta. Pipe Creek (MD-GC)  
Hilaria rigida  
Hordeum stebbinsii Barley. Hermit Trail at Santa Maria Spring (MD-  
GC)  
Imperata brevifolia Satintail. Bright Angel Trail near Colorado  
River (MD-GC)  
Lolium perenne Ryegrass. Mouth of Bright Angel Creek (CJ)  
Muhlenbergia asperifolia Muhly. Mouth of Bright Angel Creek  
(MD-GC)  
Oryzopsis bloomeri Ricegrass. Pipe Creek (MD); Bright Angel  
Trail (KP-GC) endemic

Oryzopsis hymenoides. Havasu Canyon (MD-GC)  
Panicum huachucae Witchgrass. Bright Angel Trail (KP)  
Phragmites communis. Rampart Cave area (P)  
Poa bigelovii. Rampart Cave area (P-MNA); Muav Cave (P)  
Polypogon monspeliensis Rabbitfoot polypogon. Muav Saddle (MD-GC); Rampart Cave area (P)  
Setaria lutescens Bristlegrass. Havasu Canyon (CJ)  
Setaria macrostachya. Mouth of Bright Angel Creek (MD); Havasu Canyon (CJ)  
Setaria viridis. Havasu Canyon (CJ)  
Sporobolus contractus Dropseed. Granite Rapids (CJ)  
Sporobolus cryptandrus. Havasu Canyon (CJ)  
Sporobolus flexuosus. Kanab Trail (CJ)  
Stipa coronata Needlegrass. South Kaibab Trail (CJ)  
Stipa lobata. Bright Angel Trail (KP) endemic  
Stipa scribneri. Bright Angel Trail (KP); Kaibab Trail to Roaring Springs (MD)  
Stipa speciosa. South Kaibab Trail (CJ); Rampart Cave area (P)  
Stipa tenuissima. Havasu Canyon (MD-MNA)  
Tridens pulchellus. South Kaibab Trail, Hermit Rapids, Havasu Canyon (CJ); Rampart Cave area (P)  
Triodia mutica Triodia. Hermit Trail (MD-GC)

#### CYPERACEAE

Carex curatorum Sedge. Kaibab Trail to Roaring Springs (MD-CAS)  
Eleocharis radicans. Grand Canyon (KP)  
Eleocharis rostillata Spikesedge. Grand Canyon (KP)

Fimbristylus thermalis. Foot of Bright Angel Trail (KP) endemic  
Juncus acutus var. sphaerocarpus Rush. Grand Canyon (KP) endemic  
Juncus saximontanus. Roaring Springs (MD-GC)  
Juncus torreyi. Mouth of Bright Angel Creek (CJ)

LILIACEAE

Calochortus flexuosus. Rampart Cave area, White Hills (P-MNA)  
Dichelostemma pulchellum var. pauciflorum Bluedicks. Hermit  
Trail (MD-GC)  
Nolina microcarpa Beargrass. Havasu Canyon (MD-GC); Elves  
Chasm downstream, Deer Creek, m. 139, Travertine Seep, Fern  
Glen, m. 214.6 (M)

Yucca angustissima Yucca. Havasu Canyon (MD-MNA); m. 15.3, m.  
18.3, Vasey's Paradise, Granite Falls, Conquistador Aisle, (M)  
Yucca navajoa Narrowleaf Yucca. In the canyon in Blackbrush  
community (MD)

AMARYLLIDACEAE

Agave utahensis Century plant. In the canyon in Blackbrush  
community (MD-GC); Granite Falls, Red Canyon, Shinumo,  
Elves Chasm, Fern Glen, Grapevine Rapids (M)

ORCHIDACEAE

Habenaria sparsiflora var. laxiflora. Roaring Springs (MD-GC)

SAURURACEAE

Anemopsis californica Yerbamansa. Indian Gardens (coll. in  
1917) (MD-CAS)

SALICACEAE

Populus fremontii Fremont cottonwood. Havasu Canyon, along  
Bright Angel Trail (MD-GC); Buck Farm Canyon, Deer Creek, Tapeats  
Creek (M)



POLYGONACEAE

- Chorizanthe brevicornu. Upstream from Rampart Cave (P)
- Chorizanthe rigida. Rampart Cave (P-MNA); m. 269 (P)
- Eriogonum fasciculatum. Below Lava Cave, Lava Falls (M);  
Diamond Creek, Rampart Cave (P-MNA)
- Eriogonum corymbosum. Havasu Canyon (CJ)
- Eriogonum deflexum Skeletonweed. Indian Gardens (MD-GC)
- Eriogonum howellii. Below Stanton's Cave (M)
- Eriogonum inflatum Desert trumpet. South Kaibab Trail, Havasu  
Canyon, Clear Creek Trail (MD-GC)
- Eriogonum thomasii. Rampart Cave, head of Lake Mead (P-MNA)
- Polygonum argyrocoleon Smartweed. Head of Lake Mead, m. 274,  
(P-MNA)
- Polygonum aviculare. Havasu Canyon (MD-GC)
- Pterostegia drymarioides. Havasu Canyon (CJ); Rampart Cave,  
Emery Falls Canyon (P)
- Rumex crispus. Head of Lake Mead (P)

CHENOPODIACEAE

- Atriplex canescens Fourwing saltbush. Phantom Ranch, Bright  
Angel Trail, Havasu Canyon, along Shinumo Creek (MD-GC);  
Soap Creek, Willie Taylor's grave, mouth of Fern Glen Canyon,  
mouth of Little Colorado River (M)
- Atriplex hymenelytra. Rampart Cave (P-MNA)
- Chenopodium fremontii Goosefoot. Havasu Canyon (CJ)
- Chenopodium fremontii var. incanum. Havasu Canyon (MD-MNA)
- Chenopodium hians. North Kaibab Trail (MD-CAS)
- Chenopodium murale. Havasu Canyon (MD-MNA)

Eurotia lanata Winter-fat. Conquistador Aisle, Deer Creek (M)  
Suaeda torreyana Seepweed. Palisades Canyon, Palisades Creek,  
Hance Rapids (M); Lee's Ferry, Tanner Rapids (CJ); Rampart  
Cave (P)

#### AMARANTHACEAE

Amaranthus graecizans. Havasu Canyon (CJ)  
Amaranthus hybridus Pigweed. Havasu Canyon (MD-GC)  
Amaranthus powellii. Havasu Canyon (CJ)  
Tidestromia oblongifolia. Fern Glen, Whitmore Wash (M)

#### NYCTAGINACEAE

Abronia nana Sandverbena. Hermit Trail, Kaibab Trail at 3000  
ft. (MD-GC)  
Abronia pumila. Bright Angel Trail near the river (MD-GC)  
Allionia incarnata Trailing Four-o'-clock. Grand Canyon,  
Havasu Canyon (MD-GC); Diamond Creek (P)  
Anulocaulis leisolenus. Havasu Canyon (CJ)  
Boerhaavia coulteri Spiderling. Havasu Canyon (MD-GC)  
Boerhaavia wrightii. Lower part of Bright Angel Trail, Phantom  
Ranch (MD-GC)  
Boerhaavia torreyana. Havasu Canyon (CJ)  
Mirabilis bigelovii Four-o'-clock. Phantom Ranch (MD-GC)  
Oxybaphus linearis. Phantom Ranch (MD-GC)

#### AIZOACEAE

Trianthema portulacastrum Horse purslane. Havasu Canyon (CJ)

#### PORTULACACEAE

Montia perfoliata Minerslettuce. Bright Angel Trail (MD-GC)

Salix exigua Coyote Willow. Phantom Ranch, Hermit Trail (MD-GC); Deer Creek Falls, Lava Falls (CJ); Vasey's Paradise (M)

Salix gooddingii Dudley Willow. Along Bright Angel Creek (MD-GC); Cardenas Creek, Vasey's Paradise, m. 195, m. 200.7, Buck Farm Canyon (M)

Salix laevigata var. araquipa. Foot of Bright Angel Trail, Kaibab Trail at 4150 ft., Havasu Canyon (MD-GC); Tapeats Creek (M)

#### JUGLANDACEAE

Juglans major Walnut. Havasu Canyon (CJ)

#### FAGACEAE

Quercus turbinella Scrub Oak. Bright Angel Canyon, Bright Angel and Hermit Trails, Havasu Canyon (MD-GC)

#### ULMACEAE

Celtis reticulata Nettleleaf Hackberry. Havasu Canyon, Bright Angel Trail (MD-GC); Lee's Ferry, m. 17, President Harding Rapid, m. 164, m. 197.5 (M); Rampart Cave area (P)

#### MORACEAE

Morus microphylla Texas mulberry. Havasu Canyon (MD-GC)

#### URTICACEAE

Parietaria floridana. Rampart Cave, Muav Cave (P)

Parietaria pensylvanica Pellitory. Grand Canyon (KP-GC); Havasu Canyon (CJ)

Urtica serra Nettle. Grand Canyon (KP-GC); Deer Creek Falls (CJ)

#### LORANTHACEAE

Phoradendron californicum Mistletoe. On Cat-claw Acacia from Havasu Rapids downstream (M); Rampart Cave (P-MNA)

CAPRIFOLIACEAE

Silene antirrhina. Rampart Cave area (P-MNA)

Stellaria nitens Chickweed. Hermit Trail (MD-CAS)

RANUNCULACEAE

Anemone tuberosa Anemone. Hermit Trail, Bright Angel Canyon (MD-GC); Muav Caves (P); Rampart Cave area (P-MNA)

Aquilegia chrysantha Columbine. Bright Angel Trail at 3000 ft., Ribbon Falls (MD-GC); Rampart Cave area (P)

Aquilegia triternata. Ribbon Falls (MD-GC)

Clematis ligusticifolia Virgin's bower. Bass Canyon, Havasu Canyon (MD-GC)

Delphinium amabile Larkspur. Rampart Cave, Emery Falls Canyon (P-MNA)

Delphinium scaposum. Bright Angel Trail, Kanab Creek (MD-GC)

BERBERIDACEAE

Berberis fremontii Fremont mahonia. Bright Angel Trail (MD-GC); m. 101 and 102 (M)

Berberis repens Creeping mahonia. Bright Angel Trail, Kaibab Trail (MD-GC)

PAPAVERACEAE

Argemone platyceras Pricklepoppy. Bright Angel Trail, Kaibab Trail, (MD-GC); Rampart Cave (P-MNA)

Argemone platyceras var. hispida. Hermit Trail (MD-GC)

Corydalis aurea. Bright Angel Trail (MD-GC)

Eschscholtzia glyptosperma. Rampart Cave area (P-MNA)

CRUCIFERAE

Arabis fendleri Rockcress. Hermit Trail (MD-GC)

Arabis perennans. Roaring Springs (MD-GC)

Arabis pulchra var. pallens. Kaibab Trail (MD-GC)

Athysanus pusillus. Hermit Creek (MD-CAS)

Descurainia longipedicellata Tansy mustard. Hermit Trail (MD-GC)

Descurainia pinnata ssp. ochroleuca. Hermit Creek (MD)

Descurainia pinnata ssp. glabra. Rampart Cave (P)

Draba cuneifolia var. integrifolia. Diamond Creek, Muav Cave (P); Rampart Cave (P-MNA)

Draba cuneifolia var. typica. Rampart Cave (P)

Erysimum capitatum Wallflower. Hermit Trail (MD0GC)

Erysimum repandum. South Kaibab Trail (MD-GC)

Lepidium lasiocarpum Peppergrass. Hermit Creek (MD-CAS)

Lepidium lasiocarpum var. typicum. Rampart Cave (P)

Lepidium lasiocarpum var. wrightii. Rampart Cave (P)

Lesquerella arizonica Bladderpod. Hermit Trail, Slide Canyon (MD-GC)

Lesquerella purpurea. Hermit Trail, Kaibab Trail, Phantom Ranch (MD-GC)

Physaria chambersii Twinpod. North Kaibab Trail (MD-CAS)

Rorippa nasturtium-aquaticum. Bright Angel Trail, Phantom Ranch (MD-GC)

Sisymbrium altissimum Tumblemustard. Kaibab Trail (MD-GC); Diamond Creek (P)

Sisymbrium irio. Hermit Trail (MD-CAS); Havasu Canyon (CJ)

Sisymbrium linearifolium. Ribbon Falls (MD-GC)

Stanleya pinnata Princesplume. Bright Angel Trail, Kaibab Trail, Havasu Canyon (MD-GC); Muav Cave (P-MNA)

Streptanthus cordatus Twistflower. South Kaibab Trail (MD-GC)

Thelypodium cooperi. Rampart Cave (P)

Thelypodium integrifolium. Havasu Creek (MD-GC); Havasu Canyon  
(CJ)

Thelypodium wrightii. Havasu Canyon (MD-GC)

CAPPARIDACEAE

Cleome lutea Beeplant. Havasu Canyon (CJ)

SAXIFRAGACEAE

Fendlera rupicola Fendlerbush. Bright Angel Trail (MD-GC)

Fendlerella utahensis. Bright Angel Trail, Kaibab Trail (MD-GC)

Heuchera versicolor Alumroot. Bright Angel Trail, North Kaibab  
Trail (MD-GC)

Ribes cerceum Waxcurrant. Bass Camp (MD-GC)

ROSACEAE

Amelanchier utahensis Serviceberry. Below Navajo Bridge,  
above Deer Creek Falls (M); Kaibab Trail (MD-GC)

Cercocarpus montanus Mountain mahogany. Roaring Springs (MD-  
GC)

Cowania mexicana Cliffrose. Marble Canyon, Saddle Canyon,  
Vasey's Paradise (CJ); Hermit Rapids, Red Canyon south of  
Hance Rapids (M)

Coleogyne ramosissima Blackbrush. Tonto Shelf (MD-GC)

Fallugia paradoxa Apache-plume. Common in the Canyon (MD-  
GC); Marble Canyon, Red Canyon, Hermit Canyon, Deer Creek  
(M)

Petrophytum caespitosum var. elatus Rockmat. Havasu Canyon,  
Bright Angel Trail near the Colorado River (MD-GC); Marble  
Canyon, Vasey's Paradise, Royal Arches, Elves Chasm, Kanab  
Creek (M)

Prunus fasciculata Desert Almond. Tanner Rapids, Hermit Rapids

(CJ); Saddle Canyon to Bright Angel Crossing (CJ); below

Vasey's Paradise, Palisades Creek (M); Emery Falls Canyon (P-MNA)

Rubus procerus Blackberry. Indian Gardens (MD-GC)

#### LEGUMINOSAE

Acacia greggii Catclaw. Havasu Canyon, Shinumo Creek, lower

Bright Angel Trail, along the Colorado River (MD-GC); Granite

Gorge, general along the river up to m. 39 (M)

Alhagi camelorum Camelthorn. Cardenas Creek, mi. 167.5 (M)

Amorpha fruticosa var. occidentalis Indigobush. Deer Creek (CJ)

Astragalus amphioxys Locoweed. Hermit Rest Trail, Pipe Creek,

in the Canyon (MD-GC)

Astragalus bryantii. Head of Phantom Creek (MD-GC); mouth of

Hermit Creek (MD-CAS)

Astragalus calycosus var. scaposus. Hermit Trail (MD-GC)

Astragalus humistratus. Bright Angel Trail (MD-GC)

Astragalus lentiginosus Specklepod loco. Hermit Trail, Kaibab

Trail (MD-GC)

Astragalus nuttallianus. Bright Angel Trail (MD-GC); Emery

Falls Canyon, Rampart Cave (P)

Astragalus praelongus. Havasu Canyon (MD-GC)

Astragalus zionis. Mouth of Hermit Creek (MD-CAS)

Cassia covesii Senna. Phantom Ranch, Clear Creek Trail, Havasu

Canyon (MD-GC); Cardenas Creek, Hermit Creek, Lava Falls,

Whitmore Wash (M)

Cercis occidentalis Redbud. Bright Angel Trail, Hermit Trail,

(MD-GC); Marble Canyon to Nankoweap, Deer Creek Falls, Fern

Glen, Red Canyon (M)

Dalea fremontii var. minutifolia Peabush. Stanton's Cave, Buck  
Farm Canyon, Granite Falls, Crystal Rapids, Soap Creek (M)

Dalea neomexicana. Rampart Cave (P-MNA)

Krameria parvifolia. Lava Falls, Diamond Creek (CJ); Whitmore  
Wash (M)

Lathyrus grammifolius Peavine. Bright Angel Trail, Hermit  
Trail (MD-GC)

Lupinus brevicaulis Lupine. Bright Angel Trail (MD-CAS)

Prosopis juliflora var. torreyana Mesquite. Marble Canyon,  
Lava Falls to Diamond Creek (M); Indian Gardens, Phantom  
Ranch, Havasu Canyon, general in Grand Canyon (MD-GC)

Robinia neomexicana New Mexico locust. Deer Creek above Deer  
Creek Falls (M)

Vicia exigua. Emery Falls Canyon (P-MNA)

#### GERANIACEAE

Erodium cicutarium Heronbill. Hermit Trail, Phantom Ranch,  
Tonto Shelf (MD-GC); Rampart Cave (P)

Erodium texanum. Havasu Canyon (CJ); Muav Gate (P)

#### ZYGOPHYLLACEAE

Larrea tridentata Creosote bush. Lower end of Toroweap Valley  
(MD-GC); downstream from Fern Glen (M)

Tribulus terrestris Caltrop. Havasu Canyon (MD-GC)

#### RUTACEAE

Ptelea pallida Hoptree. Marble Canyon, above Royal Arches,  
Clear Creek (M)

Thamnosia montana Turpentine bloom. Bright Angel Trail, Pipe Creek,



lower end of Toroweap Valley (MD-GC); Lee's Ferry, Vasey's Paradise, Clear Creek, Tapeats Creek (M); Granite Rapids (CJ); Emery Falls Canyon (P-MNA)

MALPIGHIACEAE

Janusia gracilis. Phantom Ranch, Clear Creek Trail above Bright Angel Creek (MD-GC)

EUPHORBIACEAE

Bernardia incana. Kaibab Trail, Clear Creek, Shinumo Creek, Havasu Canyon (MD-GC); Phantom Ranch, Elves Chasm, Fern Glen, Lava Falls (M); Hermit Rapids (CJ); Emery Falls Canyon (P); Muav Gate (P-MNA)

Ditaxis neomexicana. Clear Creek Trail above Phantom Point (MD-GC); Rampart Cave (P)

Euphorbia arizonica Spurge. Phantom Ranch, Clear Creek Trail, Roaring Springs (MD-GC)

Euphorbia polycarpa var. hirtella. Clear Creek Trail in the Canyon (MD-GC); Emery Falls Canyon, Muav Gate (P)

Euphorbia revoluta. Bright Angel Trail (MD-CAS)

ANACARDIACEAE

Rhus radicans Poison oak. Vasey's Paradise, Deer Creek Falls, Travertine Seep (M)

Rhus trilobata Squawbush. Bright Angel Canyon, Indian Gardens, Hermit Trail, Havasu Canyon (MD-GC); Lee's Ferry, Vasey's Paradise, Royal Arches, m. 165, Buck Farm Canyon, Hermit Creek, Kanab Creek, Stone Creek, Whitmore Wash (M)

CELASTRACEAE

Canotia holacantha. Havasu Canyon (MD-GC); Fern Glen, Granite Canyon, Diamond Creek (M)

Glossopetalon nevadense Greasebush. Bright Angel Trail, Tonto Shelf (MD-GC)

Mortonia scabella var. utahensis. Havasu Canyon (MD-GC)

#### ACERACEAE

Acer negundo var. interius Box-elder. North Kaibab Trail, Havasu Canyon (MD-GC); Fern Glen, Havasu Canyon (M)

#### RHAMNACEAE

Ceanothus martini. Base of Transept Trail (MD-GC)

Condalia lyciodes Lotebush. Havasu Canyon, Shinumo Canyon (MD-GC)

Condalia lycoides var. canescens. Deer Creek, Fern Glen, m. 201 (M)

Rhamnus betulaeifolia Birchleaf buckthorn. Roaring Springs, Bright Angel Trail, South Kaibab Trail (MD-GC); Buck Farm Canyon, Royal Arches, Tapeats Creek, Travertine Seep, Fern Glen (M)

#### VITACEAE

Parthenocissus inserta Virginia creeper. Havasu Canyon (CJ)

Vitis arizonica Canyon grape. Roaring Springs, Bright Angel Creek, Cataract Canyon, Nankoweap Basin (MD-GC); Kanab Creek, Granite Canyon, Havasu Canyon (M); Lava Falls (CJ)

#### MALVACEAE

Malva neglecta Mallow. Havasu Canyon (MD-GC)

Sphaeralcea ambigua. Rampart Cave (P)

Sphaeralcea fendleri Globemallow. Havasu Canyon (MD-GC)

Sphaeralcea grossulariaefolia var. pedata. Bright Angel Trail, South Kaibab Trail, Havasu Canyon (MD-GC)

Sphaeralcea incana var. cuneata. Havasu Canyon (CJ)

Sphaeralcea parvifolia. Havasu Canyon (MD-GC)

Sphaeralcea rusbyi. Hermit Trail, Bright Angel Trail (MD-CAS)

STERCULIACEAE

Ayenia pusilla. Clear Creek Trail (MD-GC)

TAMARICACEAE

Tamarix pentandra Tamarix. Stanton's Cave, Cardenas Creek,  
Granite Falls, Buck Farm Canyon, Deer Creek (M)

LOASACEAE

Eucnide urens. Rampart Cave (P)

Mentzelia affinis. Rampart Cave (P)

Mentzelia albicaulis. Rampart Cave (P)

Mentzelia pumila var. integra. Kaibab Trail in the Canyon (CJ)

Mentzelia pumila var. multiflora. South Kaibab Trail (MD-GC)

Petalonyx parryi Sandpaperplant. Havasu Canyon (CJ)

CACTACEAE

Ferocactus acanthodes Barrel cactus. Near the Bass Cable in the  
Canyon, Vasey's Paradise, President Harding Rapids (CJ);  
Hakatai Rapids, Deer Creek, Granite Canyon (M)

Ferocactus lecontei California barrel cactus. Tonto Shelf (MD-  
1936 ed.)

