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Vascular Plant and Vertebrate Inventory of Organ Pipe Cactus National Monument

Southwest Biological Science Center
Open-File Report 2006-1076
March 2007

U.S. Department of the Interior
U.S. Geological Survey
National Park Service

SONORAN DESERT NETWORK
Inventory and Monitoring Program

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By Cecilia A. Schmidt, Brian F. Powell, and William L. Halvorson

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Suggested Citation

Schmidt, C. A., B. F. Powell, and W. L. Halvorson. 2007. Vascular Plant and Vertebrate Inventory of Organ Pipe Cactus National Monument. USGS Open-File Report 2006-1076. U.S. Geological Survey, Southwest Biological Science Center, Sonoran Desert Research Station, University of Arizona, Tucson, AZ.

Cover photo: Organ Pipe Cactus National Monument. Photograph by Brian Powell.

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Acknowledgements

Thanks to Organ Pipe Cactus NM Superintendent Kathy Billings, Chief of Resources Mary Kralovec and all the staff at Organ Pipe Cactus National Monument for their support of our program. This project resulted from the collaboration of many people at the National Park Service, and was facilitated by the Desert Southwest Cooperative Ecosystem Studies Unit (CESU). Andy Hubbard and Larry Norris (NPS) provided administrative support for the project. Additional administrative support was provided by Cecily Westphal of the School of Natural Resources at the University of Arizona.

This report summarizes numerous research projects over the last 75 years. More recently, a number of people have been instrumental in collecting data in the monument and helping us gather data for this report including: Dennis Casper, Charles Connor, Peter Holm, Ami Pate, Sue Rutman, and Tim Tibbitts. Richard Felger and Sue Rutman have been stalwart keepers and revisers of the plant list and we are grateful for their diligence and years of hard work. Philip Rosen and Charles Lowe deserve much of the credit for the amphibian and reptile list. Debbie Angell, Pamela Anning, and Ryan Reese assisted with data entry and database design for this project. Theresa Mau-Crimmins allowed us to use figures 2.1–2.3. We received helpful reviews of an earlier draft of the report from: Charles Connor, Peter Holm, Andy Hubbard, Mary Kralovec, Larry Laing, Theresa Mau-Crimmons, Larry Norris, Sue Rutman, and Tim Tibbitts. All mistakes or omissions are the responsibility of the authors.

Executive Summary

We summarized inventory and monitoring efforts for plants and vertebrates at Organ Pipe Cactus National Monument (NM) in Arizona. We used data from previous research to compile complete species lists for the monument and to assess inventory completeness.

There have been 1,031 species of plants and vertebrates observed at the monument (Table 1). Most of the species on the list are documented by voucher specimens. There are 59 non-native species established in the monument: one mammal, three birds, and 55 non-native plants. Most non-native plant species were first recorded along roads.

In each taxon-specific chapter, we highlight areas that contribute disproportionately to species richness or that have unique species for the monument. Of particular importance are Quitobaquito Springs and Pond, which are responsible for the monument having one of the highest number of bird species in the Sonoran Desert Network of parks. Quitobaquito also contains the only fish in the monument, the endangered Quitobaquito pupfish *(Cyprinodon eremus)*. Other important resources for the plants and vertebrates include the xeroriparian washes (e.g., Alamo Canyon) and the Ajo Mountains.

Based on the review of past studies, we believe the inventories of vascular plants and vertebrates are nearly complete and that the monument has one of the most complete inventories of any unit in the Sonoran Desert Network.

Table 1. Summary results of vascular plant and vertebrate inventories at Organ Pipe Cactus NM.

Taxonomic group	Number of species recorded	Number of non-native species
Plants	642	55
Amphibians and Reptiles	49	0
Birds	285	3
Fish	1	0
Mammals	54	1
Total	**1,031**	**59**

Chapter 1: Introduction and Overview of Ecological Research and Monitoring at Organ Pipe Cactus National Monument

Project Overview

This report is the most recent attempt to summarize research at Organ Pipe Cactus NM with the goal of producing an up-to-date species list for plants and vertebrates. In contrast to our work in other parks in the Sonoran Desert Network (e.g., Powell et al. 2005a), we relied solely on the field work done by others to produce the species lists for Organ Pipe Cactus NM. Species inventories have both direct and indirect value for management of the monument. Species lists are not only useful in resource interpretation and facilitating visitor appreciation of natural resources, but are also critical for making management decisions. Knowledge of which species are present, particularly sensitive species, and where they occur provides for informed planning and decision-making.

Report Format and Data Organization

This report is intended to be useful for internal planning and outreach, as well as education. We report only common names unless we reference a species that is not listed later in an appendix; in this case we present both common and scientific names. For each taxonomic group we include an appendix of all species that we recorded in the monument (Appendices A–D), and species that were likely present historically or that we suspect are currently present and may be recorded with additional survey effort (except for plants and birds; Appendix E). Species lists are in phylogenetic sequence and include taxonomic order, family, genus, species, subspecies or variety (if applicable) and common name. Scientific and common names used throughout this document are current according to accepted authorities for each taxonomic group: Stebbins (2003) for amphibians and reptiles; American Ornithologist Union (AOU 1998, 2003) for birds; and Baker et al. (2003) for mammals. See Chapter 3 for list of sources used to create the plant list. Units of measurement are presented in accordance with the International System of Units.

Species Conservation Designations

We indicate species conservation designations by the following agencies: U.S. Fish and Wildlife Service (responsible for administering the Endangered Species Act), Bureau of Land Management, U.S. Forest Service (Region 3), Arizona Game and Fish Department, and Partners in Flight (a partnership of dozens of federal, state and local governments, non-governmental organizations, and private industry).

Voucher specimens

Voucher specimens are the most indisputable form of evidence of species occurrence. We searched for existing vouchers from Organ Pipe Cactus NM in records from 34 natural history museums (Table 1.1; see Appendix F for results).

Ecological Research and Monitoring at the Monument

Few natural areas in southern Arizona have received as much ecological research as Organ Pipe Cactus NM. Bennett et al. (1990; and contributors therein) provide an excellent review of research related to cultural and natural resources of the monument and surrounding areas prior to 1981, including abstracts from approximately 250 articles, reports, and notes (the vast majority related to natural resources). We make no attempt to summarize Bennett et al. (1990) and refer the reader there for more information. Yet, much has happened in the intervening years, most importantly with the formation of the Ecological Monitoring Program (EMP).