Echinocereus canyonensis Hedgehog cactus. Near the Bass Cable  
in the Canyon (CJ)

Echinocereus engelmannii. Havasu Canyon (CJ); Hermit Rapids,  
Bright Angel Creek (MD)

Echinocereus fendleri. Havasu Canyon, Hermit Rapids, mouth of  
Bright Angel Creek (CJ)

Echinocereus octacanthus. Bright Angel Creek, Hermit Creek,  
above Bass Cable in the Canyon (CJ)

Echinomastus johnsoni. Rampart Cave (P)

Mammillaria arizonica Fishhook cactus. In the Canyon (MD-1366 ed.)

Opuntia aurea Cholla. Indian Gardens (CJ)

Opuntia basilaris Beavertail cactus. Lee's Ferry, Vasey's Paradise,  
Buck Farm Canyon, Nankoweap, Cardenas Creek, Granite Falls,  
Elves Chasm, Lava Falls (CJ)

Opuntia bigelovii Jumping cholla. Lava Falls, Diamond Creek (M)

Opuntia chlorotica. Above Bass Cable in the Canyon, Havasu  
Canyon (CJ)

Opuntia engelmannii. Havasu Canyon, President Harding Rapids,  
Kwagunt Rapids, Saddle Canyon to Bright Angel Creek (CJ);  
Elves Chasm, Granite Rapids (M)

Opuntia erinacea. Bass Cable, Havasu Canyon (CJ)

Opuntia hystricina. Nankoweap Basin (MD-1936 ed.); Lee's Ferry,  
Bright Angel Creek, mouth of Havasu Canyon (CJ)

Opuntia laevis Spinelss cactus. Hermit Rapids (CJ)

Opuntia phaeacantha. Havasu Canyon, Indian Gardens (CJ);  
President Harding Rapids, Nankoweap (CJ)

Opuntia polyacantha. Hermit Creek (CJ); Lee's Ferry, President  
Harding Rapids, Tanner Rapids, Kwagunt Rapids, Nankoweap,  
Hermit Rapids (M)

Opuntia tetracantha. Mouth of Diamond Creek (CJ)

Opuntia vaseyi. Above Bass Cable in the Canyon (CJ)

Opuntia whipplei. Vasey's Paradise, Upset Rapids, Walthenberg  
Rapids, mouth of Havasu Canyon, Lava Falls, Diamond Creek (CJ)

ELAEAGNACEAE

Elaeagnus angustifolia Russian-olive. Mouth of Kanab Creek (MNA)

Shepherdia rotundifolia Buffalo berry. Marble Canyon, Stanton's Cave to Vasey's Paradise, Royal Arches, President Harding Rapids (M)

#### ONOGRACEAE

Gaura coccinea. Havasu Canyon (MD-GC)

Oenothera brevipes. Rampart Cave (P-MNA)

Oenothera cavernae. Rampart Cave (P)

Oenothera longissima. Bright Angel Creek (MD-GC)

Oenothera micrantha var. exfoliata. Havasu Canyon (CJ)

Oenothera multijuga. Havasu Canyon (MD-GC)

Oenothera multijuga var. typica. Diamond Creek (P)

Oenothera pallida. Bright Angel Trail at Canyon bottom, Havasu Canyon (MD-GC)

Oenothera refracta. Rampart Cave (P-MNA)

#### UMBELLIFERAE

Apium graveolens Celery. Havasu Canyon (MD-GC)

Caucalis microcarpa False carrot. Hermit Creek (MD-CAS)

#### CORNACEAE

Garrya flavescens Silktassel. Roaring Springs, Bright Angel Trail (MD-GC)

#### ERICACEAE

Arctostaphylos pungens Pointleaf manzanita. Roaring Springs (MD-GC)

Phyllodoce empetrifomis Mountain heath. South Kaibab Trail (MD-GC)

#### FOUQUIERIACEAE

Fouquieria splendens Ocotillo. Havasu Canyon downstream to Lake Mead (M)

OLEACEAE

Fraxinus anomala Single-leaf ash. Buckfarm Canyon, Nankoweap,  
Granite Rapids (M)

Fraxinus lowellii. Havasu Canyon (CJ)

Fraxinus velutina. Rampart Cave area (P)

Fraxinus velutina var. glabra Arizona Ash. Havasu Canyon (MD-  
GC); Fern Glen (M); Rampart Cave area (P)

GENTIANACEAE

Centaurium calycosum. Mouth of Garden Creek (MD-GC)

APOCYNACEAE

Amsonia eastwoodiana. Hermit Trail, South Kaibab Trail (MD-GC)

Apocynum cannabinum Indian Hemp. Indian Spring in the Canyon,  
Havasus Canyon (MD-GC)

Apocynum suksdorfii. Havasu Canyon (MD-GC)

ASCLEPIADACEAE

Asclepias capricornu ssp. occidentalis Milkweed. Bright Angel  
Trail

Asclepias latifolia. Hermit Trail (MD-CAS)

Funastrum heterophyllum Climbing milkweed. Phantom Ranch, Tonto  
Shelf, Havasu Canyon (MD-GC)

Funastrum hirtellum. Rampart Cave (P-MNA)

CONVOLVULACEAE

Cuscuta campestris Dodder. Havasu Canyon (MD-GC)

Ipomoea coccinea var. hederifolia Morning glory. Havasu Canyon  
(MD-GC)

POLYMONIACEAE

Gilia aggregata Skyrocket. Havasu Canyon (MD-GC)

Gilia scopulorum. Diamond Creek (P); Rampart Cave area (P-MNA)

Langloisia setosissima. Rampart Cave area (P); Havasu Canyon  
(MD-MNA)

Linanthus aureus. Rampart Cave area (P)

Linanthus bigelovii. Rampart Cave area (P); Hermit Creek (MD)

Linanthus demissus. Diamond Creek (P); Rampart Cave area (P-MNA)

#### HYDROPHYLLACEAE

Eucrypta chrysanthemifolia. Muav Cave (P); Rampart Cave area  
(P-MNA)

Eucrypta micrantha. Roaring Springs (MD-GC); Rampart Cave area  
(P-MNA)

Nama demissum. Rampart Cave area (P)

Phacelia crenulata. Diamond Creek (P); Rampart Cave (P-MNA)

Phacelia cryptantha. Hermit Creek (MD-CAS); Emery Falls Canyon  
(P-MNA); Rampart Cave (P)

Phacelia distans. Diamond Creek (P)

Phacelia fremontii. Rampart Cave area (P)

Phacelia glechomaefolia. Kaibab Trail, Bright Angel Trail,  
Havasu Canyon, Toroweap Valley (MD-GC); Muav Gate, Rampart  
Cave area (P-MNA); Diamond Creek (P)

Phacelia laxiflora. Bright Angel Trail, Hermit Trail (MD-GC)

Phacelia pedicellata. South Kaibab Trail at 3500 ft. (MD-GC)

Phacelia rotundifolia. Phantom Ranch, Pipe Creek, Bright Angel  
Trail (MD-GC); Diamond Creek, Rampart Cave area (P); Muav  
Gate (P-MNA)

Pholistoma auritum. Hermit Creek (MD-CAS); Emery Falls Canyon  
(P); Rampart Cave area (P-MNA)

BORAGINACEAE

- Amsinckia intermedia Fiddleneck. Hermit Creek (MD-CAS); Rampart Cave (P-MNA)
- Amsinckia tessellata. Hermit Trail, Indian Gardens (MD-CAS)
- Coldenia hispidissima. Rampart Cave area (P)
- Cryptantha abata. Hermit Trail (MD-GC)
- Cryptantha barbiger. Phantom Ranch, Clear Creek Trail (MD-GC)
- Cryptantha fulvocanescens. Hermit Trail (MD-GC)
- Cryptantha holoptera. Havasu Canyon (CJ)
- Cryptantha inaequata. Rampart Cave area (P)
- Cryptantha micrantha. Rampart Cave area (P)
- Cryptantha pterocarya var. cycloptera. Rampart Cave, Diamond Creek (P)
- Cryptantha racemosa. Bright Angel Trail at 3000 ft., Clear Creek Trail, Havasu Canyon (MD-GC)
- Cryptantha utahensis. Rampart Cave area (P-MNA)
- Cryptantha virginensis. Hermit Trail (MD-GC) endemic
- Lappula redowskii var. desertorum Stickweed. Hermit Trail (MD-CAS)
- Pectocarya heterocarpa Combseed. Hermit Camp (MD-CAS); Muav Caves, Rampart Cave (P)
- Plagiobothrys arizonicus Popcornflower. Hermit Camp (MD-CAS)
- Plagiobothrys jonesii. Clear Creek Trail in the Canyon (MD-GC)

VERBENACEAE

- Aloysia wrightii. Clear Creek Trail in the Canyon (MD-GC); Vasey's Paradise, Willie Taylor's grave, Cardenas Creek, Hance Rapids, Salt Creek, Hermit Creek, Elves Chasm, Deer Creek (M)
- Verbena gooddingii. Rampart Cave area (P-MNA)



## LABIATAE

Hedeoma nanum ssp. typicum False pennyroyal. Bright Angel Trail, North Kaibab Trail, Trail to Monument Creek (MD-CAS); Rampart Cave (P); Muav Gate (P-MNA)

Salazaria mexicana. Rampart Cave (P)

Salvia carnososa. Cardenas Creek (M)

Salvia carnososa ssp. pilosa. Rampart Cave area (P)

Salvia columbariae. Rampart Cave area (P)

Salvia davidsonii. Havasu Canyon (CJ)

## SOLANACEAE

Datura meteloides Sacred Datura. Indian Gardens, Bright Angel Creek (MD-GC)

Lycium andersonii Wolfberry. Bright Angel Trail at 2800 ft., Hermit Trail, Havasu Canyon (MD-GC); Stanton's Cave, Hance Rapids, Granite Falls, mouth of Bass Canyon, Elves Chasm, Cardenas Creek (M)

Lycium fremontii. Rampart Cave area (P)

Lycium pallidum. Tonto Shelf, Havasu Canyon (MD-GC)

Nicotiana attenuata Tobacco. Ribbon Falls (MD-GC)

Nicotiana trigonophylla. South Kaibab Trail at 3000 ft., Havasu Canyon (MD-GC); Rampart Cave (P)

Physalis crassifolia Groundcherry. Phantom Canyon, Bright Angel Creek, Clear Creek Trail (MD-GC)

Physalis fendleri. North Kaibab Trail (MD-CAS)

Solanum americanum. Rampart Cave area (P-MNA)

Solanum douglasii Nightshade. Havasu Canyon (MD-GC)

Solanum elaeagnifolium. Tonto Shelf (MD-GC)

SCROPHULARIACEAE

Antirrhinum filipes. Rampart Cave area (P-MNA)

Castilleja chromosa Paintbrush. South Kaibab Trail at 4000 ft.,  
Slide Canyon at 4000 ft., (MD-GC); Rampart Cave area (P-MNA)

Mimulus bigelovii. Rampart Cave area (P-MNA)

Mimulus cardinalis Monkeyflower. Bright Angel Creek, Havasu  
Canyon (MD-GC)

Mimulus guttatus. Phantom Ranch (MD-GC)

Mimulus rubellus. North Kaibab Trail (MD-CAS)

Mohavea breviflora. Rampart Cave area (P-MNA)

Penstemon eatoni var. undosus Beardtongue. Hermit Trail, Havas  
Havasu Canyon, lower end of Toroweap Valley (MD-GC); Rampart  
Cave, Muav Gate (P-MNA)

Penstemon palmeri. Bright Angel Trail, Pipe Creek, in the  
Canyon (MD-GC); Rampart Cave (P-MNA)

BIGNONIACEAE

Chilopsis linearis Desert willow. Havasu Canyon (MD-GC);  
Marble Canyon, Separation Rapids below Diamond Creek (CJ)

MARTYNIACEAE

Martynia proboscidea Unicornplant. Havasu Canyon (MD-GC)

PLANTAGINACEAE

Plantago insularis Plantain. Rampart Cave area (P); Tanner  
Rapids (CJ); Havasu Canyon (MD-GC)

Plantago purshii. Bright Angel Trail at 3700 ft. (MD-GC)

RUBIACEAE

Galium aparine Bedstraw. Hermit Creek (MD-CAS); Rampart  
Cave area (P)

Galium munzii. North Kaibab Trail (MD-CAS)

Galium stellatum var. eremicum. Bright Angel Trail, Clear  
Creek Trail in the Canyon (MD-GC); Emery Falls Canyon (P);  
Rampart Cave area (P-MNA)

Galium triflorum. Roaring Springs (MD-GC)

Galium watsoni. Bright Angel Trail, Hermit Trail (MD-GC)

#### CAPRIFOLIACEAE

Symphoricarpos longiflorus Snowberry. Buck Farm Canyon (M)

Symphoricarpos utahensis. Hermit Trail in the Canyon (MD-GC)

#### CUCURBITACEAE

Cucurbita foetidissima Buffalo gourd. Havasu Canyon (MD-GC)

#### CAMPANULACEAE

Lobelia cardinalis ssp. graminea. Bright Angel Creek, Hance  
Canyon (MD-GC)

Nemacladus glanduliferus var. orientalis. Havasu Canyon (CJ);  
Diamond Creek (P); Rampart Cave (P-MNA)

#### COMPOSITAE

Acamptopappus sphaerocephalus. Rampart Cave area (P)

Amphipappus fremontii. Rampart Cave area (P-MNA)

Artemisia frigida. Near river level at Buck Farm Canyon (M)

Artemisia ludoviciana. Vasey's Paradise, Buck Farm Canyon,  
Nankoweap, Shinumo, mouth of Kanab Creek, mouth of Fern Glen  
Canyon, Clear Creek (M)

Artemisia ludoviciana ssp. mexicana. Rampart Cave area (P)

Artemisia tridentata. Lee's Ferry, Vasey's Paradise, Buck Farm  
Canyon (M)

Aster abatus. South Kaibab Trail, Hermit Trail, Havasu Canyon

(MD-GC); Marble Canyon to mouth of Little Colorado River (M);  
Muav Gate (P)

Aster canescens. Havasu Canyon (MD-GC)

Aster cichoriaceus. Havasu Canyon.

Aster glaucodes. Havasu Canyon (MD-GC)

Aster spinosus. Foot of Bright Angel Trail (MD-GC); Lee's Ferry,  
Stanton's Cave, Cardenas Creek, Phantom Ranch, Granite Rapids,  
Fishtail Canyon, Granite Falls, Staircase Canyon (M)

Atrichoseris platyphylla. Emery Canyon Falls (P); Rampart  
Cave area (P-MNA)

Baccharis emoryi. Pipe Creek, Bright Angel Trail, Shinumo  
Canyon, Havasu Canyon, (MD-GC); Granite Falls, 164 mile  
Rapids, Granite Canyon (M); Hermit Creek, Deer Creek Falls  
(CJ); Rampart Cave area (P-MNA)

Baccharis glutinosa Seepwillow. Phantom Ranch, Havasu Canyon,  
Bright Angel Trail (MD-GC); Lee's Ferry, Buck Farm Canyon,  
Clear Creek, Hermit Creek, Bass Canyon, Havasu Creek (M)

Baccharis sarothroides Desertbroom. Fern Glen, Lava Falls (M)

Baccharis sergiloides. Stanton's Cave (M)

Baileya multiradiata. Lake Mead (P-MNA)

Bebbia juncea. Phantom Ranch (MD-GC)

Brickellia atractyloides. Phantom Ranch (MD-GC); Stanton's  
Cave, Cardenas Creek, Red Creek at Hance Rapids, Lava Falls (M)

Brickellia californica. Bright Angel Trail at 3200 ft., (MD-GC)

Brickellia longifolia. Phantom Ranch, Bright Angel Trail (MD-GC);  
Stanton's Cave, Vasey's Paradise, Granite Falls, Conquistadore

Aisle (M) endemic

Brickellia scabra. North Kaibab Trail (MD-CAS)

Calycoseris wrightii. Rampart Cave area (P)

Chaenactis fremonti. Muav Caves (P); Rampart Cave area (P-MNA)

Chaenactis macrantha False yarrow. Trail to Monument Creek (MD-CAS)

Chaenactis stevioides. Havasu Canyon (MD-GC)

Chaenactis xantiana. Havasu Canyon (MD-GC)

Chrysopsis villosa Golden aster. Havasu Canyon (MD-GC)

Chrysothamnus greenei var. filifolius Rabbitbrush. Hermit Trail  
(MD-GC); Lee's Ferry (M)

Chrysothamnus nauseosus var. junneus. Bright Angel Trail (MD-CAS)

Chrysothamnus viscidiflorus var. elegans. South Kaibab Trail (CJ)

Cirsium neomexicanum Thistle. Phantom Ranch, Havasu Canyon (MD-GC)

Dyssodia acerosa Dogweed. Havasu Canyon (MD-GC)

Dyssodia pentachaeta. Phantom Ranch, Clear Creek Trail (MD-GC);  
Muav Gate (P-MNA)

Dyssodia porophylloides. Phantom Ranch (MD-GC)

Dyssodia thurberi. Foot of North Kaibab Trail (MD-GC)

Encelia farinosa Brittlebush. Phantom Ranch (MD-GC); Nankoweap,  
Granite Falls, Granite Canyon (M); above Bass Trail, Separation  
Rapids (CJ)

Encelia frutescens. Lower Kaibab Trail (MD-GC); Nankoweap,  
Cardenas Creek, Red Canyon, Phantom Ranch, Diamond Creek (M);  
Rampart Cave area (P)

Erigeron canadensis Fleabane. Havasu Canyon (CJ)

Erigeron lobatus. Mouth of Bright Angel Creek (CJ); Diamond  
Creek (P)

Eriophyllum lanosum. Rampart Cave (P-MNA)

Eriophyllum wallacei. Rampart Cave area (P-MNA)

Filago californica. Rampart Cave area (P)

Franseria dumosa White bur-sage. Deer Creek Valley, Big Point Canyon (M)

Franseria eriocentra Bur-sage. Clear Creek Trail, Kaibab Trail near Redwall (MD-GC)

Gnaphalium wrightii. Phantom Ranch (MD-GC)

Gutierrezia microcephala. Clear Creek Trail (MD-GC)

Gutierrezia sarothrae. Tanner Rapids (CJ); mouth of Little Colorado River, Hopi Salt Mine (M)

Happlopappus acradenius Goldenweed. Bright Angel Creek near Phantom Ranch (MD-GC)

Happlopappus drummondi. Shinumo Creek (MD-GC)

Happlopappus salicinus. Bright Angel Trail (MD)

Happlopappus spinulosus var. gooddingii. South Kaibab Trail at 3300 ft., Havasu Canyon (MD-GC); Rampart Cave area (P-MNA)

Hofmeisteria pluriseta. Mouth of Havasu Canyon, Fern Glen, m. 214 (M)

Hymenoclea pentalepis. Rampart Cave area (P)

Hymenoclea salsola Burrobrush. Lower end of Toroweap Valley (MD)

Lactuca serriola forma integrifolia Lettuce. Havasu Canyon (CJ)

Malacothrix clevelandi. Hermit Creek (MD-CAS)

Malacothrix glabrata. Rampart Cave area (P)

Microseris heterocarpa. Hermit Creek (MD-CAS)

Oxytenia acerosa. Lower end of Bright Angel Trail (MD-CAS)

Parthenium incanum. Havasu Canyon (MD-GC); lower parts of Grand Canyon (KP)

Pectis papposa Fetid marigold. Havasu Canyon (MD-GC)

Perezia wrightii. Bright Angel Trail, Phantom Ranch, Havasu Canyon (MD-GC)

Perityle emoryi. Emery Falls Canyon (P); Rampart Cave area (P-MNA)

Peucephyllum schottii Pygmy Cedar. Bass Canyon, Shinumo Creek, Deer Creek, m. 128, m. 217 (M); Rampart Cave area (P)

Pluchea sericea Arrowweed. Phantom Ranch, Havasu Canyon (MD-GC); Rampart Cave area (P)

Porophyllum gracile Poreleaf. Phantom Ranch, Havasu Canyon (MD-GC); Lee's Ferry, Marble Canyon, Granite Falls, Cardenas Creek, Fishtail Canyon, m. 216 (M); Tanner Rapids, mouth of Hermit Creek (CJ)

Psilostrophe sparsiflora Paperflower. Hermit Trail, Kaibab Trail (MD-GC)

Psilostrophe tagetina. Hermit Trail (MD-CAS)

Rafinesquia neomexicana. Rampart Cave area (P)

Senecio quercetorum Groundsel. Havasu Canyon (MD-MNA)

Senecio stygius. South Kaibab Trail (MD-GC)

Solidago sparsiflora Goldenrod. Havasu Canyon (MD-GC)

Sonchus asper Sowthistle. Bright Angel Creek (MD-GC); Rampart Cave (P)

Sonchus oleraceus. Havasu Canyon (MD-MNA); South Kaibab Trail (CJ)

Stephanomeria pauciflora Wirelettuce. Bright Angel Canyon, Clear Creek Trail, Havasu Canyon (MD-GC)

Trixis californica. Bright Angel Trail, Kaibab Trail, Phantom Ranch (MD-GC); Red Creek above Hance Rapids, Granite Falls,

Fern Glen, Diamond Creek (M)

Verbesina encelioides Crownbeard. Havasu Canyon (MD-GC)

Viguiera deltoidea. Rampart Cave area (P-MNA)



## ENTOMOLOGY

An entomological checklist has yet to be compiled for the Grand Canyon Region. Indeed, an inventory has yet to be taken. Garth (1950) published a checklist of Lepidoptera found within the park and L. Schellbach, Park Naturalist from 1941 to 1957, did a great deal of insect collecting on the South Rim and in the Canyon. His lists, however, are contained in correspondence in the Grand Canyon National Park Museum files. Within the riparian habitat, some collecting has been done by Carothers and staff of the Museum of Northern Arizona.

Field research concerning insects has been done only on the North Rim in connection with the Black Hills Beetle epidemic of the 1920's and early 1930's. The Bureau of Entomology of the United States Department of Agriculture set up control and test plots in the Kaibab Forest to find an effective means of controlling the infestation.

### Possible Areas For Future Investigation

1) A Systematic Approach to Identifying the Insect Fauna of the Riparian Habitat.

This should be of the highest priority in terms of better understanding the riparian ecosystem for the Canyon. Insect populations make up one of the basic trophic levels upon which most of the vertebrates depend, either directly or indirectly. A thorough understanding of the latter group depends, in part, upon a knowledge of the life forms lower down in their food chains.