At the beginning of each taxon-specific chapter, we give a brief introduction to the relevant research and species lists. In this section, we give an overview of fish and invertebrate research and review the ongoing EMP program.

Quitobaquito Pupfish

The Quitobaquito pupfish *(Cyprinodon eremus)* is the only species of fish at the monument and it occurs at only a single site there (Quitobaquito Springs and Pond) in addition to only a few sites

Table 1.1. Museums that were queried (in 1998) for vertebrate voucher specimens with "Arizona" and "Organ Pipe Cactus National Monument" in the collection location. Collections in bold-faced type had specimens from Organ Pipe Cactus NM.

Brigham Young University	North Carolina State Museum of Natural Sciences
California Academy of Science	Oklahoma Museum of Natural History, Norman
Chicago Academy of Sciences	Peabody Museum, Yale University
Cincinnati Museum of Natural History & Science	Saguaro National Park
Cornell Vertebrate Collections, Cornell University	Strecker Museum, Baylor University, Waco
Fort Worth Museum of Science and History	**Texas Cooperative Wildlife Collection**
George Mason University (Fairfax, VA)	**Tulane Museum of Natural History**
Illinois Natural History Survey	**U.S. National Museum**
Marjorie Barrick Museum, University of Nevada-Las Vegas	**University of Arizona**
Michigan State University Museum (East Lansing)	University of Texas, Arlington
Milwaukee Public Museum	**University of Texas, El Paso**
Museum of Comparative Zoology, Harvard University	**University of Illinois, Champaign-Urbana**
Museum of Texas Tech University	**University of Colorado Museum**
Museum of Vertebrate Zoology , University of California, Berkeley	**University of Michigan**
Museum of Life Sciences, Louisiana State University, Shreveport	Walnut Canyon National Monument, Arizona
Museum of Natural History, University of Kansas	Western Archaeological and Conservation Center, Tucson
Natural History Museum of Los Angeles County	Wupatki National Monument, Flagstaff

outside of the monument (see Hendrickson and Romero 1989). Listed as endangered in 1986 under the Endangered Species Act, the Quitobaquito pupfish is one of several species of pupfish that were once found throughout the Gila River drainage, lower Colorado River and Delta, and the Imperial Valley in California (Miller 1990). Most of these populations are now extinct, presumably because of habitat destruction (Pearson and Connor 2000).

Monument personnel monitor population size at Quitobaquito Springs and Pond annually as part of the EMP (NPS 1998a, 1998b, Tibbitts 1999a, Pearson and Connor 2000). The pupfish appears to be doing well at Quitobaquito; in the last 25 years the population has never dipped below 1,800 individuals (Pearson and Connor 2000); it is currently thought to consist of approximately 8,000 to 10,000 individuals (Douglas et al. 2001). Sampling methods used to estimate population sizes are becoming more accurate (Douglas et al. 2001). A concern to the long-term persistence of the Quitobaquito pupfish is the potential introduction of non-native fish and other vertebrates, invertebrates, and plants (Pearson and Connor 2000).

Invertebrates

Similar to plants and vertebrates, invertebrates at the monument have been studied, though an inventory for this group is not complete. Bennett et al. (1990) cites 24 studies or notes about invertebrates from the monument. Many of these (and later) studies have focused on the aquatic invertebrates of Quitobaquito (e.g., Kingsley et al. 1987, Larsen and Olson 1997). Kingsley (1998) provided additional summaries of invertebrate collections and studies and he attempted a monument-wide inventory from 1987 to 1990 and found 1,024 species. Kingsley (1995) recommended not using invertebrates in the EMP program due to the rarity of a majority of the species found.

Ecological Monitoring at the Monument

The designation of the monument as a United Nations Biosphere Reserve in 1976 provided important early initiative to scientists interested in studying the Sonoran Desert. Biosphere reserves are designated because they are thought to represent the most outstanding examples of select ecosystems. It was thought that Organ Pipe Cactus National Monument's isolation and geographic location near the center of the Sonoran Desert provided an

excellent "laboratory" for research and education. One of the first initiatives after the monument's designation as a Biosphere Reserve was the compilation of all known information on the natural and cultural history of the monument. As noted earlier, the report by Bennett et al. (1990) is an invaluable reference for this information prior to 1981.

In 1986, monument staff gathered regional experts to help create the first inventory and monitoring program in the region. Modeled after the Channel Islands' Inventory & Monitoring Initiative, the monument's Sensitive Ecosystems Program (SEP) was designed to determine: (1) the condition of the monument's ecosystems, (2) alternatives available for ecosystem management, and (3) the effectiveness of implemented action programs. Originally titled the "Sensitive Habitats Projects" (in 1984), the SEP program included a broad range of natural resource studies at the monument, specifically baseline inventories to include plants, songbirds, and nocturnal rodents (Bennett and Kunzman 1987). The program was expanded in 1991 to implement some of the recommended long-term monitoring protocols (Table 1.2). Finally, in 1994, the title of the program changed to the Ecological Monitoring Program (EMP) to "reflect a change from the historic focus on 'sensitive' monument areas to a broader look at the ecosystem's many components" (NBS 1995). Prior to the initiation of the NPS Inventory and Monitoring Program (NPS 1992; of which the Sonoran Desert Network is one program), the Organ Pipe Cactus NM EMP was one of the most extensive ecological research and inventory and monitoring programs in the National Park Service. Because of early interest in the monument by ecologists, the monument had fairly complete species lists of plants and vertebrates, well ahead of other park units in southern Arizona.

According to Rowlands (1999), data from the EMP has guided management of natural resources at the monument by providing basic biological inventories and distribution data for species of concern (e.g., buffelgrass and the cactus ferruginous pygmy-owl). He suggested that the data provide a comprehensive summary of the monument's importance in maintaining biodiversity and ecological function in the Sonoran Desert. Further, the program has been recognized as an

Table 1.2. Components of the Organ Pipe Cactus National Monument Ecological Monitoring Program (EMP). Although a component of the EMP, natural history studies are observational and are used to describe ecosystem components and are useful for interpretation. Table from Hubbard et al. (2003).