## ICHTHYOLOGY

Most of the ichthyological studies have been concerned with the feasibility of planting fish in the tributary streams of the Colorado River in order to satisfy recreational needs. Checks were kept on the fate of the planted fish and occasional reports were published (Anon. 1928, 1929; Brooks, 1931; Brown, 1939; Markley, 1931; Williamson and Tyler, 1932). In 1944, R. R. Miller began a checklist of fishes of Grand Canyon National Park (corresp. NPS file) but it was never completed. This list included fishes actually collected in the Colorado River as well as Miller's hypothetical list. Rinne and Minckley (1970) reported on two species of Gila (chubs) which occur naturally in the turbulent waters of the Colorado River. Then, Holden (1973) and Constant (pers. comm. Carothers) investigated the ecology and distribution of fishes in the river and its tributaries. Both found that certain species of fish were becoming rare in the main channel. Also, Koehn (corresp. NPS file) has been working on gene flow in the fish of the main channel as have Carothers and Aitchison (1972) at Blue Springs (mile 13) on the Little Colorado River.

### Possible Areas For Future Investigation

1) A Complete Inventory of the Fishes of the Colorado River and its Tributaries Including Information on Habitat Requirements, Population Densities and Relative Densities.

This information base is critical to gaining an understanding of the interrelationships between the fishes, the riparian

vegetation and the overall productivity of the Colorado River and its tributaries. Other suggested projects, all of which are dependent upon the information gathered by an initial study as described above, are as follows:

- a) the effects of planted non-native fishes on endemic populations;
- b) the effects of shoreline stabilization and river bottom changes on the structure of fish populations; and
- c) a simulation model of what changes have taken place in the fish fauna since the closing of the Dam flood-gates. The development of this model will require a prior understanding of other southwestern river systems and subsequent interpolation.

## Fish Checklist

Below is a list of fish found in the Colorado River and the lower reaches of some of its tributaries. The list is necessarily incomplete since a systematic inventory of fishes in the area has yet to be taken. Species present and distributional information has been drawn chiefly from Holden (1973) (H).

Other sources are Rinne and Minckley (1970) (RM), Carothers and Aitchison (1972) (C-MNA), Miller and Lowe (1964) (ML), and Miller and Smith (1972) (MS).

### Family - SALMONIDAE

Rainbow Trout Salmo gairdneri. 100 yards below Glen Canyon Dam, Lee's Ferry, Shinumo Canyon, Tapeats Creek, Main Channel near Diamond Creek (H)

### CATOSTOMIDAE

Flannelmouth Sucker Catostomus latipinnis. 100 yards below Glen Canyon Dam (H)

Blueheaded Sucker Catostomus discobolus. 100 yards below Glen Canyon Dam (H)

### CYPRINIDAE

Carp Cyprinus carpio. Found generally along the Colorado River in back waters and channel mouths (H)

Red Shiner Notropis lutrensis. Common in main river (MS)

Bonytail Chub Gila robusta elegans. Found generally along the Colorado River in back waters and channel mouths (H)

Roundtail Chub Gila robusta robusta. Major tributaries of the Colorado River (ML)

Humpback Chub Gila cypha. Main channel of the Colorado River  
(RM); mouth of Bright Angel Creek (ML)

Speckled Dace Rhinichthys osculus. In tributary streams of the  
Colorado River (H); Blue Springs on the Little Colorado River  
(C-MNA)

Fathead Minnow Pimephales promelas. Kanab Creek (H); Colorado  
River, Bright Angel Creek, Little Colorado River (ML)

Hybrid - Notropis lutransis x Pimephales promelas. Shinumo  
Creek (MS)

Channel Catfish Ictalurus punctatus. Marble Canyon, 100 yards  
below Glen Canyon Dam (H)

Black Bullhead Ictalurus melas. 64 miles below Lee's Ferry (MS)

## HERPETOLOGY

The past history of herpetological investigation in the Grand Canyon has been characterized by records of sightings and collections, usually documented in Grand Canyon Nature Notes. These observations were compiled by McKee and Bogert (1934) and later by Dodge (1938). More recently, a brief checklist was published by Gehlbach (1966). No real attempt has been made to inventory the herpetofauna of the entire canyon or the riparian habitat.

Although little or no research of a theoretical nature has been carried out in the inner gorge, a few projects have been pursued on or near the rims. In particular, Gehlbach (1967, 1969) studied the evolutionary differences in the salamanders of the north and south rims. Lowe (1955) has commented on the taxonomic status of the same amphibians. Garrigues (1965) made the interesting observation that rattlesnakes in the canyon may be vectors for the dispersal of botflies.

### Possible Areas For Future Investigation

#### 1) Distributional Patterns

Most reptile and amphibian distribution data appears in such general terms as "inner gorge". There is a need for more detailed knowledge about occurrences so that specific areas can be evaluated in terms of their biological importance. Also, since it is unlikely that most species occur evenly throughout the inner gorge or even the riparian system, specific locale collection data is needed to determine habitat preferences of

the various reptile and amphibian species of the inner gorge. In light of this, a thorough inventory program is recommended. The techniques involve visual observations and collections made by a trained herpetologist who understands the effect that collecting has upon the communities of the canyon.

## 2) Direct Human Impact upon Riparian Reptiles and Amphibians

The relationship between human impact in terms of usage of riparian habitats (usually beach campgrounds) and the effect of this usage upon the reptile and amphibian communities has not yet been investigated. Since much of the riparian habitat occurs on beaches, it is also used as campsites and a human impact component has been added to the natural ecosystem. Specifically, the mechanism by which campers and boat parties affect the reptile and amphibian densities and diversities needs to be determined.

An investigation into the human impact upon reptile and amphibian communities should concentrate on changes in habitat quality within the first four or five vertical feet of an area. For example, driftwood is a popular campfire fuel but it is quite possible that densities of lizard species such as Cnemidophorus tigris and Uta stansburiana may be affected by its removal since accumulations probably provide foraging areas for these species.

## 3) Effect of Glen Canyon Dam

The controlling of the river due to the construction of Glen Canyon Dam in 1963 probably has had several effects upon members of the reptile and amphibian communities. The result of this river control has been to increase the amount of stable

shoreline and usable habitats. These effects may be expected to be beneficial in terms of increasing the size and diversity of these communities. While the river (and its associated riparian environment) has been preserved, the amount of usable (to reptiles and amphibians) shoreline has been increased. Concurrent with this has been a change in the vegetation along the river as characterized by increased numbers of phreatophytes such as cottonwoods and willows, and in the area covered by dense vegetation such as tamarix. Since some lizards, such as Sceloporus magister, use trees in their territorial systems, these reptiles can be expected to increase their numbers. An increase in the amount of densely covered area will benefit populations of amphibians, some lizards, and snakes. Since the numbers of burrowing rodents can be expected to increase in response to the additional habitat area, populations of carnivorous reptiles should become significantly higher.

All these positive vegetation associated effects are conjectural and must be investigated. No definitive statement can be made about this (and similar situations elsewhere in the Southwest) until a careful program of population sampling has been undertaken in the canyon.

#### 4) Non-biotic Aspects of Habitat Quality

Little is known about the ecological value of the physical features of the various riparian habitats along the river.

Two habitat components which might be investigated are the rockiness of an area and its soil characteristics. Reptiles use rocks as basking spots and as territorial lookouts by day and as shelters by night. Therefore, other things being equal,



some areas will support a larger reptile fauna than others simply because of the characteristics of the rock substrate. Also, many snakes and lizards require rodent burrows for shelter. Since some soils are better suited to burrow construction than others, soil type and strength is another factor which needs to be considered.

Physical data, related to zoological data, is very useful in management programs concerned with future campsite locations and restrictions.

#### 5) Social Behavior

Many lizard species are highly territorial and the males commonly maintain relatively large distances between each other. It is known, however, that when several males are "thrown together" in a restricted area these same lizards establish a social system in the form of single despot social hierarchy. Presumably this is a response to having more lizards than space for territories.

In the semi-isolated patches of riparian habitat that exist along the river, it is quite possible that a situation has developed wherein a large number of males have congregated in relatively restricted spaces. If this is so, then the canyon will be important to students of behavioral science since this effect has not been observed in studies conducted in more open areas.

## Amphibians and Reptiles Checklist

Sources of information for the compilation of the Amphibian and Reptile list were drawn from the observation file of the Grand Canyon National Park (O-GC), the collection file of the Grand Canyon National Park (C-GC), the observation file of the Museum of Northern Arizona (O-MNA), the collection file of the Museum of Northern Arizona (C-MNA), Dodge, 1938 (D), McKee and Bogert, 1934 (M&B), and Schwartz et.al., 1968 (STNB).

### Family - BUFONIDAE

Bufo woodhousei Woodhouse's Toad. Bright Angel Creek (lower) (D); Phantom Ranch, Cardenas Creek, Hance Rapids (C-MNA); Unkar Delta (STNB)

Bufo punctatus Red-spotted Toad. Indian Gardens (C-GC); Phantom Ranch, Pipe Creek, Bright Angel Creek (D); Lower Bass Canyon, Diamond Creek, Whitmore Wash, Stanton's Cave, Lee's Ferry (C-MNA); Unkar Delta (STNB); mi. 18 (O-MNA)

### HYLIDAE

Hyla arenicolor Canyon Treefrog. Havasu Falls (D); Indian Gardens, Rowes Well Tank, Pipe Creek, Dripping Spring (C-GC); Unkar Delta (STNB); Elves Chasm, mi. 18, mi. 29.9 (O-MNA)

### GEKKONIDAE

Coleonyx variegatus Banded Gecko. Canyon bottom (D); mi. 162 (C-MNA); Tanner Trail 3600', Phantom Ranch (C-GC); Kaibab Trail in Redwall formation (O-GC); Deer Creek (O-MNA)

### IGUANIDAE

Sauromalus obesus Chuckwalla. Inner Gorge (D); Stanton's Cave, Phantom Ranch, Lee's Ferry, Nautaloid Canyon (C-MNA); Kaibab Trail (Tonto Platform), Bright Angel Trail below Indian Gardens, Bright Angel Trail near River, Kaibab Trail near

the Redwall formation (C-GC); Kaibab Trail below tip-off, 3 mi. above Phantom Ranch, Junction River Trail and Kaibab Trail, Clear Creek Trail on Tonto Platform, Fern Glen (O-GC); Bass Canyon, mi. 83.8 (O-MNA)

Callisaurus draconoides Zebra-tailed Lizard. Diamond Creek (C-MNA)

Crotaphytus collaris Western Collared Lizard. Middle elevations in the Canyon (D); Deer Creek, Lower Bass Canyon (C-MNA); Phantom Ranch, mouth of Bright Angel Creek, Tanner Trail 3600', foot of Tanner Trail, Bright Angel Trail about 1 mile from Kaibab Trail (C-GC); Havasu (O-MNA); Unkar Delta (STNB)

Sceloporus magister Desert Spiny Lizard. Mouth of Bright Angel Creek (M&B); up to 7000' (D); Deer Creek, Lower Bass Canyon, Cardenas Creek, Diamond Creek, Stanton's Cave, Hance Rapids, Lee's Ferry (C-MNA); Phantom Ranch, Bright Angel Creek, Hermit Basin, Indian Gardens, Roaring Springs, foot of Tanner Trail (C-GC); Pima Point (O-GC); National Canyon, Little Colorado River junction with River, mi. 7.9, mi. 29.9, mi. 65.3, mi. 95.7, mi. 102.6 (O-MNA); Unkar Delta (STNB)

Urosaurus ornatus Tree Lizard. Deer Creek, Diamond Creek, Stanton's Cave, Elves Chasm (C-MNA); Phantom Ranch, McCormick Mine, Garden Creek (C-GC)

Uta stansburiana Side-blotched Lizard. Common below Redwall (D); Deer Creek, Lower Bass Canyon, Cardenas, Whitmore Wash, Diamond Creek, Hance Rapids, Mineral Canyon, Lee's Ferry (C-MNA); McCormick Mine, foot of Tanner Trail, 1 mi. below Indian Gardens (C-GC); Unkar Delta (STNB)

#### TEIIDAE

Cnemidophorus tigris Western Whiptail Lizard. Deer Creek, Lower Bass Canyon, Cardenas Creek, Whitmore Wash, Deer Creek

Falls, Nankoweap, Stanton's Cave (C-MNA); Phantom Ranch, Indian Gardens, Bright Angel Trail at inner gorge top, 1 mi. below Indian Gardens, McCormick Mine (C-GC); Unkar Delta (STNB); mi. 11.2, mi. 65.3 (O-MNA)

#### HELODERMATIDAE

Heloderma suspectum Gila Monster. mi. 209 (O-MNA); Diamond Creek (Kolb, 1914)

#### LEPTOTYPHLOPIDAE

Leptotyphlops humilis Western Blind Snake. Near Phantom Ranch (C-GC)

#### COLUBRIDAE

Masticophis flagellum Coachwhip. Diamond Creek (C-MNA)

Masticophis taeniatus Striped Whipsnake. Common from canyon bottom (D); Lower Indian Gardens, Hermit Rest, lower Bright Angel Creek, Phantom Ranch (C-GC)

Salvadora hexalepis Western Patch-nosed Snake. Tonto Platform (D); Kaibab Trail on Tonto Platform, Indian Gardens (C-GC); Unkar Delta (STNB)

Pituophis melanoleucus Gopher Snake. Deer Creek 30 mi. north of North Rim Ranger Station (C-MNA); Indian Gardens, Hermit's Rest, Phantom Ranch (O-GC); Unkar Delta (STNB)

Lampropeltis getulus Common Kingsnake. Mooney Falls (M&B); Havasu Canyon, common on Canyon Bottom (D); Lee's Ferry (C-MNA); Bright Angel Creek, Indian Gardens (C-GC); Phantom Ranch, mi. 204, Spring Canyon (O-GC); Boucher Creek (Redwall) (O-MNA)

Sonora semiannulata Western Ground Snake. Indian Gardens (C-GC); Bright Angel Trail near Pipe Springs (C-GC); below O'Neil Point on Kaibab Trail (O-GC)

Tantilla planiceps Western Black-headed Snake. Tapeats Creek

3000' (C-GC); Roaring Springs (O-GC)

Hypsiglena torquata Night Snake. Bright Angel (M&B); Phantom Ranch (O-GC); Unkar Delta (STNB)

Trimorphodon lambda Sonora Lyre Snake. Bright Angel Trail head of inner gorge (C-GC)

#### CROTALIDAE

Crotalus viridus abyssus Grand Canyon Rattlesnake. mi. 24.5, Tapeats Creek (C-MNA); Bright Angel Trail at Tonto Platform, Phantom Ranch, Kaibab Trail near O'Neil Butte, .5 mi. above Indian Gardens, Roaring Springs, Lower Bright Angel Creek, Pipe Creek 100 yds. from River, foot of Redwall on Bright Angel Trail, Indian Gardens (C-GC); National Canyon, Granite Canyon (O-MNA); Unkar Delta (STNB)

Crotalus molossus Black-tailed Rattlesnake. Havasu Canyon (lower) (M&B)

## ORNITHOLOGY

Ornithological investigations within the Grand Canyon Region essentially began in the late 1920's and early 1930's. As early as 1927, McKee had published a paper on the riparian birds in Havasu Canyon, followed by more work on Havasu birds by Jenks (1931a). In 1932, four Fish and Wildlife Service bird banding substations were established by Hargrave (1933a, 1933b). Five years later, Grater published the first checklist of Grand Canyon birds (1937). The checklist has since been updated by various field naturalists, most of whom were employees of the park (see especially references for Bryant and McKee). McKee (no date) and Jenks (1931b) divided the Grand Canyon region into Merriam's life zones and listed the birds found in each.

Two bird checklists have been compiled for the Grand Canyon Monument Region, one by Huey (1939) for the area around Mt. Trumbull, and the other by an unknown party (Anon., 1947) for the Toroweap Valley. Currently, M. Riffey is pursuing ornithological investigations in the Toroweap Valley and other areas of this Monument (pers. comm. Riffey to Carothers and Wertheimer).

The park bird observation records are replete with species sightings for the intervening years to the present, but little recent information has been published with the exception of annual Christmas bird counts (see Hill, 1969, 1970, 1971; Leishman, 1973; Ochsner, 1972). Since 1969, the staff biologists of the Museum of Northern Arizona have been compiling species distribution and observation records for birds of the

riparian habitat of the Colorado River and its tributaries.

This work is still in progress.

#### Possible Areas For Future Investigation

1) Determination of Habitat Requirements, Population Densities and Relative Abundances of Breeding Birds of the Riparian Habitat.

We are fairly confident that the knowledge of the species of birds occurring in the riparian habitat within the Grand Canyon is complete. Intensive work should now be concentrated on understanding habitat requirements, population densities and relative abundances of the avifauna inhabiting the riparian regions of the Canyon.

2) The Effect of Human Impact on the Avifauna of the Riparian Habitat.

During the breeding season some species of birds are very sensitive to any potential predator disturbance. This may be manifested by desertion of the nest, eggs or the young. The impact of camping within the nesting habitat of the riparian birds should be carefully monitored. There can be little doubt that campgrounds and the attendant continuous influx of people have an inimical effect on nearby breeding bird populations (Aitchison et al., ms. in prep.). The feasibility of setting aside certain camping areas for people and certain non-camping areas for wildlife should be seriously considered.

3) The Importance of the Riparian Habitat as a Migratory Corridor for Transient and Summer Resident Birds.

The presence of the riparian vegetation penetrating the

relatively barren desert regions of the Canyon provides a natural passageway through which birds going to or returning from their nesting grounds may travel. This seemingly obvious utilization of the riparian habitat is in need of documentation.

4) The Effect of Glen Canyon Dam on the Populations of Riparian Birds.

With the control of the Colorado River by the Dam, stabilization of the riparian vegetation is taking place. The effect this stabilization of the nesting habitat has on the breeding bird populations should be investigated.



Bird Checklist\*

Information used in compiling the following list of birds has been drawn from published and unpublished literature and collection and observation files. The sources are: observation files of the Grand Canyon National Park (O-GC); collection files of the Grand Canyon National Park (C-GC); observation files of the Museum of Northern Arizona (O-MNA); collection files of the Museum of Northern Arizona (C-MNA); Jenks (1931a) (J); McKee (1936) (M); Grater (1937) (G); and Bryant (1952) (B). The list is, as yet, incomplete.

Family - PODICIPEDIDAE

Western Grebe Aechmophorus occidentalis. mi. 262.5, 272, 274  
(O-MNA)

PHALACROCORACIDAE

Double-crested Cormorant Phalacrocorax auritus. Colorado River  
north of Bright Angel Creek (O-GC)

ANATIDAE

Canada Goose Branta canadensis. Bright Angel Creek, Phantom  
Ranch, mouth of Pipe Creek (O-GC)

Snow Goose Chen hyperborea. Phantom Ranch (O-GC)

Mallard Anas platyrhynchos. Phantom Ranch, mouth of Bright  
Angel Creek, between Bright Angel and Pipe Creek, between  
Cottonwood Camp and Phantom Ranch, bank of river near Bright  
Angel Trail (O-GC); mi. 16.3 (O-MNA)

American Widgeon Mareca americana. Bright Angel Creek (O-GC)

Shoveler Spatula clypeata. On river between SB Canyon and

\*The birds of this section follow the order found in Robbins, Bruun, and Zim's Birds of North America.

Tuckup Canyon (0-GC); mi. 16.5 (0-MNA)

Blue-winged Teal Anas discors. Colorado River (0-GC)

Cinnamon Teal Anas cyanoptera. Chuar Creek, Phantom Ranch,  
between Bright Angel Creek and Hermit Creek (0-GC); mi.  
119.8 (0-MNA)

Green-winged Teal Anas carolinensis. Navajo Falls, Bright  
Angel Creek south of Cottonwood Camp, mouth of Bright Angel  
Creek (0-GC)

Common Teal Anas crecca. Chuar Creek, Phantom Ranch, between  
Bright Angel Creek and Hermit Creek (0-GC)

Lesser Scaup Aythya affinis. Tuweep Canyon, Granite Spring  
Rapid (0-GC)

Bufflehead Bucephala albeola. Kaibab Suspension Bridge, lower  
end of Bright Angel Trail, Granite Spring Rapid (0-GC)

Common Merganser Mergus merganser. Colorado River, 100 yds.  
above the Kaibab Bridge (C-GC); mi. 170 (0-MNA)

Red-breasted Merganser Mergus serrator. mi. 118.7 (0-MNA)

Hooded Merganser Lophodytes cucullatus. Great Bend of the  
Colorado River, Phantom Ranch (0-GC)

#### CATHARTIDAE

Turkey Vulture Cathartes aura. Bass Camp, mi. 200, Bright  
Angel Canyon, Phantom Ranch, Havasu Canyon (0-GC)

#### ACCIPITRIDAE

Cooper's Hawk Accipiter cooperii. Hermit Rapid, Lava Canyon,  
Indian Gardens, Pipe Creek (0-GC)

Sharp-shinned Hawk Accipiter striatus. Bright Angel Creek  
between Phantom Ranch and Cottonwood Camp, Indian Gardens,

Bright Angel Spring, Hermit Creek Camp, Phantom Ranch,  
Pipe Creek, mouth of Chuar Creek, Kanab Canyon (0-GC)

Ferruginous Hawk Buteo regalis. Indian Gardens (0-GC)

Red-tailed Hawk Buteo jamaicensis. Indian Gardens, Bright  
Angel Spring, Pipe Spring, Pipe Creek, Tanner Canyon,  
Transept Canyon, Phantom Ranch, Havasu Canyon (0-GC); mi.  
24.5, 97.1, 161, 163.5, 178.7, 224.5, 225.5, 237, 238.5  
(0-MNA)

Swainson's Hawk Buteo swainsoni. Lava Falls (0-GC)

Golden Eagle Aquila chrysaetos. Phantom Canyon, Bright Angel  
Trail above Indian Gardens, Travertine Falls, Beaver Falls,  
Sapphire Canyon, Tonto Trail near Pipe Creek, Havasu Canyon,  
Tanner Trail opposite Chuar Creek, Transept Canyon, Kaibab  
Trail (0-GC)

Bald Eagle Haliaeetus leucocephalus. Phantom Ranch, Indian  
Gardens, Inner Gorge .5 mi. west of Kaibab Bridge (0-GC)

#### PANDIONIDAE

Osprey Pandion haliaetus. Mouth of Little Colorado River,  
Lee's Ferry, Lake Mead (0-GC)

#### FALCONIDAE

Prairie Falcon Falco mexicanus. Bright Angel Trail above  
Indian Gardens, Colorado River below Lava Falls (0-GC)

Peregrine Falcon Falco peregrinus. Pipe Creek (0-GC)

Pigeon Hawk Falco columbarius. Lava Canyon, Indian Gardens  
(0-GC)

Sparrow Hawk Falco sparverius. Havasu Canyon, Kaibab Trail  
.25 mi. above Phantom Ranch, Tanner Trail opposite Clear

Creek, Garden Creek below Indian Gardens, Phantom Ranch, Pipe Creek, Havasu Canyon (0-GC); Deer Creek, Marble Canyon, Badger Falls, mi. 6.2, 10.5, 58, 67.9, 115.2, 141.5, 177, 188, 193 (0-MNA)

MELEAGRIDIDAE

Turkey Meleagris gallopavo. Indian Gardens (0-GC); mi. 151.7, 192.5 (0-MNA)

TETRAONIDAE

Blue Grouse Dendragapus obscurus. Kaibab Trail (0-GC); Roaring Springs (C-GC)

PHASIANIDAE

Gambel's Quail Lophortyx gambelii. SB Canyon, Cottonwood Spring in Tuckup Canyon, Phantom Ranch, Havasu Canyon, Turquoise Canyon (0-GC)

ARDEIDAE

Snowy Egret Leucophoyx thula. Travertine Canyon, Kanab Rapids, Havasu Canyon, below Lava Falls, below Kaibab Suspension Bridge (0-GC); mi. 34.5 (0-MNA)

Great Blue Heron Ardea herodias. Upset Rapids, Colorado River, Bright Angel Creek, River Trail 1 mi. above Bright Angel Creek along river, Lava Canyon, Bright Angel Creek, Travertine Canyon, Kaibab Suspension Bridge, Inner Gorge of Little Nankoweap, Chuar Creek (0-GC); mi. 255, 263, 266, 272 (0-MNA)

Black-crowned Night Heron Nycticorax nycticorax. Phantom Ranch, Tenderfoot Knoll-Colorado River (0-GC)

RALLIDAE

American Coot Fulica americana. Havasu Creek, Havasu Canyon,  
Navajo Falls (0-GC); mi. 71, 87, 195.5, 266, 279 (0-MNA)

RECURVIROSTRIDAE

American Avocet Recurvirostra americana. Bright Angel Creek,  
Diamond Creek (0-GC)

Black-necked Stilt Himantopus mexicanus. Lee's Ferry, Lake  
Mead (0-GC)

CHARADRIIDAE

Killdeer Charadrius vociferus. Phantom Ranch (0-GC)

SCOLOPACIDAE

Long-billed Curlew Numenius americanus. Phantom Ranch (0-GC)

Spotted Sandpiper Actitis macularia. Bright Angel Canyon, Ruby  
Rapid, Deer Creek Falls, Bright Angel Creek near Phantom  
Ranch, Colorado River at foot of Bright Angel Trail, Phantom  
Ranch, Havasu Canyon, Hermit Creek (0-GC); mi. 19.7, 51.5,  
69, 72, 75.6, 111.5, 117.2, 118.7, 123.4, 130, 151.7, 155,  
165, 184.6, 190.7, 194.6, 206.4, 223, 229, 235, 235.5 (0-MNA)

Least Sandpiper Erolia minutilla. Lee's Ferry, Lake Mead  
(0-GC)

PHALAROPODIDAE

Wilson's Phalarope Steganopus tricolor. Slide Canyon (0-GC)

Northern Phalarope Lobipes lobatus. Bright Angel Trail below  
Indian Gardens (0-GC)

LARIDAE

Ring-billed Gull Larus delawarensis. Near Kaibab Suspension  
Bridge (0-GC); Pierce's Ferry, mi. 262.5, 275.5, 279 (0-MNA)

COLUMBIDAE

Band-tailed Pigeon Columba fasciata. Phantom Ranch, Tapeats Trail, Roaring Springs, Bass Camp (0-GC)

Mourning Dove Zenaidura macroura. Carbon Creek, Phantom Ranch, Tuckup Canyon, Bass Camp, Phantom Ranch Campground to Ribbon Falls, Mooney Falls, Pipe Creek Canyon, Havasu Canyon, Tanner Trail opposite Chuar Creek (0-GC); Deer Creek, Marble Canyon, mi. 1.7, 19.3, 19.7, 20, 26.2, 28, 43.4, 53.7, 67.9, 72.3, 73.6, 73.7, 73.8, 74.2, 75.6, 75.8, 83.5, 87, 102.6, 119.8, 127.7, 175, 183.3, 188, 198.4, 210.4, 215.5, 234.1, 238.5, 252.5, 280 (0-MNA)

CUCULIDAE

Yellow-billed Cuckoo Coccyzus americanus. Havasu Canyon (0-GC)

Roadrunner Geococcyx californianus. Havasu Canyon (0-GC); mi. 123.8, 210.4 (0-MNA)

STRIGIDAE

Screech Owl Otus asio. Tonto Trail-inner Canyon (0-GC)

Great Horned Owl Bubo virginianus. Phantom Ranch, Bright Angel Creek, Hermit Canyon, Carbon Creek, Bright Angel Canyon above Phantom Ranch (0-GC); mi. 73.8 (0-MNA)

Long-eared Owl Asio otus. Indian Gardens, Travertine Canyon (0-GC)

Spotted Owl Strix occidentalis. Indian Gardens (0-GC)

Flammulated Owl Otus flammeolus. Phantom Ranch (0-GC)

Pygmy Owl Glaucidium gnoma. 1 mi. below Indian Gardens (0-GC)

CAPRIMULGIDAE

Poor-will Phalaenoptilus nuttallii. Phantom Ranch, Bass Camp,  
Phantom Ranch Campground to Ribbon Falls, Indian Gardens,  
Pipe Creek (0-GC)

Common Nighthawk Chordeiles minor. Ruby Canyon (0-GC); mi. 280  
(0-MNA)

APODIDAE

White-throated Swift Aeronautes saxatalis. Havasu Falls, Ruby  
Canyon, Little Colorado junction with Colorado River, Indian  
Gardens, Phantom Ranch, Tanner Canyon, Mooney Falls, Bass  
Camp, Carbon Creek, Springs Creek, Havasu Canyon, Clear Creek  
Canyon (0-GC); Badger Falls, mi. 1.5, 4, 7.9, 28, 28.7, 37.6,  
56.5, 71, 74.2, 75.8, 87, 108.5, 120, 140, 150, 151.7, 174, 183,  
188, 225.5 (0-MNA)

TROCHILIDAE

Broad-tailed Hummingbird Selasphorus platycercus. Cottonwood  
Camp-Inner Canyon, Bass Camp, Marble Canyon-Colorado River,  
Tanner Canyon, Pipe Creek, Phantom Ranch (0-GC)

Black-chinned Hummingbird Archilochus alexandri. Marble Canyon-  
Colorado River, Carbon Creek, Havasu Canyon, SB Canyon, Thunder  
River, Indian Gardens, between Navajo and Mooney Falls, Pipe  
Creek (0-GC); mi. 47, 52, 71, 118, 118.7, 148.1, 153, 161, 162,  
163.5, 194, 196 (0-MNA)

Costa's Hummingbird Calypte costae. Kaibab Suspension Bridge  
(0-GC)

ALCEDINIDAE

Belted Kingfisher Megaceryle alcyon. Bright Angel Creek, Little

Colorado River in junction with Colorado River, Phantom Ranch,  
Phantom Creek (0-GC)

PICIDAE

Red-shafted Flicker Colaptes cafer. Indian Gardens, Bass Camp,  
Kanab Canyon, Transept Canyon, Phantom Ranch (0-GC); Deer  
Creek (0-MNA)

Ladder-backed Woodpecker Dendrocopos scalaris. Cottonwood Springs  
in Tuckup Canyon (0-GC)

Lewis' Woodpecker Asyndesmus lewis. Bottom of Grand Canyon (J)

Yellow-bellied Sapsucker Sphyrapicus varius. Havasu Campground,  
Phantom Ranch, Indian Gardens (0-GC)

Williamson's Sapsucker Sphyrapicus thyroideus. Indian Gardens,  
Phantom Ranch (0-GC)

Hairy Woodpecker Dendrocopos villosus. Phantom Ranch, Hermit  
Basin, Bass Camp, Indian Gardens, Kaibab to Ribbon Falls,  
Pipe Creek, Tanner Canyon near river (0-GC)

Downy Woodpecker Dendrocopos pubescens. Indian Gardens, Havasu  
Falls, Mooney Falls (0-GC)

TYRANNIDAE

Vermilion Flycatcher Pyrocephalus rubinus. Phantom Ranch (0-  
GC); mi. 225.5 (0-MNA)

Eastern Kingbird Tyrannus tyrannus. Phantom Ranch (G); mi.  
191.8 (0-MNA)

Western Kingbird Tyrannus verticalis. Bass Cable, Phantom  
Ranch Campground to Ribbon Falls, Havasu Canyon, Indian Gardens,  
Chuar Creek (0-GC)

Cassin's Kingbird Tyrannus vociferans. Havasu Canyon, Phantom  
Ranch, Bright Angel Canyon (0-GC)



Ash-throated Flycatcher Myiarchus cinerascens. Tuckup Canyon-Cottonwood Springs, Bass Camp, Phantom Ranch Campground to Ribbon Falls, Indian Gardens, Carbon Creek, Hermit Creek, Havasu Canyon, Pipe Creek (0-GC); mi. 43.4, 47, 74.2, 95.7, 97, 97.3, 99, 118.7, 139.3, 142, 148.5, 151.7, 188, 195.5, 210, 210.4, 229.5 (0-MNA)

Black Phoebe Sayornis nigricans. Bright Angel Creek, Bright Angel Canyon-Granite Gorge, Elve's Chasm, Mooney Falls, Phantom Ranch, Hualapai Canyon, Indian Gardens, Phantom Canyon, Thunder River (0-GC); Badger Falls, mi. 7.9, 28.7, 28.9, 29.1, 132.5, 133, 148.1, 151.5, 155, 159.8, 164.5, 183.7, 226.5 (0-MNA)

Say's Phoebe Sayornis saya. Colorado River near Kaibab Suspension Bridge, Bright Angel Canyon, Hermit Creek Canyon, Indian Gardens, Havasu Canyon, along Colorado River near Bright Angel Creek, Badger Rapid, SB Canyon, Cottonwood Springs in Tuckup Canyon, Bright Angel Trail to Indian Gardens, Inner Gorge near Redwall Caverns, Phantom Ranch (0-GC); mi. 6.5, 16.5, 21.5, 25, 25.6, 28.5, 60, 113.8, 114, 124, 214, 217.5, 218, 239 (0-MNA)

Traill's Flycatcher Empidonax traillii. Havasu Canyon (0-GC)

Western Flycatcher Empidonax difficilis. Diamond Creek (0-GC)

Olive-sided Flycatcher Nuttallornis borealis. Phantom Ranch, Indian Gardens (0-GC)

#### ALAUDIDAE

Horned Lark Eremophila alpestris. Tuckup Canyon (0-GC); above Indian Gardens, above Phantom Ranch (C-GC)

## HIRUNDINIDAE

Barn Swallow Hirundo rustica. Havasu Canyon (Navajo Falls),  
Phantom Ranch (0-GC)

Violet-green Swallow Tachycineta thalassina. Bright Angel  
Creek, Pipe Creek, Havasu Campground, Bass Camp, Havasu  
Falls, Little Colorado River junction with Colorado River,  
Thunder River, Phantom Ranch, Tuckup Canyon (0-GC); Deer  
Creek, Marble Canyon, mi. 1, 4, 7.9, 8.3, 9.5, 12.5, 16.3,  
16.5, 18, 19.3, 19.7, 23.5, 24, 24.8, 25, 25.6, 27, 27.8,  
28.5, 29.1, 36, 71 (0-MNA)

Bank Swallow Riparia riparia. Phantom Ranch (G)

Rough-winged Swallow Stelgidopteryx ruficollis. Colorado River  
at Hermit Rapids, Mooney Falls (0-GC)

## CORVIDAE

Steller's Jay Cyanocitta stelleri. Indian Gardens, Phantom  
Ranch, Bass Camp, Bright Angel Creek (0-GC)

Scrub Jay Aphelocoma coerulescens. Indian Gardens, Tuckup  
Canyon, Bass Camp, Phantom Ranch Campground to Ribbon Falls,  
Havasu Canyon, Hualapai Canyon, Thunder River, below Bass  
Camp, Phantom Canyon (0-GC); Lava Falls (0-MNA)

Pinyon Jay Gymnorhinus cyanocephalus. Tuckup Canyon, Bass  
Camp, Seep Springs below Bass Camp, Tanner Creek opposite  
Chuar Creek, Indian Gardens, Pipe Creek (0-GC)

Clark's Nutcracker Nucifraga columbiana. Phantom Ranch, Bass  
Camp (0-GC)

Common Raven Corvus corax. Phantom Ranch, below Redwall Cavern,  
Indian Gardens, Havasu Campground, Colorado River-Bright Angel

Trail, Bright Angel Creek, Bass Camp, Havasu Canyon, Bright Angel and Clear Creeks, Beaver Falls (0-GC); Deer Creek, Badger Creek, mi. 1, 7.9, 32.5, 34.7, 45.5, 47.3, 62, 65, 71, 72.5, 73.8, 87, 124.9, 133.5, 137, 140, 151.4, 151.7, 187.5, 203, 207.4, 234.1 (0-MNA)

#### PARIDAE

Mountain Chickadee Parus gambeli. Bass Camp, Seep Springs below Bass Camp, Indian Gardens, Bright Angel Spring, Ruby Canyon, Phantom Ranch, Inner Canyon at Toroweap (0-GC)  
Plain Titmouse Parus inornatus. Seep Springs below Bass Camp (0-GC)

Bridled Titmouse Parus wollweberi. Topock Trail (0-GC)

Verdin Auriparus flaviceps. Havasu Canyon (0-GC)

Common Bushtit Psaltriparus minimus. Bass Camp, Bright Angel Trail, Esplanade Plateau to Thunder Springs, Mooney Falls, Bright Angel Trail near Ribbon Falls, Bright Angel Canyon, Phantom Ranch, Havasu Canyon (0-GC)

#### CINCLIDAE

Dipper Cinclus mexicanus. Bright Angel Creek, Phantom Ranch, Thunder River, Tapeats Creek, Havasu Falls, Mooney Falls, Bright Angel Trail (0-GC); Deer Creek (0-MNA)

#### SITTIDAE

White-breasted Nuthatch Sitta carolinensis. Indian Gardens (0-GC)

Red-breasted Nuthatch Sitta canadensis. Phantom Ranch (0-GC)

#### CERTHIIDAE

Brown Creeper Certhia familiaris. Indian Gardens, Bright

Angel Trail (0-GC)

TROGLODYTIDAE

House Wren Troglodytes aedon. Phantom Ranch (0-GC)

Winter Wren Troglodytes troglodytes. Garden Creek (0-GC)

Bewick's Wren Thryomanes bewickii. Lava Canyon near mouth of Chuar Creek, Travertine Canyon, Diamond Creek, Phantom Ranch to Ribbon Falls, Inner Canyon along Bright Angel Trail (0-GC)

Rock Wren Salpinctes obsoletus. Bright Angel Trail at river, Hualapai Trail, Mooney Falls, Tuckup Canyon, Phantom Ranch Campground to Ribbon Falls, Hualapai Canyon, Phantom Ranch, Pipe Creek, Bass Trail (0-GC); Colorado River near Bright Angel Creek (C-GC); Badger Falls, mi. 7.9, 8.3, 9.5, 11.2, 15.2, 16.5, 19.3, 19.7, 27.8, 30.5, 39.8, 53.7, 73.8, 74.3, 86.8, 99, 107.8, 111.5, 117.2, 118.7, 121.1, 121.6, 137, 151.7, 160, 172.7, 180, 188 (0-MNA)

Canyon Wren Catherpes mexicanus. Pipe Spring, Indian Gardens, Phantom Ranch, Bighorn Spring, Bass Camp and Trail, Bright Angel Canyon, Thunder River, Havasu Canyon, Hermit Creek (0-GC); Lava Falls, Deer Creek, Badger Creek, mi. 7.9, 10, 12.5, 12.6, 16.5, 17.5, 18, 20, 24.8, 28, 30.5, 34.7, 37, 37.3, 37.6, 40.3, 47, 95.7, 118.7, 127.7, 137, 139.6, 153, 172.7, 178.5, 210.4, 213.7 (0-MNA)

Long-billed Marsh Wren Telmatodytes palustris. Havasu Canyon, Inner Canyon-Bright Angel Trail (0-GC)

MIMIDAE

Mockingbird Mimus polyglottos. Carbon Creek, Bright Angel Trail to Indian Gardens, Indian Gardens, Bright Angel Creek,

Phantom Ranch (0-GC); mi. 225.5 (0-MNA)

Sage Thrasher Oreoscoptes montanus. Thunder River, Indian Gardens, Tanner Canyon (0-GC)

#### TURDIDAE

Robin Turdus migratorius. Phantom Ranch, Bass Cable, Bright Angel Creek, Indian Gardens, Havasu Canyon, river at Bright Angel Trail junction, Pipe Creek Cabin (0-GC)

Townsend's Solitaire Myadestes townsendi. Bright Angel Trail at Indian Gardens, Roaring Springs, Phantom Ranch, Bright Angel Creek (0-GC)

Hermit Thrush Hylocichla guttata. Bright Angel Camp, Bright Angel Spring, Roaring Springs (0-GC)

Western Bluebird Sialia mexicana. Indian Gardens, Phantom Ranch (0-GC)

Mountain Bluebird Sialia currucoides. Phantom Ranch (0-GC)

#### SYLVIIDAE

Blue-gray Gnatcatcher Polioptila caerulea. Lee's Ferry to Lake Mead, Supai and Havasu Campground, Phantom Ranch, Seep Springs below Bass Camp, Havasu Canyon, Bighorn Spring, Bright Angel Trail, .25 mi. above Indian Gardens, Bright Angel Trail (0-GC); mi. 38.8, 41.3, 43.4, 47, 53.7, 139, 148.5, 151.7, 172.7, 188, 195.5, 210 (0-MNA)

Golden-crowned Kinglet Regulus satrapa. Bright Angel Creek (0-GC)

Ruby-crowned Kinglet Regulus calendula. Indian Gardens, Bright Angel Spring, Pipe Creek at foot of Bright Angel Trail, Navajo Falls, Phantom Ranch, mouth of Bright Angel Creek, Mooney Falls, Kaibab Trail near Ribbon Falls, mouth of Tanner Canyon, Hermit Creek Canyon (0-GC)

BOMBYCILLIDAE

Cedar Waxwing Bombycilla cedrorum. Pipe Creek, Phantom Ranch (0-GC)

PTILOGONATIDAE

Phainopepla Phainopepla nitens. Pipe Creek Canyon near Bright Angel Trail, Mooney Falls, Havasu Canyon, Indian Gardens, (0-GC); mi. 213.7 (0-MNA)

LANIIDAE

Loggerhead Shrike Lanius ludovicianus. Bright Angel Creek near Phantom Ranch (0-GC)

STURNIDAE

Starling Sturnus vulgaris. Phantom Ranch, Indian Gardens (0-GC)

VIREONIDAE

Bell's Vireo Vireo bellii. mi. 71, 169.5, 172.4, 177.6, 178.7, 179.5, 181.5, 183.4, 188, 193, 208, 213.7, 252.5 (0-MNA)

Solitary Vireo Vireo solitarius. Roaring Springs, Phantom Ranch (0-GC)

Red-eyed Vireo Vireo olivaceus. Havasu Canyon (B)

PARULIDAE

Nashville Warbler Vermivora ruficapilla. Bright Angel Creek near Phantom Ranch (0-GC)

Virginia's Warbler Vermivora virginiae. Phantom Ranch (0-GC);  
below Supai Village, but above upper waterfall (C-GC)

Lucy's Warbler Vermivora luciae. Phantom Ranch, Marble Canyon,  
Havasu Canyon, Indian Gardens, Bright Angel Canyon above  
Phantom Ranch, between trail and Bright Angel Creek near  
mouth of Creek (0-GC); mi. 43.4, 53.7, 74.2, 118.7, 143.5,  
148.5, 163.5, 164.5, 169.5, 172.7, 178, 179.5, 183, 193,  
195.5, 206, 234.1 (0-MNA)

Yellow Warbler Dendroica petechia. Havasu Creek, Bass Cable,  
Havasu Canyon, Phantom Ranch, Indian Gardens, Bright Angel  
Canyon above Phantom Ranch (0-GC); mi. 50.4, 51.4, 71, 225.5  
(0-MNA)

Audubon's Warbler Dendroica auduboni. Bass Cable, mouth of  
Bright Angel Creek, Indian Gardens, Phantom Ranch (0-GC)

Black-throated Gray Warbler Dendroica nigrescens. Phantom  
Ranch, Bright Angel Trail .25 mi. above Indian Gardens  
(0-GC)

Hermit Warbler Dendroica occidentalis. Havasu Canyon (B)

Grace's Warbler Dendroica graciae. Phantom Ranch (0-GC)

Northern Waterthrush Seiurus noveboracensis. Phantom Ranch,  
(0-GC); Cardenas Creek (C-MNA)

Yellowthroat Geothlypis trichas. Phantom Ranch Campground  
to Ribbon Falls, Phantom Ranch, Tanner Canyon (0-GC);  
Bright Angel Canyon (C-GC); Lava Falls, 38.8, 43.4, 46, 47,  
50, 50.4, 53.7, 54.3, 55, 67, 71, 72, 136.3, 178.5, 181.5,  
187.5, 197.5 (0-MNA)

Yellow-breasted Chat Icteria virens. Havasu Falls, Harding

Rapid-Marble Canyon, Cardenas Creek-Inner Gorge (0-GC);  
mi. 9.5, 47, 52.9, 193, 197.5, 252, 252.5 (0-MNA)  
MacGillivray's Warbler Oporornis tolmiei. Phantom Ranch  
Campground to Ribbon Falls, Havasu Campground (0-GC)  
Wilson's Warbler Wilsonia pusilla. Phantom Ranch, Indian  
Gardens (0-GC)