		Type of study		
Category	Component	Monitoring	Inventory	Natural history
Physical environment	Atmospheric deposition	X		
	Water quality	X		
	Air quality-visibility	X		
	Climate (precipitation, humidity, temperature)	X		
	Well depths	X		
Vertebrates	Nectar-feeding *(Leptonycteris)* bats	X		
	All other bats		X	X
	Birds	X	X	X
	Lizards	X		X
	Quitobaquito desert pupfish	X		X
	Nocturnal rodents	X		X
Vascular plants	Acuña cactus		X	X
	Organ pipe cactus growth rates		X	X
	Senita cactus growth rates		X	X
	Gearstem cactus flowering phenology		X	X
	Desert caper		X	X
	Grazing recovery		X	X
	Vegetation structure and diversity		X	X
Human impacts	Surrounding land use trends		X	

important early effort in comprehensive ecological monitoring in the Sonoran Desert and as a valuable "prototype" program from which others may learn. Unfortunately, the program has experienced many of the pitfalls that are common among ecological monitoring programs (Noon 2003). Hubbard et al. (2003) identified those problems as: (1) lack of clear parameter identification and objectives, (2) unclear reason for choosing indicators, (3) problems with the spatial sampling design, and (4) lack of comprehensive data analyses. We believe that the program needs a thorough review (based on comprehensive data analysis), which is essential for the long-term efficacy of the program (e.g., McEachern 2000).

Despite some of the program's challenges, it remains the longest-running ecological monitoring program in the region for most of the parameters being measured. Therefore, it has value for detecting trends in these parameters, and for informing other monitoring programs in the region. In particular, it will be valuable for informing monitoring decisions for the Sonoran Desert Network Inventory and Monitoring Program. In addition, park personnel are resuming annual reporting of their findings which was suspended in 1996 (Peter Holm, *pers. comm.*).

Endangered Species Monitoring

The monument has an active monitoring program for four endangered species. The Quitobaquito pupfish is restricted to Quitobaquito Springs and pond. The southern (lesser) long-nosed bat forages throughout the monument where saguaro and organ pipe cactus are present, and the largest known maternity roost in the U.S. is within the monument. The cactus ferruginous pygmy-owl occurs in relatively dense and diverse Sonoran Desertscrub associations, chiefly in the eastern and northern portions of the monument. The Sonoran pronghorn occurs primarily west of Highway 85. The monument carries out monitoring and management of these species in cooperation with the U.S. Fish and Wildlife Service, Arizona Game and Fish Department, and others.

Chapter 2: Monument Overview

Monument Area and History

Organ Pipe Cactus National Monument (NM) is located near the heart of the Sonoran Desert in southwestern Arizona, adjacent to Mexico (Fig. 2.1). At 133,830 ha, it is the largest park unit in the Sonoran Desert Network (Fig. 2.2). The monument was established in 1937 to preserve the largest portion of desert in the United States with the park's namesake, the organ pipe cactus. The monument was designated as a United States Biosphere Reserve in 1976 by the United Nations Educational, Scientific and Cultural Organization (UNESCO). This designation signifies that the monument contains an outstanding, internationally significant ecosystem. The UNESCO designation prompted the NPS to interpret the management objectives for the monument as preserving the monument as a "representative example of the natural and cultural resources of the Sonoran Desert" and "to serve as a natural laboratory for understanding and managing Sonoran Desert ecosystems" (NPS 1994a). Current annual visitation to the monument is approximately 270,000 (NPS 2005).

Although large in size, the monument is dwarfed by the major land management units surrounding it: Cabeza Prieta National Wildlife Refuge to the west and north, the Tohono O'odham Indian Reservation to the east, and Bureau of Land Management land to the north (Fig. 2.3). In Mexico, El Pinacate y Gran Desierto de Altar (also a designated UNESCO Biosphere Reserve) borders the monument.

Archaeological evidence suggests that humans occupied the monument as far back as 12,000 years ago (Rankin 1991). Quitobaquito Springs has been an active site for settlement in recent history, and it was an important source of water for Spanish explorers and migrants attempting to cross the Sonoran Desert (Bennett and Kunzman 1989). Today, there are a number of sites at the monument that are sacred to the Tohono O'odham. Livestock grazing was the livelihood for a number of families who lived in the area, but was discontinued in 1976 (NPS 1997). Prior to the creation of the monument there were numerous active mining claims.

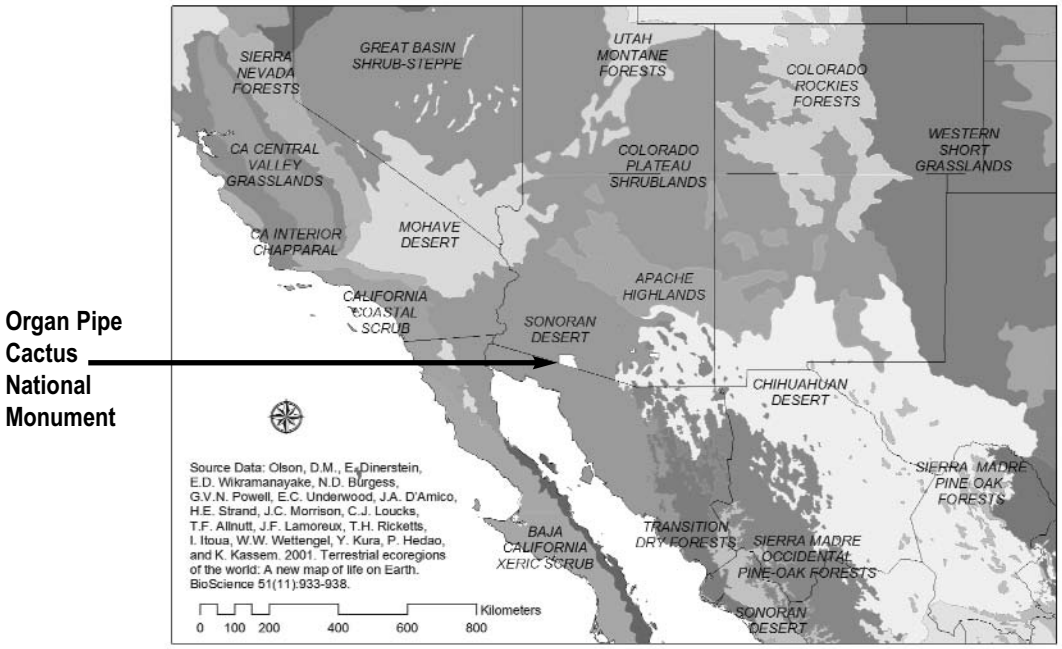

Figure 2.1. Diagram of major ecological provinces of the southwestern United States and northwestern Mexico.