#### PLOCEIDAE

House Sparrow Passer domesticus. mi. 87 (0-MNA)

#### ICTERIDAE

Yellow-headed Blackbird Xanthocephalus xanthocephalus. Near  
stream courses Lower Sonoran Zone (G)  
Red-winged Blackbird Agelaius phoeniceus. Phantom Ranch,  
Indian Gardens, Lava Canyon (0-GC); Pierce's Ferry, mi. 71,  
266, 272 (0-MNA)  
Brewer's Blackbird Euphagus cyanocephalus. Phantom Ranch,  
Bright Angel Creek near river (0-GC)  
Scott's Oriole Icterus parisorum. Slide Canyon (M)  
Bullock's Oriole Icterus bullockii. Phantom Ranch (0-GC);  
Lee's Ferry, mi. 71 (0-MNA)  
Brown-headed Cowbird Molothrus ater. Lee's Ferry, mi. 95.7,  
229.5 (0-MNA)

#### THRAUPIDAE

Western Tanager Piranga ludoviciana. 1.6 mi. below Indian  
Gardens on Bright Angel Trail, Phantom Ranch, north end of  
Phantom Ranch Campground to Ribbon Falls, Bright Angel Trail  
to Indian Gardens (0-GC); Lava Falls, mi. 214.5 (0-MNA)



FRINGILLIDAE

Rose-breasted Grosbeak Pheucticus ludovicianus. Tapeats Creek  
(0-MNA)

Black-headed Grosbeak Pheucticus melanocephalus. Havasu  
Canyon, near Havasu Falls, Canyon bottom-north of Indian  
Gardens, Phantom Ranch (0-GC)

Blue Grosbeak Guiraca caerulea. Stanton's Cave, Cardenas  
Creek, Lee's Ferry, mi. 19.3, 28.7, 29.9, 34.7, 37.6,  
38.8, 39.8, 41.1, 45.5, 47, 51, 53.7, 54.3, 172.7, 178,  
183.4, 187.5, 188, 193, 225.5, 255 (0-MNA)

Indigo Bunting Passerina cyanea. 4 mi. above Phantom Ranch,  
Indian Gardens (0-GC)

Lazuli Bunting Passerina amoena. Near Indian Gardens, Phantom  
Ranch Campground to Ribbon Falls, Indian Gardens, above  
Supai, Phantom Ranch (0-GC); Pipe Spring (C-GC)

Cassin's Finch Carpodacus cassinii. Colorado River near  
Tanner Canyon (0-GC)

House Finch Carpodacus mexicanus. Carbon Creek, Inner Gorge,  
Bright Angel Trail-above Indian Gardens, Havasu Canyon,  
Indian Gardens, Pipe Creek (0-GC); Badger Falls, mi. 7.9,  
8.5-9.5, 12.5, 16.3, 19, 19.3, 19.7, 24.8, 28.5, 30.5, 47,  
52, 53.7, 61, 71, 73.7, 73.8, 74.1, 74.3, 78.2, 85.7, 108.5,  
143.5, 148.5, 163.5, 177.6, 188, 195.5, 203, 210.4, 215.5,  
218, 219 (0-MNA)

Lesser Goldfinch Spinus psaltria. Phantom Ranch, Indian Gardens,  
Pipe Creek above tipoff, Lava Canyon, Little Colorado River  
to junction with Colorado River (0-GC); mi. 195.5 (0-MNA)

Green-tailed Towhee Chlorura chlorura. Indian Gardens, Phantom Ranch, Canyon bottom-south of Indian Gardens (0-GC)

Rufous-sided Towhee Pipilo erythrophthalmus. Indian Gardens, Bright Angel Creek, Phantom Ranch (0-GC)

Savannah Sparrow Passerculus sandwichensis. Havasu Canyon (B)

Vesper Sparrow Poocetes gramineus. Chuar Creek (C-GC)

Lark Sparrow Chondestes grammacus. Phantom Ranch, Bright Angel Creek, Tanner Trail opposite Chuar Creek, Havasu Falls (0-GC); Granite Falls Rapids, near mouth of Bright Angel Creek (C-GC)

Rufous-crowned Sparrow Aimophila ruficeps. Above Indian Gardens, Bright Angel Canyon, Indian Gardens (0-GC); Inner Canyon above Ribbon Falls (C-GC)

Black-throated Sparrow Amphispiza bilineata. Mouth of Tanner Canyon, Indian Gardens, river near Bright Angel Creek, Seep Springs below Bass Camp, Bass Camp, Phantom Ranch, Pipe Creek, Bass Canyon, foot of Bass Trail, Bright Angel Creek (0-GC); mi. 52, 108.5, 139.3, 178.5, 188 (0-MNA)

Sage Sparrow Amphispiza belli. Bright Angel Trail to Indian Gardens (0-GC)

Slate-colored Junco Junco hyemalis. Bright Angel Creek between Phantom and Cottonwood Camp, Indian Gardens (0-GC)

Oregon Junco Junco oreganus. Indian Gardens, Phantom Ranch, Bright Angel Creek above Box Canyon (0-GC)

Gray-headed Junco Junco caniceps. Phantom Ranch, Indian Gardens (0-GC)

Mexican Junco Junco phaeonotus. Indian Gardens (0-GC)

Tree Sparrow Spizella arborea. .5 mi. above Indian Gardens (0-GC)

Chipping Sparrow Spizella passerina. Supai Village, Canyon  
bottom of Little Colorado River to junction, Phantom Ranch  
(0-GC)

Brewer's Sparrow Spizella breweri. North of Indian Gardens  
(0-GC)

Black-chinned Sparrow Spizella atrogularis. Bright Angel  
Trail from 6000 ft. to Indian Gardens (0-GC)

Harris' Sparrow Zonotrichia querula. Phantom Ranch (C-GC)

White-crowned Sparrow Zonotrichia leucophrys. Bass Cable,  
Havasu Canyon, Lava Canyon, Tonto Trail between Kaibab and  
Indian Gardens, Indian Gardens, Phantom Ranch, Bright Angel  
Canyon (0-GC); Deer Creek (0-MNA)

Golden-crowned Sparrow Zonotrichia atricapilla. Indian Gardens  
(0-GC)

Fox Sparrow Passerella iliaca. Rock House at mouth of Bright  
Angel Canyon (0-GC)

Lincoln's Sparrow Melospiza lincolni. Phantom Ranch, Indian  
Gardens (0-GC)

Song Sparrow Melospiza melodia. Canyon bottom-Bright Angel  
Trail, along streams in Havasu Canyon, Phantom Ranch,  
Indian Gardens (0-GC)

## MAMMALOLOGY

The greatest volume of zoological work in the Grand Canyon has been done on mammal studies. Some of the first work to appear was that of Bailey (1927) wherein he proposed the theory that the Canyon acts as a barrier to the ranges of plant and animal species. Goldman (1937) later expanded on this theory using Abert's and Kaibab squirrels as examples of differential speciation. Durham (1955) worked with variation in adaptations of certain rodents on the North Rim.

The first checklist of mammals of the Park Region was that published by Bailey (1935) and later updated by Hoffmeister (1955). Aside from a few unpublished collecting trips down the Colorado River and some work on Kaibab squirrels (Hall, 1967a, 1967b), nothing more appeared on the subject until 1971 when Hoffmeister (1971) and Hoffmeister and Durham (1971) published major works on mammals of the Grand Canyon Region.

Carothers (1970) surveyed the small mammals of the riparian habitat of the Colorado River from Lee's Ferry (mile 1) to Diamond Creek (mile 225). There has since been a concerted effort by the staff biologists of the Museum of Northern Arizona to complete a survey of the mammals of the riparian habitat of the Colorado River and its tributaries.

Additionally, concern over the reduction in numbers of desert bighorn sheep has generated studies of their life history. Russo (1956) advised on the proper management of the sheep, and Guse (1973) has been trying to clarify problems of competition between the sheep and the feral burros in the Canyon for forage

and water.

There has been a continued interest, since the beginning of this century, in the status and health of the Kaibab mule deer herd. The Arizona Game and Fish Department conducted a number of studies on the deer, including their use of forage (Kimball, 1951; Wright, 1950). Workers, such as Foster (1970), Hungerford (1970), Trefethen (1967) and others outline the story of the deer on the plateau and the political and ecological conflicts that caused or were caused by their presence.

#### Possible Areas for Future Investigation

1) Determination of Habitat Requirements, Population Densities and Relative Abundances of Small Mammals of the Riparian Habitat.

With the amount of survey work conducted in the riparian habitat within recent years, the knowledge of the kinds and distributions of mammals of the inner gorge is relatively complete. Intensive work should now concentrate on habitat requirements, population densities, and relative abundance of the mammal fauna of the riparian habitat of the Colorado River and its tributaries.

2) The Effect of Human Impact on the Mammal Fauna of the Riparian Habitat.

Human impact on a mammal fauna in a restricted habitat, such as may be found along the Colorado River and its tributaries, may be difficult to evaluate. One possible indicator of human influence would be an increase in certain mammal species known to associate with humans. The house mouse has

only been recorded in the buildings around Phantom Ranch. This species is an obvious indicator of human influence and should be watched for in other areas of the Canyon. The deer mouse may also be an indicator of human influence in some areas. It has recently been recorded (Hoffmeister, 1971b) in the riparian habitat of the Colorado River. Changes in distribution and abundance of these two mammals should be carefully monitored.

3) General Taxonomic Studies of Mammals of the Inner Gorge.

Prior to recent mammal collecting along the Colorado River and its tributaries, there were few specimens available for taxonomic studies within this restricted geographic area. Specimens are now available for a thorough taxonomic re-examination of the small mammals of the Grand Canyon Region.

## Mammal Checklist

The following is a brief checklist of mammals collected or observed in the riparian habitat of the Colorado River.

Information used in compiling this list has been drawn from Hoffmeister (1971) (H), Cockrum (1960) (Cr), and from the observation files of the Museum of Northern Arizona (O-MNA) and the collection files of the Museum of Northern Arizona (C-MNA). Hoffmeister's locations are restricted to within the Park boundaries.

### Family - SORICIDAE

Desert Shrew Notiosorex crawfordi. (H); Tuweap (C-MNA)

### VESPERTILIONIDAE

California Myotis Myotis californicus. (H); Stanton's Cave, Hotauta Canyon (C-MNA)

Yuma Myotis Myotis yumanensis. (H)

Western Pipistrelle Pipistrellus hesperus. (H); Stanton's Cave, Deer Creek Falls (C-MNA)

Red Bat Lasiurus borealis. (H)

Hoary Bat Lasiurus cinereus. (H)

Pallid Bat Antrozous pallidus. (H)

### MOLOSSIDAE

Free-tailed Bat Tadarida brasiliensis. (H); Hance Rapids (C-MNA)

### SCIURIDAE

White-tailed Antelope Squirrel Citellus leucurus. Nankoweap Canyon, mouth of Fern Glen Canyon (C-MNA)

Rock Squirrel Citellus variegatus. (H); Stanton's Cave (C-MNA);

mi. 71.5, mi. 87, mi. 198 (0-MNA)

#### HETEROMYIDAE

Long-tailed Pocket Mouse Perognathus formosus. (H); Kwagunt Delta, Nankoweap Canyon, Deer Creek Falls, mi. 224 (C-MNA)

Rock Pocket Mouse Perognathus intermedius. (H); Palisades Creek, Hance Rapids, mouth of Hermit Creek, Elves Chasm, mouth of Prospect Canyon, Hualapai Indian Reservation, mi. 224, 225.5 (C-MNA)

#### CASTORIDAE

Beaver Castor canadensis. (H); mi. 4, Clear Creek, Bright Angel Creek (0-MNA)

#### CRICETIDAE

Mexican Vole Microtus mexicana. (H)

White-throated Woodrat Neotoma albigula. (H); mi. 29.5, Palisades Creek, mi. 70, Hermit Creek (C-MNA)

Bushy-tailed Woodrat Neotoma cinerea. Lee's Ferry (Cr)

Desert Woodrat Neotoma lepida. (H); Stanton's Cave, Cardenas Creek, Nankoweap, Hatauta Canyon, Bass Camp, mouth of Prospect Canyon, Whitmore Wash, Hualapai Indian Reservation, Kwagunt Delta (C-MNA)

Brush Mouse Peromyscus boylii. (H); Stanton's Cave, Vasey's Paradise, Nankoweap Canyon, Kwagunt Delta, Deer Creek Falls, Fern Glen Canyon (C-MNA)

Canyon Mouse Peromyscus crinitus. (H); Stanton's Cave, Badger Creek, Kwagunt Delta, mi. 29, mi. 38, mouth of Hermit Creek, mouth of Crystal Creek, Hatauta Canyon, Bass Camp, mi. 128, Tapeats Creek, mouth of Fishtail Canyon, mouth of Kanab Creek,



mi. 156, mi. 162, mouth of Fern Glen Canyon, mi. 188 (C-MNA)  
Cactus Mouse Peromyscus eremicus. (H); Badger Creek, Marble  
Canyon, Nankoweap, Hance Creek, Cardenas, Palisades Creek,  
mouth of Hermit Creek, mouth of Crystal Creek, Hatauta  
Canyon, Elves Chasm, mouth of Tapeats Creek, Deer Creek  
Falls, mouth of Fishtail Canyon, mouth of Kanab Creek,  
Diamond Creek, Whitmore Wash, mi. 136, mi. 162 (C-MNA)  
Deer Mouse Peromyscus maniculatus. (H); Nankoweap Canyon,  
Kwagunt Delta, Little Colorado River, Palisades Creek (C-MNA)  
Western Harvest Mouse Reithrodontomys megalotis. (H); Nankoweap  
Canyon, Deer Creek, Bright Angel Trail, Deer Creek Falls (C-MNA)

PROCYONIDAE

Raccoon Procyon lotor. (H)

BASSARISCIDAE

Ringtail Bassariscus astutus. (H)

MUSTELIDAE

River Otter Lutra canadensis. (H)

Spotted Skunk Spilogale putorius. (H)

Long-tailed Weasel Mustela frenata. mi. 25 (C-MNA)

CANIDAE

Coyote Canis latrans. (H)

Gray Fox Urocyon cinereoargenteus. (H)

FELIDAE

Mountain Lion Felis concolor. (H)

Bobcat Lynx rufus. (H)

CERVIDAE

Mule Deer Odocoileus hemionus. (H)

BOVIDAE

Bighorn Sheep Ovis canadensis. (H)

Burro Equus asinus. (H)

Domestic Sheep Ovis aries. mi. 14.5 (0-MNA)

BIBLIOGRAPHIC REFERENCES FOR  
PLANTS, INSECTS, FISH, AMPHIBIANS  
AND REPTILES, BIRDS, AND MAMMALS  
OF THE GRAND CANYON REGION

PLANTS

- Adams, C. C. 1925. Ecological conditions in national forests and national parks. *Sci. Monthly*, 20(6):561-593.
- Anonymous. 1927. Flora of the Tonto Platform. *Grand Canyon Nature Notes*, 1(12):1.
- Anonymous. 1927. Arizona Redbud. *Grand Canyon Nature Notes*, 1(12):4.
- Anonymous. 1931. Cottonwood (Populus fremontii). *Grand Canyon Nature Notes*, 5(4):38.
- Anonymous. 1931. A reconnaissance of the cover type on the Coconino Plateau, Grand Canyon Park: a preliminary report. Ms. 30 p.
- Anonymous. 1948. List of plants from Havasupai Canyon collected April 14, 1946 - June 14, 1946 - April 18, 1948 - May 3, 1947. Ms. 12 p.
- Bailey, V. 1929. Life zones of the Grand Canyon. *Grand Canyon Nature Notes*, 3(9):2-4.
- Barneby, R. C. 1948. Pugilus astragalorum: IX Novelties in *Batidipaca* Rydb. *Leaflets of Western Botany*, 5:82-89.
- Barrell, R. L., 1964. Botanical abstracts for fact file cards. *Reg. Memo., U.S.N.P.S., Santa Fe*, 12 pp.
- Bennett, P. S. 1969. Some notes on the vegetation of the Inner Gorge, Grand Canyon. In *Four Corners Geol. Soc. 5th Field Conf., Powell Centennial River Exped.*, p. 25-34.
- Bennett, P. S. (no date). Teacher's manual for environmental awareness: an ecological inventory of the Grandview Area, Grand Canyon National Park. Manuscript, 100 p.

- Benson, L. 1942. Notes on the flora of Arizona. *Torreyia*, 42:9-11.
- Breitring, A. J. 1956. In search for Agaves. *The Los Angeles Cactus Chronicle*, 5(7):3.
- Bryant, H. C. 1942. Plants noted in Havasu Canyon, March 30. Manuscript, 8 pp.
- Clover, E. U. and L. Jotter. 1941. Cacti of the Canyon of the Colorado and tributaries. *Bull. of Torrey Bot. Club*, 68(6):409-419.
- Clover, E. U. and L. Jotter. 1944. Floristic studies in the canyon of the Colorado and tributaries. *Amer. Midland Nat.*, 32(6):591-642.
- Collom, R. E. 1953. Plants collected by R. E. Collom. Manuscript, 4 pp.
- Cooper, N. C. 1947. Botanical report of the Allan Hancock Foundation Expedition to Grand Canyon National Park. Manuscript, 10 pp.
- Count, E. W. 1928. Results of a large crop of Pinon nuts. *Grand Canyon Nature Notes*, 2(12):3.
- Count, E. W. 1929. Manzanita on the south rim. *Grand Canyon Nature Notes*, 3(10):2.
- Count, E. W. 1929. A mutating Penstemon. *Grand Canyon Nature Notes*, 4(1):6.
- Count, E. W. 1930. Pinon puzzle. *Grand Canyon Nature Notes*, 4(5):33.
- Count, E. W. 1930. A living conquest. *Grand Canyon Nature Notes*, 4(9):54-58.
- Count, E. W. 1931. Bright Angel Point. *Grand Canyon Nature*

- Notes, 5(11):117.
- Count, E. W. 1931. Russian thistle. Grand Canyon Nature Notes, 6(2):18.
- Count, E. W. 1947. A brief report on some burnt-over areas of the Coconino Plateau, with special reference to plant succession. Manuscript, 10 pp.
- Coville, F. V. and D. T. McDougal. 1903. The Grand Canyon of the Colorado. Carnegie Instn. of Wash., Publ. 6 (Desert Bot. Lab. of the Carnegie Instn.):23.
- Croft, A. R. 1932. Notes on the Yaki Point burn. Grand Canyon Nature Notes, 7(7):71-73.
- Croft, A. R. 1932. Deer browse on cactus. Grand Canyon Nature Notes, 7(9):95.
- Croft, A. R. 1933. The 1933 "pine nut" crop. Grand Canyon Nature Notes, 7(6):58-60.
- Croft, A. R. 1933. The "burro spring" pine. Grand Canyon Nature Notes, 7(11):113.
- Darling, M. S. 1966. Structure and productivity of a pinon-juniper woodland in Northern Arizona. Diss., Duke Univ. Press.
- Deaver, C. F. and H. Haskell. 1955. Ferns and flowering plants of Havasu Canyon. Plateau, 28(1):11-23.
- Dodge, N. N. 1936. Trees of the Grand Canyon National Park. Grand Canyon Nat. Hist. Assoc., Bull. No. 3.
- Duncan, P. D. 1970. Trees on the Rim. Amer. Forests, 76(7):12-15.
- Durham, O. C. 1949. Air-borne allergens in the national parks. Jour. of Allergy, 20(4):3-15.
- Eastwood, A. 1919. Early spring at the Grand Canyon near the El Tovar. Plant World, 22(4):95-99.

- Fountain, P. 1906. [The Grand Canyon.] In his: Eleven eaglets of the west. New York, Dutton. p 291-299.
- Gregory, H. E. 1932. Colorado Plateau region. Internat'l Geol. Cong., 16th Sess., Guidebook [18], Washington. Govt. Print. Off.
- Haring, I. M. 1941. Mosses of the Grand Canyon National Park. The Bryologist, 44(9):121-124.
- Haring, I. M. 1946. Mosses of the Grand Canyon National Park, Arizona II. The Bryologist, 49(9):90-96
- Hawbecker, A. C. 1936. Plants of Grand Canyon National Park. Field Div. of Forestry, U.S.N.P.S., Manuscript, 68 pp.
- Hawksworth, F. G. 1952. Unusual hosts for two southwestern mistletoes. Plant Disease Reporter, 36(6):246.
- Hawksworth, F. G. 1953. The pycnial stage of Cronartium filamentosum. Plant Disease Reporter, 37(4):23.
- Hawksworth, F. G., J. L. Stewart and W. F. Bailey. 1968. You can save your pines from dwarf mistletoe. U.S.D.A. Forest Service Research Paper, RM-35, 20 pp.
- Hills, L. 1929. Mariposa lily. Grand Canyon Nature Notes, 3(12):1.
- Howell, J. T. 1950. Plants collected in Havasu Canyon, May, 1950. Manuscript, 10 pp.
- Ives, J. C. 1861. Report upon the Colorado River of the West, explored in 1857 and 1858 by Lieutenant Joseph C. Ives, Corps of Topographical Engineers, under the direction of the office of exploration and surveys... [U.S. Army Engr. Dept.] Washington. Govt. Print. Off.

- James, G. W. 1908. Botany of the Grand Canyon. In his: In and around the Grand Canyon. Boston, Little, Brown.
- Jameson, D. A., J. A. Williams and E. W. Wilton. 1962. Vegetation and soils of Fishtail Mesa, Arizona. Ecology, 43(3):403-410.
- Jett, S. C. 1972. Biogeographical notes on the Kanab Canyon system, Mohave and Coconino Counties, Arizona. Plateau, 45(1):1-16.
- Johnson, H. 1940. An interview concerning the deer-coyote situation in the forest for the season of 1940. Manuscript, 3 pp.
- Jones, S. B. 1929. Lightning-scarred trees. Grand Canyon Nature Notes, 3(12):5.
- Jones, S. B. 1929. Unconventional pines. Grand Canyon Nature Notes, 4(4):25.
- Jones, S. B. 1930. Oh, cedar. Grand Canyon Nature Notes, 4(7):42-43.
- Kearney, T. H. 1940. Arizona localities of interest to botanists. Manuscript, 43 pp.
- Kearney, T. H. 1943. A new cliff-rose from Arizona. Madrono 7(1):15-18.
- Kearney, T. H. and R. H. Peebles. 1943. Gilia multiflora Nutt. and its nearest relatives. Madrono, 7(2).
- Kearney, T. H., E. McClintock and K. F. Parker. 1953. Recent additions to the known flora of Arizona. Leaflets of Western Botany, 7(1):1-11.
- Kearney, T. H. (no date). Grand Canyon plants in Herbarium California Academy. Manuscript, 16 pp.



- Keener, P. D. 1956. Two fungi associated with a microcyclic rust, Coleosporium crowelli Cummins, on needles of Pinus edulis Engelm. in Arizona. Madrono, 13(6):189-195.
- Keener, P. D. 1959. Sporophore size in Fomes pinicola (Swartz ex. Fries) Cooke. Plant Disease Reporter, 43(9):
- Keener, P. D. 1962. Needle-cast and Needle-blight fungi attacking species of Pinus in Southwestern forests. Proceed. 10th Western Int. Forest Disease Work Conf. p. 34-40.
- Kern, F. D. and P. D. Keener. 1960. Identity of a rust on Ephedra. Science, 131(3396).
- Kimmel, J. R. 1969. Pond succession on the Kaibab Plateau, Arizona. Baylor Univ., Waco, Texas.
- Lexen, B. R. 1935. Some factors influencing the yield and mortality of Ponderosa Pine in the Southwest. Jour. Agri. Res., 50(9):777-787.
- Lutz, F. E. 1934. From low to high. Grand Canyon Nature Notes, 9(7):327-329.
- McClintock, E. 1952a. Botanizing in the Toroweap Valley in Northern Arizona. The Asa Gray Bull., 1(4):359-368.
- McClintock, E. 1952b. Plants collected in the Grand Canyon National Monument. Manuscript, 14 pp.
- McDougall, W. B. 1947. Checklist of plants of Grand Canyon National Park, revised. Grand Canyon Nat. Hist. Assoc. Bull. No. 10.
- McDougall, W. B. 1964. Grand Canyon wildflowers. Museum of Northern Arizona, Bull. No. 43, in cooperation with Grand Canyon Nat. Hist. Assoc.
- McDougall, W. B. and J. Stockert. 1966. New plants for Arizona

- from Grand Canyon National Park and Marble Canyon.  
Plateau, 39(2):102-103.
- McHenry, D. E. 1932. Sagebrush in Grand Canyon National Park.  
Grand Canyon Nature Notes, 7(1):6-7.
- McHenry, D. E. 1932. Prince's plume, a new mustard record.  
Grand Canyon Nature Notes, 7(2):16-18.
- McHenry, D. E. 1932. Demonstration life zone gardens. Grand  
Canyon Nature Notes, 7(8):81-85.
- McHenry, D. E. 1932. Quaking aspen at Grand Canyon. Grand  
Canyon Nature Notes, 7(9):87-90.
- McHenry, D. E. 1933. Gambel oaks at Grand Canyon. Grand Canyon  
Nature Notes, 7(12):124-125.
- McHenry, D. E. 1933. Index to checklist of plants of Grand  
Canyon National Park. Manuscript, 6 pp.
- McHenry, D. E. 1934. Indian uses of Juniper in the Grand Canyon  
region. Grand Canyon Nature Notes, 9(1):261-271.
- McHenry, D. E. 1934. Canadian zone plants on the South Rim of  
Grand Canyon. Grand Canyon Nature Notes, 9(4):301-303.
- McHenry, D. E. 1934. Does mistletoe kill the trees at Grand  
Canyon? Grand Canyon Nature Notes, 9(5):305-309.
- McHenry, D. E. 1935. Quaking aspen - its future in the park.  
Grand Canyon Nature Notes, 9(10):361-365.
- McKee, B. H. 1932. The Yucca - sword-like yet friendly. Grand  
Canyon Nature Notes, 6(3):23-35.
- McKee, E. D. 1933. Diary of early spring. Grand Canyon Nature  
Notes, 8(1):140.
- McKee, E. D. 1934. Pinyon nuts as bird feed. Grand Canyon  
Nature Notes, 9(2):272-273.

- McKee, E. D. 1934. Botanical notes. Grand Canyon Nature Notes, 9(5):315
- McKee, E. D. 1934. Flora of Grand Canyon National Monument. Grand Canyon Nature Notes, 9(7):316-321.
- McKee, E. D. (no date). Life zones of the Grand Canyon. Manuscript, 10 pp.
- McKelvey, S. D. 1949. A new Agave from Arizona. Jour. Arnold Arboretum, XXX:227-230.
- Martin, P. S. 1971. Trees and shrubs of the Grand Canyon: Lee's Ferry to Diamond Creek. Manuscript, 16 pp.
- Mead, P. 1930. Our cactuses. Grand Canyon Nature Notes, 4(6):38-40.
- Mead, P. 1930. Some Grand Canyon plants and their uses. Grand Canyon Nature Notes, 4(11):72-77.
- Mead, P. 1930. Seeds of some Grand Canyon wild flowers. Grand Canyon Nature Notes, 4(12):84-89.
- Mead, P. 1930. Some Grand Canyon plants and their uses. Ariz. Wildlife, 3(11):17.
- Mead, P. 1930. A winter-blooming goosefoot. Grand Canyon Nature Notes, 5(1):10-11.
- Mead, P. 1930. A brief ecological comparison of lifezones on the Kaibab Plateau. Grand Canyon Nature Notes, 5(2):13-17.
- Mead, P. 1930. Preliminary report on the germination of native wild flower seeds. Grand Canyon Nature Notes, 5(2):19-20.
- Mead, P. 1931. Second report of the germination of native wild flower seeds. Grand Canyon Nature Notes, 5(3):28-29.
- Mead, P. 1931. The first spring flowers. Grand Canyon Nature Notes, 5(4):36.

- Mead, P. 1931. Fourth report on the germination of native wild flower seeds. *Grand Canyon Nature Notes*, 5(5):51-52.
- Mead, P. 1931. The rock-loving alumroot. *Grand Canyon Nature Notes*, 5(5):47.
- Merkle, J. 1952. An analysis of a Pinyon-Juniper community at Grand Canyon, Arizona. *Ecology*, 33(3):375-384.
- Merkle, J. 1953. An ecological analysis of the meadows on the Kaibab Plateau, Arizona. *Yr. Bk. Amer. Philosophical Soc.*, p. 157-160.
- Merkle, J. 1954. An analysis of the Spruce-Fir community on the Kaibab Plateau, Arizona. *Ecology*, 35(3):316-322.
- Merkle, J. 1962. Plant communities of the Grand Canyon area, Arizona. *Ecology*, 43(4):698-711.
- Merriam, C. H. 1890. Results of a biological survey of the San Francisco Mountain region and desert of the Little Colorado, Arizona. *North Am. Fauna*, No. 3., Washington. Govt. Print. Off.
- Merriam, C. H. and S. B. Jones. 1929. Flowers - North Rim for seasons 1928 and 1929. Manuscript, 9 pp.
- Merriam, C. W. 1928. Analogy of past and present life. *Grand Canyon Nature Notes*, 3(2):3-4.
- Merriam, J. C. 1930. The unity of nature as illustrated by the Grand Canyon. Manuscript, 17 pp.
- Mielke, J. L. 1946. Observations on Coleosporium crowelli. *The Plant Disease Reporter*, 30(11):422-423.
- Noble, L. F. 1910. Contributions to the geology of the Grand Canyon, Arizona; the geology of the Shinumo area. *Am. Jour. Sci.*, 4th Ser., 29:369-386; 497-528.

- Patraw, P. M. 1931. Broomrape, a root parasite. Grand Canyon Nature Notes, 5(7):66.
- Patraw, P. M. 1931. Where our cacti grow. Grand Canyon Nature Notes, 5(8):71-72.
- Patraw, P. M. 1931. A yellow lily. Grand Canyon Nature Notes, 5(10):105.
- Patraw, P. M. 1931. Plant succession in Kaibab limestone. Grand Canyon Nature Notes, 6(1):6-9.
- Patraw, P. M. 1931. Preliminary checklist of plants of Grand Canyon National Park. U.S.N.P.S., 47 pp.
- Patraw, P. M. 1936. Checklist of plants of Grand Canyon National Park. Grand Canyon Nat. Hist. Assoc., Bull. No. 6.
- Pearson, G. A. 1923. Natural reproduction of Western Yellow Pine in the Southwest. U.S. Dept. of Agri., Bull. 1105., Washington. Govt. Print. Off.
- Phillips, A. M. III. 1973. Plant collections of the lower Grand Canyon - April, 1973. Manuscript, 5 pp.
- Pody, S. M. 1942. Distribution patterns in Melampsorella in the national forests and parks of the western states. Mycologia, XXXIV(6):612-613.
- Rand, P. J. 1958. The plant communities of Grand Canyon National Park, Arizona. Proceed. Minnesota Acad. of Sci., 25:88-90.
- Rand, P. J. 1965. Factors related to the distribution of Ponderosa and Pinyon Pines at Grand Canyon, Arizona. Dept. of Botany, Duke Univ., diss.
- Rasmussen, D. I. 1941. Biotic communities of the Kaibab Plateau, Arizona. Ecol. Monog., 11(3):229-275.
- Redburn, R. A. 1931. Pinyon Pine nuts. Grand Canyon Nature

- Notes, 5(12):125-126.
- Rollins, R. C. 1953. A new Sisymbrium from Arizona. Leaflets of Western Botany, 7(1):15-16.
- Scharff, R. (ed.). 1969. Grand Canyon National Park. David McKay Company, Inc., New York.
- School of American Research, 1970. Preliminary report on the ecology of the Walhalla Plateau.
- Schwartz, D. W., G. Thornton, D. Nichols and P. Bennett. 1968. The ecology of the Unkar Delta. Manuscript, 39 pp.
- Searl, C. C. 1930. Irregularities in climatic belts. Grand Canyon Nature Notes, 4(10):68-69.
- Sigleo, W. R. 1971. Modern pollen distribution as related to vegetation communities and elevation in the Grand Canyon, Arizona. Univ. of Ariz. Press, Tucson.
- Sleznick, J., Jr. 1961. Orchids of Grand Canyon National Park. Am. Orchid Soc., p. 360-362.
- Stockert, J. W. and W. Joanne. 1967. Common wildflowers of the Grand Canyon. Salt Lake City, Wheelright Press.
- Sturdevant, G. E. 1926. Cliff rose. Grand Canyon Nature Notes, 1(6):1-2.
- Sturdevant, G. E. 1926. Cat's-claw (Acacia gregii). Grand Canyon Nature Notes, 1(8):2-3.
- Sturdevant, G. E. 1927. Canyon rim roses. Grand Canyon Nature Notes, 2(3):3.
- Sturdevant, G. E. 1927. Pinon nuts. Grand Canyon Nature Notes, 2(4):3.
- Sturdevant, G. E. 1928. Ironwood (Knowlton's hornbeam). Grand Canyon Nature Notes, 3(2):2-3.

- Sturdevant, G. E. 1929. Lessons from the Grand Canyon. Grand Canyon Nature Notes, 3(7):2-3.
- Sutton, A. 1971. The wilderness world of the Grand Canyon. Lippincott Co., Philadelphia.
- Taylor, W. R. and H. S. Colton. 1928. The phytoplankton of some Arizona pools and lakes. Am. Jour. Bot., 15:596-614.
- Tidestrom, I. 1910. Species of Aquilegia growing in Utah and in adjacent portions of Colorado, Idaho and Arizona. Am. Midland Nat., 1:[165]-71.
- Tillotson, M. R. 1924. North Rim - table of the trees in order of their importance. Manuscript, 5 pp.
- Tillotson, M. R. and F. J. Taylor. 1929. Flora of the Grand Canyon country. In their: Grand Canyon country. Stanford Univ. Press, Palo Alto, Calif. p. 77-85.
- VanDyke, J. C. 1920. The Grand Canyon of the Colorado: recurrent studies in impressions and appearances. New York, Charles Scribner's Sons.
- Wampler, J. 1959. Havasu Canyon, gem of the Grand Canyon. Howell-North Press, Berkeley.
- Wheeler, 1st Lieut. G. M. 1878. Report upon United States geographical surveys west of the 100th meridian. Vol VI-Botany. Washington. Govt. Print. Off.
- Wherry, E. T. 1939. Four southwestern subspecies of Phlox. Jour. Wash. Acad. Sci., 29(12):517-519.
- Whipple, Lieut. A. W. 1856. Reports of explorations and surveys to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean. Part V - Botany of the expedition. Washington. Beverley Tucker, Printer.

## INSECTS

- Anonymous. 1924. A great forest threatened. American Forests and Forest Life, 30:359.
- Anonymous. 1931. Giant moths -- errata. Grand Canyon Nature Notes, 6(1):14.
- Ball, E. D., E. R. Tinkhorn, R. Flack, and C. T. Vorhies. 1942. Grasshoppers and other Orthoptera of Arizona. Univ. of Arizona Tech. Bull. no. 93.
- Baumhafer, L. G. 1930. Report on examination of bark beetle conditions in Grand Canyon National Park. U.S. Dept. of Agri., Dept. of Entomology, Washington. Govt. Printing Off., Aug. 22-24.
- Bell, E. L. and F. E. Watson. Butterflies collected in Mesa Verde and the Grand Canyon region by the American Museum party in 1934. Unpubl. manuscript, 11 pp.
- Count, E. W. 1929. Cricket notes. Grand Canyon Nature Notes, 3(12):4-5.
- Cresson, E. T. 1878. Report upon the collections of Hymenoptera In Wheeler, 1st Lieut. G.M. Report upon U.S. Geographical surveys west of the 100th meridian. Vol. V-Zoology, Wash. Govt. Print. Off.
- Emmel, T. C. and J. F. Emmel. 1967. The biology of Papilio indra kaibabensis in the Grand Canyon. Jour. Lepidopterists Soc., 21:1.
- Garth, J. S. 1949. A new subspecies of Speyeria atlantis (Edwards) from the Kaibab Plateau, Grand Canyon National Park. Bull. S. Calif. Acad. Sci. XLVIII,1:1-4.



- Garth, J. S. 1950. Butterflies of Grand Canyon National Park. Grand Canyon Nat. Hist. Assoc., Bull. no. 11.
- Gates Clarke, J. F. 1941. The North American moths of the genus Arachuis with one new species. Proceed. U.S. Nat'l Mus., 91(3123):59-73.
- Hottes, F. C. 1955. Three new subspecies and figures of five previously unfigured species of Cinara. Proceed. Biol. Soc. Wash., 68:101-104.
- Hottes, F. C. 1956. Two new species of Cinara from northern Arizona with illustrations of hitherto unfigured species and notes of Schyolachnus flocculosa (Williams). Proceed. Biol. Soc. Wash., 69:219-223.
- Hottes, F. C. and G. D. Butler. 1955. A new species of Cinara from Arizona. Proceed. Biol. Soc. Wash., 68:65-66.
- Keen, F. P. 1926. Report of insect reconnaissance and conditions on Kaibab National Forest and Grand Canyon National Park. Unpubl. manuscript, 12 pp.
- Lutz, F. no date. Big bees of the Grand Canyon. Unpubl. manuscript.
- McKee, E. D. 1927. The Papilio tribe of butterflies. Grand Canyon Nature Notes, 2(2):1-2.
- McKee, E. D. 1928. The Polyphemus moth. Grand Canyon Nature Notes, 3(2):4-5.
- McKee, E. D. 1931. Giant moths. Grand Canyon Nature Notes, 5(9):93-94.
- Mead, P. 1930. Butterflies near the Colorado River in November. Grand Canyon Nature Notes, 5(1):2-3.
- Nabokov, V. 1942. Some new or little known Nearctic Neonympha. Psyche, XLIX(3-4):61-80.

- Rehn, J. A. G. and M. Hebard. 1908. An Orthopterological reconnaissance of the southwestern United States. Part I:Arizona. Acad. Nat. Sci. of Phila. Proc., 60:365-402.
- Searl, C. C. 1931. An interesting bug. Grand Canyon Nature Notes, 5(7):64-65.
- Searl, C. C. 1931. Beetles. Grand Canyon Nature Notes, 5(3):25-26.
- Searl, C. C. 1931. Dragon-flies at Grand Canyon. Grand Canyon Nature Notes, 6(2):16-18.
- Searl, C. C. 1931. The Lantern-fly. Grand Canyon Nature Notes, 5(8):77.
- Searl, C. C. 1931. Some beetles of Grand Canyon. Grand Canyon Nature Notes, 5(6):54-55.
- Searl, C. C. 1932. An insect observation. Grand Canyon Nature Notes, 7(5):51-52.
- Searl, C. C. 1932. Insect notes. Grand Canyon Nature Notes, 7(6):57.
- Searl, C. C. 1932. Report on destructive insect conditions in Grand Canyon National Park and adjacent areas. Unpubl. manuscript, 6 pp.
- Searl, C. C. 1932. Vandals in the sand. Grand Canyon Nature Notes, 6(5):41-42.
- Sturdevant, G. E. 1926. Daily battles. Grand Canyon Nature Notes, 1(4):6.
- Tilden, J. W. 1955. A revision of Tharsolea Scud. (S. Str.), with a description of a new subspecies (Lepid., Lyc.), Bull. S. Calif. Acad. Sci., 54(2):66-67.
- Usinger, R. L. 1931. A new species of Platylygus. Pan-Pacific

Entom., 7(3):129-130.

Waesch, H. H. 1933. A baffling piece of plateglass. Grand Canyon Nature Notes, 7(6):55-57.

Wheeler, W. M. 1906. The ants of Grand Canyon. Bull. Amer. Mus. Nat. Hist., 22:329-345.

Wheeler, W. M. 1908. The ants of Texas, New Mexico, and Arizona. Am. Mus. Nat. Hist., Bull. 24:399-484.

Wind, R. G. 1930. Butterflies of the Grand Canyon. Grand Canyon Nature Notes, 4(12):81-84.

#### FISH

Anonymous. no date. Fish plants, Grand Canyon National Park, 1920-1956.

Anonymous. 1928. Inspecting a possible trout stream of Grand Canyon. Grand Canyon Nature Notes, 2(11):1-6.

Anonymous 1929. Clear Creek is stocked with trout. Grand Canyon Nature Notes, 3(7):3.

Anonymous. 1930. Odds and ends. Grand Canyon Nature Notes, 4(10):69-71.

Anonymous. 1960. A list of common and scientific names of fishes from United States and Canada. Amer. Fish Soc. Spec. Pub. no. 2.

Brooks, J. P. 1931. Official report on stocking canyon streams with fish. Grand Canyon Nature Notes, 5(5):48.

Brooks, J. P. 1932. Field observations. Grand Canyon Nature Notes, 6(4):33.

Brown, A. L. 1939. Memorandum concerning the planting of Blue Channel Cat Fish in the Colorado River.

Carothers, S. W. and S. W. Aitchison. 1972. Blue Springs as

a barrier to distribution of Speckled Dace (Rhinichthys osculus Girard (Cyprinidae). Museum of Northern Arizona, manuscript.

- Holden, P.B. 1973. Distribution, abundance and life history of the fishes of the upper Colorado River Basin. Utah St. Univ., diss.
- Hubbs, C. L. and R. R. Miller. 1941. Studies of the fishes of the order Cyprinodontes, 17 genera and species of the Colorado River system. Occas. Papers Mus. of Zoo., Univ. of Mich., No. 433.
- Kay, C. 1965. Lee's Ferry. Wildlife Views, 12(3):10-13.
- McKee, E. D. 1930. Briefs. Grand Canyon Nature Notes, 4(6): 37.
- McKee, E. D. 1932. Field notes. Grand Canyon Nature Notes, 6(5):47.
- McKee, E. D. 1933. Miscellany. Grand Canyon Nature Notes, 7(12):126-127.
- Markley, C. R. 1931. Early stages in the development of Rainbow Trout. Grand Canyon Nature Notes, 5(6):59-60.
- Miller, R. R. 1944. Preliminary checklist of fishes of Grand Canyon National Park. Unpubl. manuscript.
- Miller, R. R. 1946. Gila cypha, a remarkable species of cyprinid fish from the Colorado River in Grand Canyon, Arizona. Jour. Wash. Acad. Sci., 36(12):409-415.
- Miller, R. R. 1958. Origins and affinities of the freshwater fish fauna of western North America. Zoogeography, Amer. Assn. Adv. Sci.
- Miller, R. R. and C. L. Hubbs. 1960. The spiny-rayed cyprinid fishes (Plagopterini) of the Colorado River system. Misc.

Publ. Mus. Zoo., Univ. of Mich., No. 115.

- Miller, R. R. and C. H. Lowe. 1964. An annotated checklist of fishes of Arizona. In Lowe, C. H., Vertebrates of Arizona. Univ. of Arizona Press, Tucson.
- Miller, R. R. and G. R. Smith. 1972. Fishes collected on the Grand Canyon Survey, Lee's Ferry to Diamond Creek, August, 1968. Unpubl. manuscript.
- Mulch, E. E. and W. C. Gamble. 1956. Game fishes of Arizona. Arizona Game and Fish Dept.
- Patraw, P. M. 1931. Planting fish eggs in Clear Creek. Grand Canyon Nature Notes, 5(4):34-35.
- Rinne, J. N. and W. L. Minckley. 1970. Native Arizona fishes; part III; "Chubs". Wildlife Views, 17(5):12-19.
- Williamson, R. R. and C. F. Tyler. 1932. Trout propagation in Grand Canyon National Park. Grand Canyon Nature Notes, 7(2):11-15.

#### AMPHIBIANS AND REPTILES

- Anonymous. 1934. Report on rattlesnake specimens. Grand Canyon Nature Notes, 8(11):248-249.
- Bishop, S. C. 1947. Handbook of salamanders. Comstock Publishing Co., Ithaca. pp. 168-171.
- Bogert, C. M. 1931. Two reptiles new to the Grand Canyon region. Grand Canyon Nature Notes, 5(11):115-116.
- Bogert, C. M. 1932. Herpetological problems at Grand Canyon National Park. Grand Canyon Nature Notes, 7(6):61-65.
- Bogert, C. M. 1933. Notes on Grand Canyon amphibians. Grand Canyon Nature Notes, 7(12):119-120.
- Count, E. W. 1930. Some lizards of Grand Canyon. Grand Canyon Nature Notes, 4(6):36-37.
- Croft, R. A. 1932. A "reptile story". Grand Canyon Nature Notes, 7(8):76.