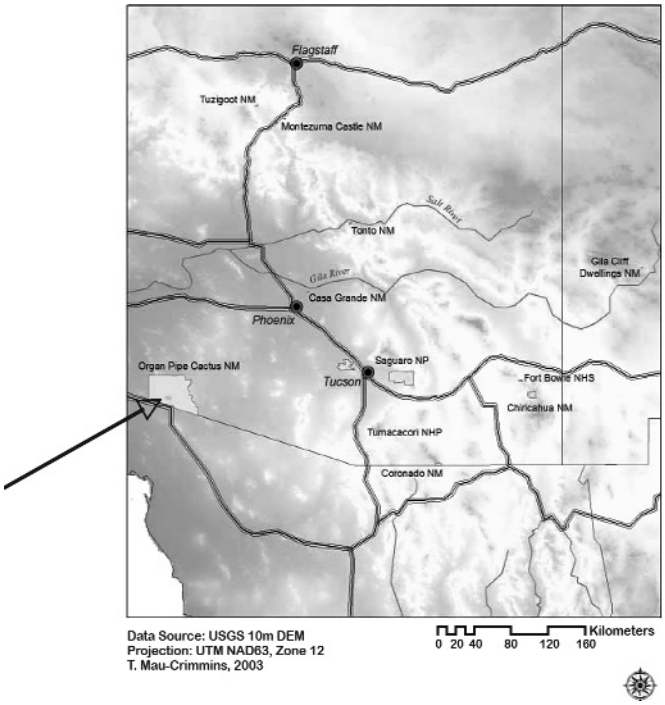

Figure 2.2. Location of Organ Pipe Cactus NM in relation to other parks in the Sonoran Desert Network of parks.

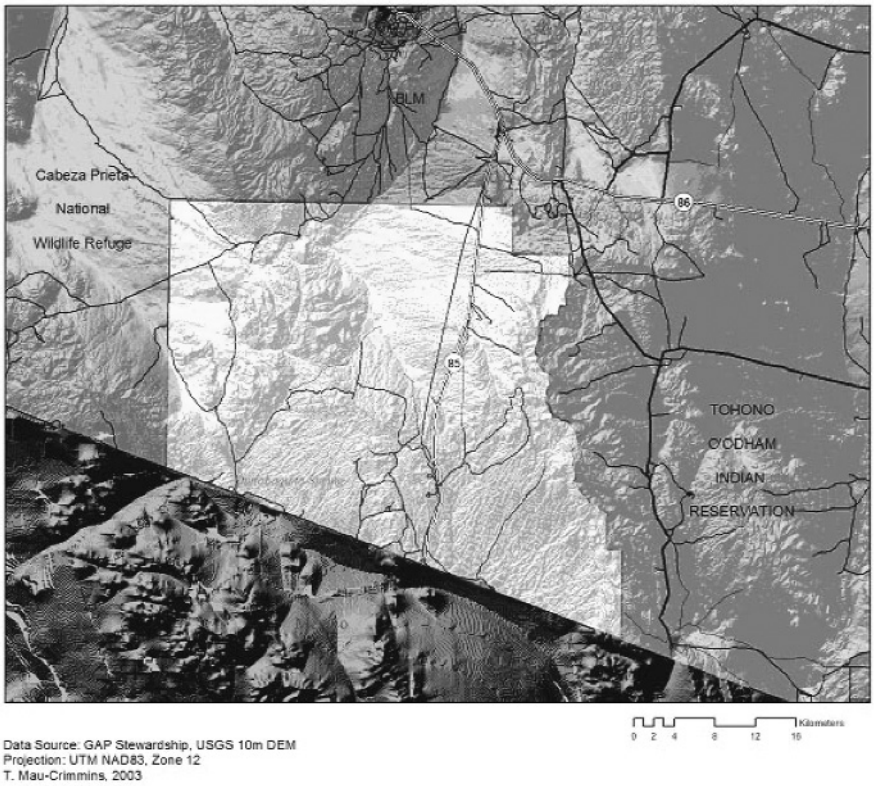

Figure 2.3. Map of Organ Pipe Cactus NM showing topography and neighboring land ownership.

Table 2.1. Average monthly climate data for Organ Pipe Cactus National Monument, 1948–2004. (Data from WRCC 2005).

Characteristic	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Maximum temperature (°C)	20.2	22.3	24.9	29.1	33.3	38.1	39.6	38.8	36.9	31.6	24.8	20.4	30.0
Minimum temperature (°C)	3.8	5.1	6.8	9.7	13.6	18.2	23.2	22.6	19.5	13.4	7.2	3.9	12.2
Precipitation (cm)	2.1	1.8	2.1	0.7	0.3	0.3	3.5	4.9	2.4	1.9	1.5	2.9	2.0

Natural Resources Overview

Physiography, Geology and Soils

Organ Pipe Cactus NM is located in the Basin and Range Geologic Province and its topography varies from deep alluvial valleys to steep, rugged mountain ranges. Elevation at the monument is as low as 305 m and extends to 1,465 m at the eastern boundary of the monument in the Ajo Mountains, the monument's most prominent geologic feature. Geology of the mountains is the result of volcanic flows during the Cretaceous, Tertiary, and Plio-Pleistocene periods. The valleys of the monument are formed of alluvial material originating in the mountains and transported down via streams and sheet-flows (Warren et al. 1981). Soils at the monument are all considered aridosols (for a complete soil survey, see Chamberlin 1972).

Hydrology

There are no perennial rivers or streams within the monument, though there are 11 springs, four with perennial flow. The most prominent spring, Quitobaquito, feeds a large human-made pond, the second largest natural oasis in the Sonoran Desert. Quitobaquito Spring has been the subject of considerable cultural and natural resource research, the latter being reviewed in Chapter 1. Two of the other perennial springs and five of the intermittent springs occur near the Quitobaquito area. The other perennially flowing spring (Dripping Spring) is located in the Puerto Blanco Mountains. There are 60 tinajas (natural depressions in bedrock that hold water) throughout the monument and they are the most widespread source of seasonal water.

Climate

Organ Pipe Cactus NM experiences an annual bimodal pattern of precipitation which is characterized by heavy summer (monsoon) storms brought about by moisture coming from the Gulfs of Mexico and California, and less intense frontal systems coming from the Pacific Ocean in the winter. On average, approximately one-half of the annual precipitation falls from July through September (Table 2.1; WRCC 2005). The area's hot season occurs from May through September; maximum temperatures in July can exceed 40°C. Winter temperatures rarely dip below freezing. The average annual precipitation total for the monument is 24.3 cm (Table 2.1).