- Dodge, N. N. 1938. Amphibians and reptiles of Grand Canyon National Park. Grand Canyon Nat. Hist. Assoc. Bull. No. 9.
- Dunn, E. R. 1940. The races of Ambystoma tigrinum. Copeia, 3:154-162.
- Durham, F. E. 1956. Amphibians and reptiles of the North Rim, Grand Canyon, Arizona. Herpetologica, 12:220-224.
- Fowlie, J. A. 1965. The snakes of Arizona. Azul Quinta Press, Fallbrook, Calif.
- Garrigues, R. M. 1965. A Cuterebra (Diptera:Cuterebridae) infestation in the Grand Canyon rattlesnake, Crotalus viridis abyssus, with a list of those recorded from other hosts. Trans. Kansas Acad. Sci., 67(4):689-692.
- Gehlbach, F. R. 1966. Grand Canyon amphibians and reptiles; field checklist. Grand Canyon Nat. Hist. Assoc.
- Gehlbach, F. R. 1967. Evolution of tiger salamanders (Ambystoma tigrinum) on the Grand Canyon rims, Arizona. Yearbook of the American Philosophical Society, p. 266-269.
- Gehlbach, F. R., J. R. Kimmel, and W. A. Weems. 1969. Aggregations and body water relations in tiger salamanders (Ambystoma tigrinum) from the Grand Canyon rims, Arizona. Physiological Zoology, 42(2):173-182.
- Gloyd, H. K. 1902. The rattlesnakes, genera Sistrurus and Crotalus, a study in zoogeography and evolution. Chicago Acad. Sci. Spec. Publ. No. 4:151-160, 215-216.
- Grater, R. 1934. Field observations. Grand Canyon Nature Notes, 9(7):337.

- Grater, R. 1934. When enemies meet. Grand Canyon Nature Notes, 9(7):322.
- Hastings, B. 1929. The Chuckwalla. Grand Canyon Nature Notes, 3(9)2.
- Jones, S. B. 1929. The elusive Sceloporus. Grand Canyon Nature Notes, 4(2):12-13.
- Jones, S. B. 1929. Horned Toads. Grand Canyon Nature Notes, 4(1):1-2.
- Lowe, C. H. Jr. 1955. The Salamanders of Arizona. Trans. Kansas Acad. of Sci., 58(2):237-251.
- McHenry, D. E. and E. D. McKee. 1932. Field observations. Grand Canyon Nature Notes, 7(7):75-76.
- McHenry, D. E. 1933. Rattlesnakes of the Canyon rim. Grand Canyon Nature Notes, 8(8):213-214.
- McHenry, D. E. 1934. Lizard eat lizard. Grand Canyon Nature Notes, 9(3):285-287.
- McKee, E. D. 1928. The Blue-bellied Lizard. Grand Canyon Nature Notes, 3(3):3-4.
- McKee, E. D. 1929. The next generation. Grand Canyon Nature Notes, 3(12):6.
- McKee, E. D. 1929. Snakes as mediators. Grand Canyon Nature Notes, 4(1):5.
- McKee, E. D. 1930. The Grand Canyon Rattlesnake. Grand Canyon Nature Notes, 4(6):40.
- McKee, E. D. 1930. Preliminary checklist of amphibians and reptiles, Grand Canyon. U.S.N.P.S., Grand Canyon, Arizona, Tech. Bull., 7 pp.
- McKee, E. D. 1931. Grand Canyon -- a barrier to reptiles? Grand Canyon Nature Notes, 5(10):107-109.

- McKee, E. D. 1932. Field observations. Grand Canyon Nature Notes, 7(5):54.
- McKee, E. D. 1932. Snake stories. Grand Canyon Nature Notes, 7(9):96.
- McKee, E. D. 1933. Diary of early spring. Grand Canyon Nature Notes, 8(1):140.
- McKee, E. D. and C. M. Bogert. 1934. The amphibians and reptiles of Grand Canyon National Park. Copeia, 4:178-180.
- Peterson, E. L. and S. F. Wood. 1955. A Sonoran Lyre Snake, Trimorphodon, under a ground cloth. Bull. S. Calif. Acad. Sci., 54(3):166.
- Redburn, R. A. 1931. Lizards. Grand Canyon Nature Notes, 5(9):93.
- Scoyen, E. T. 1926. A few pets. Grand Canyon Nature Notes, 1(5):7.
- Springer, S. 1928. An annotated list of the lizards of Lee's Ferry, Arizona. Copeia, 169:100-104.
- Stejneger, L. 1890. Annotated list of reptiles and Batrachians collected by Dr. C. H. Merriam and Vernon Bailey on the San Francisco Mountain Plateau and desert of the Little Colorado, Arizona, with descriptions of new species. North American Fauna No. 3:103-118.
- Tanner, W. W. 1953. A study of taxonomy and phylogeny of Lampropeltis pyromelona Cope. The Great Basin Naturalist, 3(1-2):47-66.
- Wheeler, 1st Lieut. G. M. 1878. Report upon United States Geographical Surveys west of the 100th Meridian. Vol. V-Zoology. Wash. Govt. Pring. Off.



VanDenburgh, J. and J. A. Slevin. 1913. A list of the amphibians and reptiles of Arizona, with notes on the species in the collection of the Academy. Proceed. Calif. Acad. Sci., 4(3):391-454.

VanDenburgh, J. 1922. The reptiles of western North America. Occas. Papers, Calif. Acad. Sci., 2 vols.

#### BIRDS

Anonymous. 1928. Cassin Vireo observed. Grand Canyon Nature Notes, 3(1):2.

Anonymous. 1928. Dusky Grouse on South Rim. Grand Canyon Nature Notes, 3(2):5.

Anonymous. 1928. Kingfisher at Grand Canyon. Grand Canyon Nature Notes, 3(5):1-2.

Anonymous. 1928. Red-shafted Flicker. Grand Canyon Nature Notes, 2(12):1.

Anonymous. 1928. Robin breaks ice to take bath. Grand Canyon Nature Notes, 3(5):2.

Anonymous. 1928. Sea gulls visit the park. Grand Canyon Nature Notes, 2(12):2.

Anonymous. 1929. Along the trail. Grand Canyon Nature Notes, 4(4):6-7.

Anonymous. 1929. Nesting Notes. Grand Canyon Nature Notes, 3(10):3-4.

Anonymous. 1930. Briefs. Grand Canyon Nature Notes, 5(1):11.

Anonymous. 1930. Odds and ends. Grand Canyon Nature Notes, 4(10):69-70.

Anonymous. 1931. A Sage Thrasher. Grand Canyon Nature Notes,

5(9):86.

- Anonymous. 1931. Little Trail Flycatchers. Grand Canyon Nature Notes, 6(1):15.
- Anonymous. 1931. Robins and the coming of spring. Grand Canyon Nature Notes, 5(4):42.
- Anonymous. 1968. Wild Turkey. Arizona Big Game Bull. Ariz. Game and Fish Dept.
- Arnold, J. R. 1941. Western Grasshopper Sparrow at Grand Canyon, Arizona. Condor, 43:292-293.
- Avery, B. 1954. Wild Turkey finds new home in Arizona's Kaibab Plateau. Ariz. Days and Ways, Sept. 5.
- Bailey, F. M. 1939. Among the birds in the Grand Canyon country. Wash. Govt. Print. Off.
- Baker, M. E. 1940. Annotated hypothetical checklist of birds observed along the Green and Colorado Rivers from Green River, Wyoming, to Lake Mead. Manuscript, 4 pp.
- Behle, W. H. and E. D. McKee. 1943. Additional bird records for Grand Canyon National Park. Auk, 60:278-279.
- Bryant, H. C. 1941. A Nighthawk migration on an Arizona desert. Condor, 43:293.
- Bryant, H. C. 1945. Back-yard observations at Grand Canyon, Arizona. Gull, Audubon Assoc. of the Pacific, 27(5): 16-17.
- Bryant, H. C. 1945. The status of game birds in Grand Canyon National Park. Arizona Wildlife-Sportsman, 6(9):10-11.
- Bryant, H. C. 1952. Additions to the checklist of birds of Grand Canyon National Park. Condor, 54(5):320.
- Carothers, S. W. 1973. Notes from a 1972 Colorado River

- trip. Unpubl. ms., Museum of Northern Arizona.
- Collins, G. and others. 1931. Miscellany. Grand Canyon Nature Notes, 6(2):21-22.
- Count, E. W. 1929. Avian cliff-dwellers. Grand Canyon Nature Notes, 4(3):18.
- Count, E. W. 1929. The gathering of the jay clan. Grand Canyon Nature Notes, 4(1):2.
- Count, E. W. 1930. Briefs. Grand Canyon Nature Notes, 4(12):90.
- Count, E. W. and others. 1930. July bird notes. Grand Canyon Nature Notes, 4(9):62.
- Coues, E. 1878. Birds of the Colorado Valley. Hayden Survey, Misc. Pub. No. 11, Wash. Govt. Print. Off.
- Crockett, H. L. and R. Crockett. 1941. Birds of the Grand Canyon. Ariz. Highways, 17(6):16.
- DeSaussure, R. 1956. Remains of the California Condor in Arizona caves. Plateau, 29(2):44-45.
- Grater, R. 1934. Field observations. Grand Canyon Nature Notes, 9(7):337.
- Grater, R. 1934. An archeological-minded jay. Grand Canyon Nature Notes, 9(7):322-323.
- Grater, R. 1934. Current observations... Grand Canyon Nature Notes, 9(9):354.
- Grater, R. 1934. Some wildlife observations. Grand Canyon Nature Notes, 9(4):303.
- Grater, R. 1934. Some migrating sparrows and related species. Grand Canyon Nature Notes, 9(7):335-336.
- Grater, R. 1935. Some wildlife observations on the canyon floor. Grand Canyon Nature Notes, 9(10):365-367.

- Grater, R. K. 1935. Miscellaneous field notes. Grand Canyon Nature Notes, 9(11):382.
- Grater, R. K. 1935. Miscellaneous field notes. Grand Canyon Nature Notes, 9(12):394.
- Grater, R. K. 1936. Bird banding from Oct. 15, 1934 to Oct. 15, 1935. Contrib. to Grand Canyon Ornithology, Nat. Hist. Bull. No. 4, Grand Canyon Nat. Hist. Assoc.
- Grater, R. K. 1937. Checklist of birds in the Grand Canyon National Park. Nat. Hist. Bull. No. 8, Grand Canyon Nat. Hist. assoc.
- Hargrave, L. L. 1932. Miscellaneous bird notes from the San Francisco Mountains. Grand Canyon Nature Notes, 7(2):18-21.
- Hargrave, L. L. 1932. Notes of fifteen species of birds from the San Francisco Mountain region, Arizona. Condor, 34: 217-220.
- Hargrave, L. L. 1933a. Bird-banding in northern Arizona: part 1. Grand Canyon Nature Notes, 7(11):114-116.
- Hargrave, L. L. 1933b. Bird-banding in northern Arizona: part 2. Grand Canyon Nature Notes, 7(12):121-123.
- Hargrave, L. L. 1933c. Some bird notes from Bly, Arizona. Grand Canyon Nature Notes, 8(6):184-187.
- Hill, W. 1969. Sixty-ninth Christmas Bird Count, Grand Canyon. Aud. Field Notes, 23(2):390.
- Hill, W. 1970. Seventieth Christmas Bird Count, Grand Canyon. Aud. Field Notes, 24(2): 417.
- Hill, W. 1971. Seventy-first Christmas Bird Count, Grand Canyon. Aud. Field Notes, 25(2):464.
- Hoener, L. R. 1951. The characteristics and management of Merriam's Wild Turkey. Princ. of Game Managt., Mar.

- Huey, L. M. 1939. Birds of Mount Trumbull region. *Auk*,  
56(3):320-325.
- Jenks, R. 1931a. Birding in Grand Canyon. *Grand Canyon Nature  
Notes*, 5(8):75-77.
- Jenks, R. 1931b. Ornithology of the life zones: summit of San  
Francisco Mountains to bottom of Grand Canyon. U.S. Dept.  
Interior Tech. Bull. No. 5.
- Jenks R. 1931c. Recent bird records from Havasu Canyon. *Grand  
Canyon Nature Notes*, 7(5):37-38.
- Jenks, R. 1931d. Some birds and their nest on the Kaibab.  
*Grand Canyon Nature Notes*, 5(10):101-105.
- Johnson, R. R. 1971. Notes from a 1971 Colorado River trip.  
Unpubl. ms., Prescott College.
- Johnson, R. R. 1973. Notes from a 1973 Colorado River trip.  
Unpubl. ms., Prescott College.
- Kraus, P. 1933. An outrage. *Grand Canyon Nature Notes*,  
8(8):209-210.
- Leishman, W. 1973. Seventy-third Christmas Bird Count, Grand  
Canyon. *Aud. Field Notes*, 27(2):480.
- McHenry, D. E. and E. D. McKee. 1932. Field observations.  
*Grand Canyon Nature Notes*, 7(7):75-76.
- McHenry, D. E. 1933. A broken-winged Robin. *Grand Canyon  
Nature Notes*, 8(5):178-181.
- McKee, E. D. 1927. Birds of the Havasupai Canyon. *Grand  
Canyon Nature Notes*, 2(3):2.
- McKee, E. D. 1927. Trailside nests. *Grand Canyon Nature  
Notes*, 2(1):3-4.
- McKee, E. D. 1928. Bird life on the Tonto Platform.  
*Grand Canyon Nature Notes*, 3(1):2-3.

- McKee, E. D. 1928. Bird records for the park. Grand Canyon Nature Notes, 3(3):2.
- McKee, E. D. 1929. Feathered friends. Grand Canyon Nature Notes, 4(3):15-16.
- McKee, E. D. 1929. Odds and ends. Grand Canyon Nature Notes, 3(9):6.
- McKee, E. D. 1930. Briefs. Grand Canyon Nature Notes, 4(6):37.
- McKee, E. D. 1930. The Canyon Towhee. Grand Canyon Nature Notes, 4(11):80.
- McKee, E. D. 1931. Field observations. Grand Canyon Nature Notes, 5(7):69-70.
- McKee, E. D. 1931. A lively beggar. Grand Canyon Nature Notes, 5(6):56-57.
- McKee, E. D. 1931. A quarrel among bird families. Grand Canyon Nature Notes, 5(11):117.
- McKee, E. D. 1932. Bird migration dates. Grand Canyon Nature Notes, 7(3):28.
- McKee, E. D. 1932. Field observations. Grand Canyon Nature Notes, 4(5):47.
- McKee, E. D. 1932. Field observations. Grand Canyon Nature Notes, 6(4):34.
- McKee, E. D. 1932. Field observations. Grand Canyon Nature Notes, 6(5):47.
- McKee, E. D. 1932. Recent bird notes. Grand Canyon Nature Notes, 7(9):91-92.
- McKee, E. D. 1933. Diary of early spring. Grand Canyon Nature Notes, 8(1):140.
- McKee, E. D. 1933. The hermit of Horn Creek. Grand Canyon

- Nature Notes, 7(11):116-118.
- McKee, E. D. 1933. Junco visits both rims. Grand Canyon Nature Notes, 8(3):157.
- McKee, E. D. 1933. Miscellany. Grand Canyon Nature Notes, 8(7):205.
- McKee, E. D. 1934. Swifts. Grand Canyon Nature Notes, 9(2):281.
- McKee, E. D. 1936. Contributions to Grand Canyon ornithology. Nat. Hist. Bull. No. 4, Grand Canyon Nat. Hist. Assoc.
- McKee, E. D. 1938. Grand Canyon and birds. Western Tanager, No. 5.
- McKee, E. D. 1939. Four species new to Grand Canyon National Park. Condor, 41(6):156-157.
- McKee, E. D. 1942. Results from a bird banding station at Grand Canyon. Plateau, 15(1):10-13.
- McKee, E. D. (no date). Preliminary check-list of birds of Grand Canyon. National Park Service Tech. Bull.
- McKee, E. D. and others. 1934. Field observations. Grand Canyon Nature Notes, 9(2):280-282.
- Messinger, N. G. 1965. A survey of the birds of the inner canyon. Manuscript, 11 pp.
- Messinger, N. G. 1966. A copy of the field notes from a survey of the birds of the inner canyon. Manuscript, 11 pp.
- Messinger, N. G. 1967. Two June records of the Canada Goose in Grand Canyon, Arizona. Condor, 69(3):319.
- Miller, A. H. The summer distribution of certain birds in central and northern Arizona. Condor, 43:96.
- Miller, L. 1960. Condor remains from Rampart Cave, Arizona. Condor, 62(1):70.

- Oberholser, H. C. 1937. Descriptions of the three new Screech Owls from the United States. Jour. Wash. Acad. Sci., 27(8):354-357.
- Ochsner, D. 1972. Seventy-second Christmas Bird Count, Grand Canyon. Aud. Field Notes, 26(2):480.
- Patraw, P. and E. D. McKee. 1932. Special notes. Grand Canyon Nature Notes, 6(3):28.
- Parmalee, P. W. 1969. California Condor and other birds from Stanton's Cave, Arizona. Jour Ariz. Acad. Sci., 5(4):204-206.
- Phillips, A., J. Marshall, and G. Monson. 1964. The birds of Arizona. Univ. of Arizona Press, Tucson.
- Redburn, R. A. 1932. Food for the hawk. Grand Canyon Nature Notes, 7(4):40.
- Scoyen, E. T. 1927. You're next, Mr. Duck. Grand Canyon Nature Notes, 1(10):4-5.
- Searl, C. C. 1930. A new bird record. Grand Canyon Nature Notes, 4 (11):80.
- Searl, C. C. 1931. Early November bird species. Grand Canyon Nature Notes. 6(1):3-6.
- Searl, C. C. 1931. Some interesting bird records. Grand Canyon Nature Notes, 5(4):3-5.
- Schellbach, L. 1935. Grand Canyon National Park Bird Banding Notes. Memo.
- Schellbach, L. and others. 1933. Miscellany. Grand Canyon Nature Notes, 8(8):215-216.
- Spangle, P. and E. Spangle. 1948. Wildlife observations and sketches, manuscript.



- Stein, L. 1934. Statistical report of bird-banding. Grand Canyon Nature Notes, 9(2):274-276.
- Sturdevant, G. E. 1927. Crossbill winters at Grand Canyon. Grand Canyon Nature Notes, 2(7):3.
- Sturdevant, G. E. 1927. Crossbill. Grand Canyon Nature Notes, 2(4):1-2.
- Sturdevant, G. E. 1927. Mother grouse poses for movie camera. Grand Canyon Nature Notes, 2(4):3-4.
- Sturdevant, G. E. 1927. Wild Goose. Grand Canyon Nature Notes, 1(11):2.
- Sturdevant, G. E. 1927. A winter resident. Grand Canyon Nature Notes, 1(11):1.
- Sturdevant, G. E. 1928. Bird baths. Grand Canyon Nature Notes, 3(4):4-5.
- Sturdevant, G. E. 1928. Near tragedy. Grand Canyon Nature Notes, 2(9):7.
- Sturdevant, G. E. 1928. The Turkey Buzzard... . Grand Canyon Nature Notes, 1(8):1-2.
- Torrey, B. 1906. A bird-gazer at the Grand Canyon. Atlantic Monthly, June.
- Watson, W. A. 1936. An unusual nesting habit. Contrib. to Grand Canyon Ornithology, Grand Canyon Nat. Hist. Assoc., Bull. No. 4.
- Waesche, H. H. 1932. A baffling piece of plate glass. Grand Canyon Nature Notes, 7(6):55-57.
- Wetmore, A. 1908. Notes on some northern Arizona birds. Kansas Univ. Sci. Bull., 4(19):377-388.
- Wheeler, 1st Lieut. G. M. 1878. Report upon United States

- Geographical Surveys west of the 100th Meridian. Vol. V-  
Zoology. Wash. Govt. Print. Off.
- Williamson, R. R. and others. 1934. Miscellany. Grand  
Canyon Nature Notes, 8(10):237-238.
- Woodbury, A. M. Bird records from Utah and Arizona. Condor,  
41:157.

#### MAMMALS

- Aitchison, S. W. 1972. Notes from Colorado River trips: small  
mammals. Unpubl. ms., Museum of Northern Arizona.
- Anonymous. 1926. Button, button, who has the button? Grand  
Canyon Nature Notes, 1(6):2.
- Anonymous. 1927. Antelope happenings. Grand Canyon Nature  
Notes, 1(12):2-3.
- Anonymous. 1927. Antelope reveals goat traits. Grand Canyon  
Nature Notes, 2(7):4.
- Anonymous. 1927. A canyon culprit. Grand Canyon Nature  
Notes, 2(5):4.
- Anonymous. 1927. Canyon walls are a barrier to migration.  
Grand Canyon Nature Notes, 2(7):1-2.
- Anonymous. 1927. Fox holds up party. Grand Canyon Nature  
Notes, 2(1):2.
- Anonymous. 1927. Mountain sheep observed on canyon rim. Grand  
Canyon Nature Notes, 2(7):3.
- Anonymous. 1927. Mountain sheep visits studio. Grand Canyon  
Nature Notes, 1(12):3.
- Anonymous. 1927. Pal killed by Mountain Lion. Grand Canyon  
Nature Notes, 2(7):1.

- Anonymous. 1927. Pet fawns introduced to snow and rain.  
Grand Canyon Nature Notes, 2(5):3-4.
- Anonymous. 1927. Ranger Smith entertains. Grand Canyon  
Nature Notes, 1(11):4.
- Anonymous. 1927. "Smoky" is an apt pupil. Grand Canyon  
Nature Notes, 2(7):2.
- Anonymous. 1927. Tame deer herd started in Grand Canyon.  
Grand Canyon Nature Notes, 2(5):1-2.
- Anonymous. 1928. Antelope for burros. Grand Canyon Nature  
Notes, 3(1):1-2.
- Anonymous. 1928. Antlers as an age indicator of deer. Grand  
Canyon Nature Notes, 3(4):3.
- Anonymous. 1928. Deer arrive at Bright Angel Point. Grand  
Canyon Nature Notes, 2(12):2.
- Anonymous. 1928. Kaibab fawn captured. Grand Canyon Nature  
Notes, 3(1):2.
- Anonymous. 1928. Kaibab squirrel plentiful. Grand Canyon  
Nature Notes, 2(12):3.
- Anonymous. 1928. Mountain sheep comes up Bright Angel Trail.  
Grand Canyon Nature Notes, 3(1):4.
- Anonymous. 1928. Nesting and food habits of the Abert squirrel  
at Grand Canyon. Grand Canyon Nature Notes, 2(8):1-3.
- Anonymous. 1928. Two trail parties in one picture. Grand  
Canyon Nature Notes, 3(5):2.
- Anonymous. 1929. Along the trail. Grand Canyon Nature Notes,  
4(1):6-7.
- Anonymous. 1929. In time for refreshments. Grand Canyon  
Nature Notes, 3(7):3.

- Anonymous. 1930. Left-overs. Grand Canyon Nature Notes, 4(7):48.
- Anonymous. 1930. Odds and ends. Grand Canyon Nature Notes, 4(8):56.
- Anonymous. 1931. Desert pallid bat. Grand Canyon Nature Notes, 5(8):74.
- Anonymous. 1931. Notes. Grand Canyon Nature Notes, 5(3):33.
- Anonymous. 1932. Field observations. Grand Canyon Nature Notes, 6(4):33.
- Anonymous. 1933. Miscellany. Grand Canyon Nature Notes, 8(7):205.
- Anonymous. 1934. Raven vs. squirrel. Grand Canyon Nature Notes, 8(11):247.
- Anthony, H. E. 1937. The facts about Shiva. Nat. Hist. XL: 708-721; 775-776.
- Arnold, J. R. 1936. The house mouse in Grand Canyon National Park. Jour. Mammal., 17:292.
- Bailey, F. M. 1932. Abert squirrel burying pinecones. Jour. Mammal., 13(2):165-166.
- Bailey, V. 1927. The Rocky Mountain mule deer; a preliminary report. U.S. Dept. of Interior, National Park Service, Grand Canyon National Park. File #710.
- Bailey, V. 1929. Deer conditions on the Kaibab up to August 5, 1929. Grand Canyon Nature Notes, 3(12):1-2.
- Bailey, V. 1935. Mammals of the Grand Canyon region. Grand Canyon Nat. Hist. Assoc., Bull. no. 1.
- Benson, S. B. 1933. Descriptions of two races of Perognathus amplus from Arizona. Proceed. Biol. Soc. Wash., 46:109-112.

- Benson, S. B. 1934. Descriptions of a race of Dipodomys merriami from Arizona. *Proceed. Biol. Soc. Wash.*, 47: 49-50.
- Benson, S. B. and R. M. Bond. 1939. Notes on Sorex merriami Dobson. *Jour. Mammal.*, 20:348-351.
- Blaisdell, J. A. 1964. The great deer drive. Talk given to Grand Canyon Rotary Club, Aug. 4.
- Blaisdell, J. A. 1966. Wildlife policies and management practices at Grand Canyon National Park. *In* *Proceed. 6th Ann. Mtg. Wildlife So., N.M.-Ariz. sec., Show Low, Ariz.*
- Bogert, C. M. 1933. Notes on porcupines of the Grand Canyon. *Grand Canyon Nature Notes*, 8(10):137-140.
- Bryant, H. C. 1945. The status of big game in Grand Canyon National Park. *Arizona Wildlife-Sportsman*, 6(9):10-11.
- Buechner, H. K. 1960. The Bighorn sheep in the United States: its past, present and future. *Wildlife Mong.*, no. 4, *Wildlife Society*, p. 174.
- Burgoon, R. C. 1966. A catalogue of the mammal collection, Grand Canyon National Park. Manuscript, p. 24.
- Burk, C. J. 1973. The Kaibab deer incident: a long-persisting myth. *Bio. Sci.*, 23:113-114.
- Cahalane, V. H. 1947. A deer-coyote episode. *Jour. Mammal.*, 28:36-39.
- Carothers, S. W. 1970. Preliminary report: small mammal survey of Colorado River from Lee's Ferry to Diamond Creek. Ms. 8 pp.
- Carothers, S. W. and J. R. Haldeman. 1972. Shiva temple revisited. Unpub. Ms. 12 pp.

- Cockrum, E. L. 1960. An annotated check list of the recent mammals of Arizona. In Lowe, C. H. Vertebrates of Arizona. Univ. of Ariz. Press, Tucson.
- Collins, G. 1931. Bare facts about bear tracks. Grand Canyon Nature Notes, 5(8):73-74.
- Collins, G. 1931. Winter feeding of whitetailed squirrels. Grand Canyon Nature Notes, 5(7):67-68.
- Collins, G., B. H. McKee, E. D. McKee and C. C. Searl. 1931. Miscellany. Grand Canyon Nature Notes, 6(2):21-22.
- Count, E. W. 1930. Briefs. Grand Canyon Nature Notes, 4(12):90.
- Count, E. W. 1930. Chisel-teeth-chatter. Grand Canyon Nature Notes, 4(10):65-66.
- Count, E. W. 1930. Dining solitaire. Grand Canyon Nature Notes, 4(11):77-78.
- Croft, A. R. 1932. Deer browse on cactus. Grand Canyon Nature Notes, 7(9):95.
- Dodge, N. N. 1965. Whitetail (Kaibab) squirrel. Pacific Discovery, 18(21):23-26.
- Dodge, N. N. 1966. The Kaibab squirrel. Animals, 9(5).
- Durham, F. E. 1948. Checklist of animals - North Rim. Ms., 4 pp.
- Durham, F. E. 1952. A new pocket gopher from the North Rim of the Grand Canyon, Arizona. Jour. Mammal., 33(4):498-499.
- Durham, F. E. 1955. Variations and adaptations of the rodents of the North Rim of the Grand Canyon, Arizona. Essays in the Natural Sciences in honor of Capt. Allen Hancock.
- Fleming, W. 1970. Arizona's buffalo. Wildlife Views, 17(6): 9-13.
- Foster, J. C. 1970. The deer of the Kaibab: federal-state conflict in Arizona. Arizona and the West, 12(3):255-268.
- Goldman, E. A. 1928. The Kaibab white-tailed squirrel. Jour.

Mammal., 9:127-129.

- Goldman, E. A. 1937. The Colorado River as a barrier in mammalian distribution. Jour. of Mammal., 18(4):427-435.
- Goldman, E. A. 1938. Pocket gophers of the genus Thomomys from Arizona and Utah. Jour. Wash. Acad. Sci., 28:233-243.
- Goldman, E. A. 1947. The pocket gophers (Thomomys) of Arizona. North Amer. Fauna No. 59, Washington, Govt. Print. Off.
- Goldman, E. A. and S. B. Locke. 1923. The mountain of twenty thousand deer. Amer. Forestry, 29:649-653, 682.
- Grater, R. 1934. Some wildlife observations. Grand Canyon Nature Notes, 9(4):363.
- Grater, R. 1935. When enemies meet. Grand Canyon Nature Notes, 9(7):322.
- Grater, R. 1935. Some wildlife observations on the canyon floor. Grand Canyon Nature Notes, 9(10):365-367.
- Grater, R. 1935. American pronghorn antelope in Grand Canyon region. Grand Canyon Nature Notes, 9(12):383-388.
- Grater, R. K. 1935. The status of the American pronghorn antelope in the Grand Canyon region. Grand Canyon Nature Notes, 9(12):383.
- Guse, N. G., Jr. 1973. Colorado River bighorn sheep survey. Ms. 13 pp.
- Guse, N. G., Jr. (no date). Compilation of desert bighorn sheep observations, pre-1900 to present. Ms. 11 pp.
- Gustafson, T. A. 1963. The Jaguar, Felis onca. Ms. 11 pp.
- Hall, E. R. 1925. Report on the Kaibab deer. U.S. Biological Survey Files, Unpubl. memo.
- Hall, E. R. 1931. Tree-climbing Callospermophilus. Murrelet.

- May.
- Hall, E. R. 1932. A new shrew of the Sorex merriami group from Arizona. Jour. Mammal., 13:259-263.
- Hall, E. R. 1933. Sorex leucogenys in Arizona. Jour. Mammal., 14:153-154.
- Hall, E. R. and K. R. Kelson. 1952. Comments on the taxonomy and geographical distribution of some North American rodents. Kansas Univ. Pub. Mus. Nat. Hist., 5:343-371.
- Hall, E. R. and K. R. Kelson. 1959. The mammals of North America, vol. 2. The Ronald Press, New York.
- Hall, J. G. 1967a. The Kaibab squirrel in Grand Canyon National Park: a seven season summary, 1960-1966. Unpubl. manuscript.
- Hall, J. G. 1967b. White tails and yellow pines (Kaibab squirrel and Ponderosa Pine). National Parks, 41(325).
- Hall, J. G. 1968. Spotted skunk of Shiva Temple. Plateau, 40(3):98-100.
- Hawbecker, A. C. 1944. The use of a road by mammals. Jour. Mammal., 25(2):196.
- Hasting, B. 1929. Lady Hecate. Grand Canyon Nature Notes, 3(10):2.
- Hoffmeister, D. F. 1955. Mammals new to Grand Canyon National Park. Plateau, 28(1):1-7.
- Hoffmeister, D. F. 1971. Mammals of Grand Canyon. Univ. of Ill. Press, Urbana.
- Hoffmeister, D. F. and F. E. Durham. 1971. Mammals of the Arizona Strip including Grand Canyon National Monument. Tech. Series No. 11, Museum of Northern Arizona.
- Householder, B. 1960. The buffalo in House Rock Valley and on



- the Raymond Ranch Preserve owned by the state. *Arizona Wildlife-Sportsman*, 31(3):22.
- Howell, A. H. 1938. Revision of the North American ground squirrels with a classification of the North American Sciuridae. *North Am. Fauna*, 56:256.
- Hungerford, C. R. 1970. Response of the Kaibab mule deer to management of summer range. *Jour. of Wildlife Management*, 34(4):852-862.
- Jones, S. B. 1929. Porky. *Grand Canyon Nature Notes*, 4(3):19-20.
- Jones, S. B. 1930. Climbing deer. *Grand Canyon Nature Notes*, 4(5):32.
- Keith, J. O. 1956. The Abert squirrel and its relationship to the forests of Arizona. Ms. thesis, Univ. of Ariz., Tucson.
- Keith, J. O. 1965. The Abert squirrel and its dependance upon Ponderosa Pine. *Ecology*, 46(1):150-163.
- Kimball, T. L. 1951. The Kaibab north cooperative deer-live-stock forage relationship study. *Arizona Game and Fish Commission*.
- Knipe, T. 1944. The status of the antelope herds of northern Arizona. *Ariz. Game and Fish Dept.*, p. 40.
- Kraus, P. 1933. An outrage. *Grand Canyon Nature Notes*, 8(8):209-210.
- Lange, K. I. 1960. The jaguar in Arizona. *Trans. Kansas Acad. Sci.*, 63(2):96-101.
- Lauzon, H. R. 1929. Cougars on the South Rim of Grand Canyon. *Grand Canyon Nature Notes*, 4(4):23-24.
- Lowe, C. H. 1964. *Vertebrates of Arizona*. Univ. of Ariz.

- Press, Tucson.
- Luzon, B. A. 1931. A strange combination. Grand Canyon Nature Notes, 5(4):38.
- McHenry, D. E. 1932. Recent notes on the American pronghorn antelope of the Grand Canyon. Grand Canyon Nature Notes, 7(3):29-30.
- McHenry, D. E. 1932. The turning of the tables. Grand Canyon Nature Notes, 7(7):69.
- McHenry, D. E. and E. D. McKee. 1932. Field observations. Grand Canyon Nature Notes, 7(7):75-76.
- McKee, B. H. 1933. Over-abundant chipmunks. Grand Canyon Nature Notes, 8(4):169-171.
- McKee, B. H. 1934. Bucks grow bold. Grand Canyon Nature Notes, 8(11):244-245.
- McKee, B. H. 1934. Some wildlife observations. Grand Canyon Nature Notes, 9(4):304.
- McKee, E. D. 1929. Odds and ends. Grand Canyon Nature Notes, 3(9):6.
- McKee, E. D. 1929. Preliminary checklist of mammals of Grand Canyon. Tech. Bull. Mimeo., 13 pp.
- McKee, E. D. 1930. Geological and wildlife observations. Grand Canyon Nature Notes, 5(1):3-10.
- McKee, E. D. 1931. Pocket mice. Grand Canyon Nature Notes, 5(6):57-58.
- McKee, E. D. 1932. A bitter struggle. Grand Canyon Nature Notes, 7(7):73-75.
- McKee, E. D. 1932. A little-known mammal. Grand Canyon Nature Notes, 7(9):95.

- McKee, E. D. 1933. Diary of early spring. Grand Canyon Nature Notes, 8(1):140.
- McKee, E. D. 1933. Fawn observations. Grand Canyon Nature Notes, 8(5):182-183.
- McKee, E. D. 1933. Are there any bears here? Grand Canyon Nature Notes, 8(8):214-215.
- McKee, E. D. 1934. Status of the desert bighorn in Grand Canyon National Park. Grand Canyon Nature Notes, 9(4):294-300.
- McKee, E. D. 1934. New mammal record for Grand Canyon. Grand Canyon Nature Notes, 9(9):360.
- McKee, E. D. 1941. Distribution of tassel-eared squirrels. Plateau, 14(1):12-20.
- McKee, E. D. no date. Preliminary checklist of mammals, Grand Canyon. National Park Service, Grand Canyon National Park.
- Mann, W. G. and S. B. Locke. 1931. The Kaibab deer: a brief history and recent developments. U.S. Forest Service Mimeo., 70 pp.
- Markley, C. 1931. The badger and its environment. Grand Canyon Nature Notes, 5(3):30-31.
- Markley, C. 1931. Sonora beaver. Grand Canyon Nature Notes, 5(8):78-80.
- Markley, C. R. 1931. The raccoon of Havasupai. Grand Canyon Nature Notes, 5(5):49-50.
- Merriam, C. W. 1928. Cougars not extinct on Kaibab. Grand Canyon Nature Notes, 3(1):3-4.
- Patraw, P. M. 1930. Wild burros of the Grand Canyon. Grand Canyon Nature Notes, 4(7):43-45.

- Patraw, P. M. and E. D. McKee. 1932. Special notes. Grand Canyon Nature Notes, 6(3):69.
- Pearson, T. G. 1925. The deer of the Kaibab. Nat. Mag., 5:158-160.
- Redburn, R. A. 1931. A mother squirrel transports its young. Grand Canyon Nature Notes, 5(8):80-81.
- Redburn, R. A. 1931. An experiment in Grand Canyon with the American pronghorn. Grand Canyon Nature Notes, 6(1):10-13.
- Redburn, R. A. 1932. A Kaibab squirrel family. Grand Canyon Nature Notes, 7(7):66-68.
- Redburn, R. A. 1932. Mountain lion poses for auto caravan. Grand Canyon Nature Notes, 7(8):85-86.
- Redburn, R. A. 1932. Mountain sheep recorded. Grand Canyon Nature Notes, 7(9):94.
- Redburn, R. A. 1933. A coyote trail. Grand Canyon Nature Notes, 7(12):128-129.
- Roosevelt, T. 1913. A cougar hunt on the rim of the Grand Canyon. Outlook, 105(5):259-266.
- Ruffner, G. A. 1973. Effects of fire on montane small mammal communities. Museum of Northern Arizona, Manuscript.
- Russo, J. P. 1956. Desert bighorn sheep in Arizona, a research management study. Arizona Game and Fish Dept., Phoenix, 53 p.
- Russo, J. P. 1964. The Kaibab north deer herd, its history, problems, and management. Ariz. Game and Fish Dept. Wildlife Bull. no. 7.
- Satterwhite, R. 1934. Beaver home in Bright Angel Creek. Grand Canyon Nature Notes, 9(3):283-285.
- Scheffer, T. H. 1931. Habits and economic status of the pocket

- gophers. U.S.D.A. Tech. Bull. no. 224.
- Schellbach, L. 1948. A record of the shrew Sorex nanus, Arizona. Jour. Mammal., 29:295.
- Schellbach, L. P. Kraus, J. Bryan and W. Dowling. 1933. Miscellany. Grand Canyon Nature Notes, 8(8):215-216.
- Scoyen, E. T. 1926. A few pets. Grand Canyon Nature Notes, 1(5):7.
- Scoyen, E. T. 1926. Kaibab deer arrives on South Rim. Grand Canyon Nature Notes, 1(6):5-6.
- Scoyen, E. T. 1927. An experimental job. Grand Canyon Nature Notes, 1(10):1-4.
- Searl, C.C. 1930. Deer antlers. Grand Canyon Nature Notes, 4(12):81.
- Setzer, H. W. 1949. Subspeciation in the kangaroo rat, Dipodomys ordii. Univ. Kansas Publ. Mus. Nat. Hist., (1):473-573.
- Shiras, G, III. 1924. The mule deer of the Kaibab National Game Preserve. Kaibab National Forest files, Unpubl. memorandum.
- Smith, I. 1956. Wildlife residents of the Grand Canyon. Ariz. Days and Ways, p. 32-35.
- Sturdevant, G. E. 1926. American beavers... . Grand Canyon Nature Notes, 1(5):1-4.
- Sturdevant, G. E. 1926. Courtin' time. Grand Canyon Nature Notes, 1(5):5-6.
- Sturdevant, G. E. 1926. Bear? Grand Canyon Nature Notes, 1(8):4-5.
- Sturdevant, G. E. 1927. Conservation. Grand Canyon Nature Notes, 1(9):5.

- Sturdevant, G. E. 1927. Cats and polecats. Grand Canyon Nature Notes, 2(3):1-2.
- Sturdevant, G. E. 1927. Pal. Grand Canyon Nature Notes, 2(3):4.
- Sturdevant, G. E. 1928. Champion barker. Grand Canyon Nature Notes, 2(10):1-2.
- Sturdevant, G. E. 1928. Deer leaps 1,700 feet to death. Grand Canyon Nature Notes, 2(10):4.
- Sturdevant, G. E. 1928. Mountain sheep leads way up trail. Grand Canyon Nature Notes, 2(10):4.
- Sturdevant, G. E. 1929. Beaver at Phantom Ranch. Grand Canyon Nature Notes, 3(8):5-6.
- Sturdevant, Mrs. G. E. 1928. Oswald. Grand Canyon Nature Notes, 3(3):4-5.
- Sturdevant, Mrs. G. E. 1928. Ring-tailed cats. Grand Canyon Nature Notes, 3(5):3-4.
- Swank, W. G. 1958. Mule deer in Arizona chaparral. Ariz. Game and Fish Dept.
- Trefethen, J. B. 1967. The terrible lesson of the Kaibab deer overpopulation. Nat. Wildlife, 5(4)
- Tyler, C. F. 1931. Bats. Grand Canyon Nature Notes, 5(9):84-86.
- United States Forest Service. 1905-1939. Annual grazing reports of forest supervisor, 1905-1939. Unpubl. manuscript.
- Vorhies, C. T. and W. P. Taylor. 1933. The life histories and ecology of jack rabbits in relation to grazing in Arizona. Univ. of Ariz. Tech. Bull. No. 49.
- Vorhies, C. T. and W. P. Taylor. 1940. Life history and ecology of the white-throated wood rat, Neotoma albigula albigula Hartley in relation to grazing in Arizona. Univ. of Ariz.

Tech. Bull. No. 86.

- Well, F. E. 1940. How Arizona's wild herd of bison was preserved. See *Scenic Southwest*, 12(2):1,5.
- Williamson, R. R., G. L. Collins and D. E. McHenry. 1934. Miscellany. *Grand Canyon Nature Notes*, 8(10):237-238.
- Wheeler, 1st. Lieut. G. M. 1878. Report upon United States Geographical Surveys west of the 100th Meridian. Vol. V-Zoology. Washington Govt. Print. Off.
- Wright, G. M. and B. H. Thompson. 1934. Fauna of the national parks of the United States. Fauna Series No. 2, Supt. Documents, Washington.
- Wright, G. M., J. S. Dixon and B. H. Thompson. 1932. Fauna of the national parks of the United States. Fauna Series No. 1, Supt. Documents, Washington.
- Wright, J. T. 1950. Cooperative Kaibab north livestock-deer forage relationship study. Arizona Game and Fish Commission, Wildlife Restoration Division.

ERRATA

- Page 92 Add: Kearney, T. H. and R. H. Peebles, 1964. Arizona  
Flora. Univ. of Calif. Press, Berkeley.
- Page 94 Add: McKee, E. D. 1929. Grand Canyon lichens.  
Grand Canyon Nature Notes, 4(4):27-29.
- Page 96 Add: Mills, L. E. 1929. Mushrooms on the Kaibab.  
Grand Canyon Nature Notes, 4(1):3-4.
- Page 106 Add: Gehlbach, F. R. 1966. Grand Canyon amphibians  
and reptiles; field check list. Grand Canyon  
Nat. Hist. Assoc.



ADDENDA

Page 94 Add: McHenry, D. E. 1932. Sagebrush in Grand Canyon National Park. Grand Canyon Nature Notes, 7(1):6-7.

Page 109 Add: Anonymous. 1929. Odds and ends. Grand Canyon Nature Notes, 4(9):56.

Page 114 Add: McKee, E. D. 1929. Hither and yon. Grand Canyon Nature Notes, 4(2):13-14.

Page 120 Add: Anonymous. 1963. Bighorn sheep. Arizona Big Game Bull. No. 15-28, Ariz. Game and Fish Dept.

Anonymous. 1963. Buffalo. Arizona Big Game Bull. No. 9-58, Ariz. Game and Fish Dept.

Page 125 Add: Lange, A. L. 1956. The occurrence of woodchuck remains in northern Arizona caves. Amer. Jour. Mammal., 37(2):289-291.

Page 126 Add: McKee, E. D. 1931. Notelets. Grand Canyon Nature Notes, 5(6):61.

Page 127 Add: McKee, E. D. 1933. Miscellany. Grand Canyon Nature Notes, 7(2):126-127.

McKee, E. D., C. C. Searl, P. M. Patraw and R. A. Redburn. 1931. Field observations. Grand Canyon Nature Notes, 5(7):69-70.

McKee, E. D., R. A. Redburn and C. Bogert. 1932.  
Field observations. Grand Canyon Nature Notes,  
7(5):54.

Page 129 Add: Sturdevant, G. E. 1926. The common skunk... .  
Grand Canyon Nature Notes, 1(7):1-4.