Vegetation

According to Warren et al. (1981), the monument has six plant communities (i.e., biomes):

- Great Basin conifer woodland containing oneseed juniper–Arizona rosewood mixed shrub association;
- Madrean evergreen forest and woodland containing Ajo Mountain scrub oak–mixed shrub association;
- Sonoran riparian woodland containing honey mesquite riparian woodland association;
- Interior chaparral containing rock gooseberry–common hoptree mixed scrub association;
- Sonoran desertscrub containing 23 associations dominated by creosote bush, burrobush, ragweed, ocotillo, palo verde, jojoba, ironwood, acacia, organ pipe cactus, and salt bush;
- Sonoran interior marshland containing southern cattail–chairmaker's bulrush association and inland saltgrass–rush association.

Natural Resource Management Issues

Border Crossings

Ten years ago, the trespass of drug smugglers and undocumented immigrants (border crossers) across the U.S./Mexico border was not considered an important natural resource management issue (NPS 1994a). Today, this issue is one of the greater

challenges to the ecological integrity of the monument. It is estimated that 500 border crossers enter the U.S. through the monument each day and approximately 700,000 pounds of drugs are brought through the monument each year (NPS 2003a). Border crossers can pose a serious threat to visitors, employees, and personal property at the monument. They also create a network of trails, leave trash, and destroy soils and vegetation. Finally, there is concern that excessive use of the major springs and water sources has led to water contamination (Sprouse et al. 2002). Park personnel are currently mapping trails and monitoring trash deposition by undocumented immigrants (NPS 2003a).

The movement of illegal vehicles crossing into the monument and subsequent border patrol vehicle pursuits has caused severe damage to fragile desert resources. Responding to this threat, the NPS constructed a vehicle barrier across most of the monument's border with Mexico (NPS 2003b). The barrier will likely prevent some animal movement, but the anticipated drop in off-road vehicle traffic and associated impacts are thought to generally improve soil stability and habitat for plants and animals (NPS 2003b).

Adjacent Land Use

There is intensive agricultural development and urbanization associated with the neighboring town of Sonoyta, Mexico (Brown 1991). Sonoyta's population is currently about 20,000 and is expected to increase. In the late 1980s, groundwater for irrigating crops in the Sonoyta Valley was being pumped out of the aquifer at 2.5 times the rate of recharge (Barnett and Sharrow 1992). The aquifer used for irrigation near Sonoyta appears to be shared by the southern portion of the monument (but not Quitobaquito Springs; Carruth 1996), and the subsequent lowering of the water table poses a potential threat to the monument's natural resources. In recent years, this issue may have been less severe because of a reduction of agriculture in the area (Ami Pate, *pers. comm.* to Andy Hubbard). There is also concern about the overexploitation of ironwood trees (for cooking fuel, charcoal, and wood carving) along the Mexican boundary and how this collecting impacts the populations within the monument (Suzan et al. 1997, 1999).

Vertebrate Mortality along Arizona Highway Route 85

Arizona Highway Route 85 runs north/south and dissects the monument (Fig. 2.3). Roads are a common source of vertebrate mortality (Rosen and Lowe 1994); they act as barriers to the dispersal of small mammals, thereby creating subpopulations (Oxley et al. 1974, Adams and Geis 1983); deter, disturb and alter movement patterns of songbirds and medium and large mammals (Forman and Alexander 1998, Trombulak and Frissell 2000); and pollute soil and water via runoff. Roads may also attract many vertebrates, ultimately leading to them being killed by vehicles. Herbaceous plant species thriving along roadsides from runoff attract granivorus birds and small mammals (Oxley et al 1974, Adams and Geis 1983, Forman and Alexander 1998, Trombulak and Frissell 2000) and road surfaces provide warmth to ectothermic reptiles and amphibians (Rosen and Lowe 1994, Rosen and Lowe 1996).

Animal Poaching and Collection

Organ Pipe Cactus NM has several species of plants and vertebrates that are of interest to illegal collectors and poachers. Many plants, such as some cacti, are of value for landscaping purposes and many woody plant species are scavenged by border crossers for fire and shelter (NPS 2003a). According to a study by Rosen and Lowe (1996) many species of reptiles, such as the rosy boa, Gila monster, chuckwalla, sidewinder, tiger rattlesnake, and desert tortoise found in the monument are collected for personal collections or for the pet trade. Rosen and Lowe (1996) found signs of illegal collecting at Alamo Canyon and Eagle Pass in the monument.

Aircraft Noise

Low-flying military aircraft from Luke and Davis Monthan Air Force Bases, law enforcement aircraft from the U.S. Border Patrol, and private aircraft often pass over the monument (NPS 1994b). Both vibrations and noise generated by these aircraft affect the natural quiet of the monument and may also affect wildlife in the area (NPS 1994b). Aircraft overflights can produce changes in the physiology and behavior of some wildlife species (Luz and Smith 1976, Weisenberger et al. 1996).

Chapter 3: Plants

The monument's flora is the most complete of any large natural area in the desert southwest and is the result of many studies. The first known species list for the monument was created by McDougall (1945) and was based on his collections and those by A. A. Nichols from 1939 (Rutman 2005). Their list included approximately 300 species. Other early collections were made by Ora Clark, a science teacher in Ajo during the late 1930s and early 1940s. Specimens from these collections still remain at the monument and/or at the University of Arizona Herbarium. There were three subsequent, unpublished floras for the monument (reviewed in Pinkava et al. 1992) but Bowers (1980) produced the first annotated flora. She reported 518 species. Other additions to the flora included: Pinkava et al. (1992; 52 new species) and Felger et al. (1992; species list and ethnobotany at the Quitobaquito area). Principle works on the non-native plants of the monument include Felger (1990) who reviewed plant specimens from four herbaria and his own field observations and Halvorson and Guertin (2003) who provided location information for 17 species of non-native plants. Ruffner and Associates (1995) identified 44 species of plants that were in need of monitoring because of "sensitivity to disturbance" or because they were deemed to be indicators of change.

There have been a number of vegetation studies in the monument. Steenberg and Warren (1977) constructed exclosures at four sites to determine the impacts of grazing on plant community structure and composition. These exclosures were resurveyed by Warren and Anderson (1995). Warren et al. (1981) classified and mapped dominant (perennial) vegetation at the monument. Bowers (1990) reviewed past studies from the region, provided a historical context for vegetation changes, and used repeat photography to illustrate some important changes. Brown and Warren (1986) plotted the location and calculated density of riparian vegetation in and around Quitobaquito Springs and Pond. Parker (1991) established vegetation and environmental relationships at 100 sites throughout the monument. Lowe et al. (1995) designed the vegetation monitoring protocol for the EMP. Finally, Sue Rutman and Richard Felger are writing a book-length annotated flora for the monument (Sue Rutman, *pers. comm.*)

Data Used To Create Plant Species List

The flora for the monument (Appendix A) is based entirely on the list by Rutman (2005). That list is specimen-based and was assembled by compiling a list of specimens in herbaria at the monument, Arizona State University (ASU), and the University of Arizona (UA). All specimens were reviewed by experts, most notably Richard Felger and Sue Rutman. Alva Day verified the gilia (*Gilia* sp.) specimens, Andrew Salywon reviewed difficult species in the Brassicaceae family, and John and Charlotte Reeder verified many of the grass specimens in the monument's herbarium (Sue Rutman, *pers. comm.*). Some specimens were reviewed by Thomas H. Kearney. Excluded from the monument's flora are species that were waifs (their appearance was rare and transitory) and for which no reproducing populations were established.

Unlike the other species lists in this report and other flora created by our program (e.g., Powell et al. 2005b), we do not attempt to compile historical data from sources other than the Rutman (2005) species list. Rutman (2005) primarily used Flora of North America (FNA 1993) as a taxonomic references for her list, but also used W3Tropicos (a web-based resource, MGB no date), USDA (a web-based resource, USDA no date) and other resources.

Results and Discussion

There have been 642 species of plants found at the monument (Appendix A), of which 55 (9%) are non-native. This plant list was the result of dozens of collectors over approximately 75 years and represents one of the most complete floras of the region.

Compared to others in Arizona, the monument's flora is not particularly species rich (Bowers 1980). For example, Powell et al. (2005b; and citations therein) found almost the same number of species (638) at Fort Bowie National

Historic Site in southeastern Arizona, an area <0.5% the size of Organ Pipe Cactus NM. Bowers (1980) provides similar comparisons to other floras in southern Arizona. However, within the monument there are areas of high species richness, most notably Quitobaquito Springs and Pond and the Ajo Mountains. Bowers (1980) found 163 species occur in the Ajo Mountains, which comprise about 10% of the area of the monument. This high species richness is primarily due to topographic relief, soil-texture gradients, and temperature and rainfall (Bowers 1980, Parker 1991). In addition, a number of species reach the western-most limit of their geographic ranges in the Ajo Mountains, including some with distinctly Madrean affinities (Bowers 1980).

The number of non-native plant species recorded in the monument (n = 55, 9% of all species) is low, although slightly higher than Saguaro National Park, Rincon Mountain District (approx. 7%, Powell et al. 2006), which has the lowest percentage of non-native species in the Sonoran Desert Network. Non-native plants are an important management concern because they alter ecosystem function and processes (Naeem et al. 1996, D'Antonio and Vitousek 1992), reduce abundance of native species, and cause potentially permanent changes in diversity and species composition (Bock et al. 1986, D'Antonio and Vitousek 1992, OTA 1993). However, some species have stronger impacts on the ecological community than others. In assessing the potential threat posed by non-native species, it is important to consider the spatial extent of species, particularly those species that have been identified as "invasive" or of management concern. Felger (1990) found 14 species, including red brome and buffelgrass, to be "thoroughly" invasive and an additional 10 species — including smooth barley, crimson fountaingrass, Sahara mustard, and common sowthistle — that have become established on disturbed sites.

Inventory Completeness

The plant inventory for Organ Pipe Cactus NM is considered complete. However, the monument is large and there are undoubtedly established species that have not been found and new species (especially non-native), that will become established.

Chapter 4: Amphibians and Reptiles

There have been a number of studies of amphibians and reptiles at Organ Pipe Cactus NM. Lowe (1990) provided an excellent summary of early herpetofauna studies and collections by Gloyd (1937), Huey (1942), Hensley (1950), and Lowe and Supernaugh (1953). Lowe (1990) also provided a species list based on these and other collections. Gloyd (1937) noted the distribution of reptiles and amphibians in southern Arizona, including parts of the monument. Huey (1942) conducted an inventory of the entire monument, and Hensley (1950) collected specimens incidentally and while driving the monument's roads. Lunsford and Lapidus (1977) created an annotated species list for the monument but John Cross (1977; assistant curator of herpetology collection at the UA) and others (Lowe 1990) have questioned the accuracy of that list. More recently, Rosen and Lowe (1996) conducted an inventory and established a long-term monitoring program. Rosen and Lowe (1995) wrote the monitoring protocol for lizards (summarized in NPS 1998a, 1998b, Connor and Rosen 1996). Rosen and Lowe (1994, 1996) conducted a study on highway mortality of snakes. Lowe and Rosen (1991) and later Rosen and Lowe (1996) created the most up-to-date species list, the latter being the most definitive annotated species list for the monument. Rosen (2000) used data from the EMP and his own data to investigate community patterns for lizards and snakes. From 1995 to 1997, Wirt et al. (1999) conducted a monument-wide survey of desert tortoise. In 2005 Phil Rosen *(unpubl. data)* studied desert tortoise near Highway 85 and Matt Goode *(unpubl. data)* studied tiger rattlesnakes in the Ajo Mountains.

Data Used to Create Herpetofaunal List

We base our amphibian and reptile species list (Appendix B) entirely on the thorough list created by Rosen and Lowe (1996) and museum specimens listed in Appendix F. The list by Rosen and Lowe (1996) was created using many of the previously mentioned lists, studies, and collections, in addition to over 600 field days of their own research. Most of the species on the list are backed by voucher specimens located at the monument and the UA Amphibian and Reptile Collection (Appendix F).

Results and Discussion

There are 49 species of amphibians and reptiles that are known to occur at the monument: five toads, two turtles, 16 lizards, and 26 snakes (Appendix B). There were no non-native species found to breed at the monument.

The high diversity of herpetofauna at the monument is related to its size and variety of biotic communities. Reptiles are well represented at the monument, particularly lizards and snakes. Rosen and Lowe (1996) assert that dominant physical features of the monument's geology and soils separate the lizards and snakes into three communities: (1) rock piles, (2) bajadas, and (3) valley-bottom fills. Two "true" desert species inhabit only rock piles: common chuckwalla and speckled rattlesnake. By contrast, six species (including: desert horned lizard, western shovel-nosed snake, and sidewinder) inhabit the valley-bottom fills (containing fine-textured soils) where the vegetation community is lower Colorado Valley Sonoran Desertscrub. Finally, the bajadas contain some species associated with Arizona Upland Sonoran Desertscrub: tree lizard, regal horned lizard, and Sonoran shovel-nosed snake (Rosen and Lowe 1996). Another important community within the monument is xeroriparian desertscrub along washes, which hosts a number of species such as the western coralsnake and common kingsnake. Rosen and Lowe (1996) noted that washes became particularly important during droughts when species from adjacent areas use the washes more than in times of normal rainfall.

Rosen and Lowe (1995) established lizard transects at 13 sites throughout the monument as part of the EMP. They used distance sampling, a detectability-adjusted method that allows for unbiased estimates of density. Data from this project have been summarized (Connor and Rosen 1996, Rosen 2000) but a more thorough analysis of the data holds great promise to determine population-level changes in the monument.

Rosen and Lowe (1996) created a list of species that they considered threatened because of (1) range-wide or local population decline, (2) potential for poaching, and/or (3) susceptibility to mortality on Arizona Highway Route 85. The list included the desert tortoise (a federal Species of Concern and an Arizona state Wildlife Species of Concern) and tiger rattlesnake, species that are targeted by collectors. Both the rosy boa (a federal Species of Concern and a Sensitive Species according to BLM) and the Sonoran shovel-nosed snake (a Sensitive Species according to the USFS) are also targeted by collectors and are often killed on roadways. The Sonoran mud turtle is probably undergoing a population decline and it is restricted only to Quitobaquito Pond. The canyon spotted whiptail, a federal Species of Concern, has its largest known population in the Ajo Mountains, which are only partially encompassed by the monument. The following species have restricted distributions, isolated populations, population centers off the monument, or are uncommon: Sonoran green toad, longtailed brush lizard, desert horned lizard, black-necked garter snake, southwestern black-headed snake, speckled rattlesnake, Sonoran whipsnake, and western shovel-nosed snake. The one additional species not listed by Rosen and Lowe (1996) that is federally listed as a Species of Concern is the common chuckwalla. Rosen and Lowe (1996) foresaw no immediate threat to this species.

Inventory Completeness

The species list, created by Rosen and Lowe (1996), covers specimens collected from the monument over the last six decades (Appendix B). Although this is most likely a complete list, Rosen and Lowe (1996) believe several additional species are possible in the monument.

If found in the monument, the northern casque-headed frog would be in dry washes and the Great Plains narrow-mouthed toad would be near springs or ephemeral pools (Stebbins 2003). If present, both species would be on the northernmost extent of their range in Arizona (Stebbins 2003).

Two additional species of lizards may be found in the monument: desert night lizard and Madrean alligator lizard. The desert night lizard occurs only in isolated populations in Arizona and is usually associated with yucca, which occurs in the Ajo Mountains. The Madrean alligator lizard is very unlikely, but if found at the monument, it would also be in the Ajo Mountains.

The monument has likely experienced loss of species in the last few decades. Two native species, the Mexican spadefoot *(Spea multiplicata)* and yellow mud turtle *(Kinosternon flavescens)*, were previously documented in the monument but are believed to no longer be present (Rosen and Lowe 1996).

Four non-native species: tiger salamander *(Ambystoma tigrinum)*, American bullfrog *(Rana catesbeiana)*, painted turtle *(Chrysemys picta),* and pond slider *(Trachemys scripta)* have also been documented at the monument but no longer occur there.

Chapter 5: Birds

The bird fauna of the monument has been extensively surveyed over the past century. Mearns (1907) was the first to report on the birds of the monument; he spent a month in 1894 near Sonoyta, Mexico and Quitobaquito Springs. Huey (1942) conducted approximately 90 days of general surveys over the entire monument for all vertebrates, especially mammals and birds. Hensley (1954) recorded bird species and nests around natural permanent water sources and mountain canyons, and conducted line-transect surveys in the intermountain regions of the monument. Hensley (1959) and Phillips and Pulich (1948) studied common nesting birds of the monument. Tallman (1970), an ornithology professor from Northern State College, spent approximately two months netting and observing birds at Quitobaquito and Williams springs. Johnson et al. (1983) studied breeding birds on two plots bordering Quitobaquito Springs. Parker (1986) similarly studied bird community structure, nest-sites, and foraging of common species at one site in the monument, in an area that was dominated by creosote bush and triangle burr ragweed. Halterman et al. (1999) studied the impacts of brown-headed cowbirds on nesting birds at the monument and established eight transects in xeroriparian areas. Volunteers and monument staff conducted Christmas Bird Counts at the monument from 1966 to 1984 (NAS 2005) and two Breeding Bird Survey Routes, which were surveyed irregularly from 1990 to 2003 (Sauer et al. 2005). Benson et al. (2001) reviewed the use of the Mapping Avian Productivity and Survivorship (MAPS) program (mist netting) in Growler Wash and Alamo Canyon in 1997 and 1998. Johnson (1995) designed the bird-monitoring portion of the EMP, but that protocol was abandoned in 1995. In 1997 a new protocol was developed, which was modified a few times up until 1999 (e.g., NPS 1998a, 1998b). The new protocol was used from 1999 to 2004 (Tibbitts 2003). Tibbitts (2003) provides a synthesis of the changes to the bird monitoring protocol since 1995.

Steenbergh and Hoy (1963) created the first species list for the monument; it summarized observations made by researchers and the general public from 1939 to 1963. Subsequent lists included: Cunningham (1969, 1971), Wilt (1976; the first annotated list), and Brown et al. (1985). The most comprehensive annotated list was by Groschupf et al. (1988) and later revised by Tibbitts and Dickson (2005).

Data Used to Create Bird List

The bird list for the monument is based on Groschupf et al. (1988) and Tibbitts and Dickson (2005). We also include summaries by Benson et al. (2001). Taken together, these lists represent one of the most thoroughly documented bird species lists of any in the region. Like the lists for plants and herpetofauna, the bird list is an outstanding example of one built on past efforts with periodic updates.

Results and Discussion

There have been 285 species of birds recorded at the monument (Appendix C). Of these, three are non-native species and 73 require open water and/or marshland (found at Quitobaquito Pond): 21 species of ducks and geese (Anatidae), four species of grebe (Podicipedidae), seven species of heron and egret (Ardeidae), five species of rail (Rallidae), 19 species of "shorebirds" (Charadriidae, Recurvirostridae, and Scolopacidae), nine species of gulls (Laridae), and eight other species.

Based on this list, Organ Pipe Cactus NM has the highest bird diversity of any unit in the Sonoran Desert Network. This diversity results from three main factors. First, the monument has had extensive surveys and observations over the past century, which has enabled the monument to have a near complete species list. The second factor is that many species have their northern-most distribution at the monument (i.e. crested caracara). The third factor determining the diversity of birds at the monument is the variety of biotic communities within the monument itself: from mixed Sonoran desertscrub to the juniper-oak woodland/mixed mountain scrub to marsh and open water. The diversity of major vegetation communities and the variety and gradient of topographic features are major determinants of bird

diversity in the southwest and elsewhere (Rosenberg et al. 1991).

Quitobaquito provides an oasis of open water and marsh in an area otherwise devoid of surface water. This important resource attracts birds requiring open water and also hosts many migrants en route to more northern or southern wintering or summering areas. Several species that use this open water and marsh are federally listed as Endangered or Species of Concern including the wood stork, brown pelican and white-faced ibis. Although extremely rare at the monument, they have been found at Quitobaquito Pond.

Another important resource for birds is the xeroriparian areas along washes such as Alamo Canyon and Growler Wash. Hardy et al. (2004) surveyed ecologically similar areas north of the monument and found that most of the spring passage migrant species preferentially selected dry washes, and many species used them exclusively. Also, many of the species that breed at the monument prefer the xeroriparian washes compared to upland sites, presumably because washes provide cooler microsites and protection from predators (Parker 1986).

Inventory Completeness

The bird list is one of most complete lists of its kind in the region. In the 17 years since the excellent work by Groschupf et al. (1988), only 11 species have been added to the list (Tibbitts and Dickson 2005). This indicates that the bird species list is nearly complete. However, because birds are highly mobile animals, it is difficult to compile a truly complete list of birds, especially for Organ Pipe Cactus NM, which is well known for species that seldom enter the U.S. from Mexico. Also, it is likely that even more birds requiring open water will be found at Quitobaquito Pond because of its proximity to the Gulf of California.

Chapter 6: Mammals

Mearns (1907) was the first collector at the monument. He and others collected vertebrates at Quitobaquito and others areas around Sonoyta, Mexico in 1894. Huey (1942) was the first to report on the mammals from throughout the monument. From the 1930s through the 1950s, a number of researchers collected voucher specimens from the monument (NPS 1994a). Subsequent research was focused on single-species habitat assessment and population estimation: desert bighorn sheep (Coss 1964, Carrico 1969, Douglas 1975), feral burro (Hungerford 1976), white-tailed deer (Henry and Sowls 1980), and western white-throated woodrat (Olsen 1970).

Steenbergh and Warren (1977) quantified vegetation characteristics and trapped small mammals in grazed and ungrazed areas of the monument to establish the effects of livestock grazing. Warren and Anderson (1995) resampled vegetation at these sites, but to our knowledge, the rodent trapping has never been repeated. Other rodent trapping efforts included establishment of trapping grids as part of the EMP program (Petryszyn 1995a; results reported in NPS 1998a, 1998b, and Petterson 1999) and associated programs (Rosen 2000). Petryszyn and Russ (1996) also used data from the EMP program. Trapping currently takes place annually at 16 EMP sites.

Bats are also well surveyed at the monument. Cockrum (1981) trapped bats in 1979 and 1980 and reviewed past information to create a species list of bats for the monument. Petryszyn and Cockrum (1990) trapped at Quitobaquito Pond in 1981 and 1982 and created a species list of other mammals they found there. Petryszyn (1995b) prepared the bat monitoring protocol for the EMP and results were reported in annual reports (NPS 1998a, 1998b and Pate and Petterson 1999). More recently, Petryszyn et al. (1998), Pate et al. (1999), and Tibbitts et al. (2002) have monitored and studied foraging, surface water use and roosting areas of bats at the monument. Tibbitts (1999b) reported on the roost-site investigations of the endangered southern long-nosed bat.

Species lists for the monument were made by Huey (1942) and later by Cockrum (1984 and 1990). The most complete annotated list for the monument was by Cockrum and Petryszyn (1986).

Data Used to Create Mammal List

The list of the monument's mammals (Appendix D) is based on Cockrum and Petryszyn (1986), with additions based on results from the EMP studies and species collected: NPS (1998a, 1998b) and sections in Pate (1999).

Results and Discussion

The current list of mammals for Organ Pipe Cactus NM consists of 54 species: 14 bats, 20 small, terrestrial mammals (principally rodents) and 20 medium to large mammals (Appendix D). Also included in this list is one non-native species, the feral dog. Quitobaquito plays an important role in the high mammal diversity at the monument by providing the largest source of perennial water in the region. Quitobaquito is an important resource for bats that use open water to hunt for insects and is the only site in the monument were the desert shrew is located (Cockrum and Petryszyn 1986). Night blooming cacti are another important resource, including organ pipe cactus, which provide nectar for the endangered southern (lesser) long-nosed bat.

Two large mammals that are found at the monument are uncommon in Arizona: the Sonoran pronghorn and desert bighorn sheep. The pronghorn is believed to be an occasional visitor to the monument and the desert bighorn sheep is found in very small numbers in the Diablo, Puerto Blanco, and Ajo mountains. Both species may occasionally be found at Quitobaquito.

Inventory Completeness and Possible Species

Based on the list of species and the many years of mammal surveys, most of the mammal species that occur at the monument have been recorded. There is one species, the feral burro *(Equus asinus),* that occurred at the monument in the recent past but is no longer present. There are several species that Cockrum and Petryszyn (1986) thought may occur in the monument:

BATS

Mexican long-tongued bat. Found in the very southern part of Arizona and south into Mexico,

these bats prefer higher elevations in oak and pine but may be found in the higher elevations of Alamo Canyon.

Yuma myotis. This bat requires permanent water for insect prey, usually large bodies of water such as the Lower Colorado River. However, this species may be found at Quitobaquito Springs.

Fringed myotis. Usually found from chaparral to pine forests at elevations above 1,524 m (Hoffmeister 1986), this species may occasionally be found at the upper elevations of the Ajo mountains.

Eastern small-footed myotis. This species is usually found in oak and pinyon-juniper habitats, but may be found in the Ajo Mountains.

Eastern red bat. This bat would only be found in the winter at the monument in areas with tall trees.

Southern yellow bat. Similar to the eastern red bat, this species would be found in areas with trees.

Small Mammals

Western and fulvous harvest mouse. Both species are normally associated with grasslands but may be found near Quitobaquito.

Deer mouse. This species would be found near intermittent streambeds or near other riparian areas.

Canyon mouse. Found in rocky canyons, and volcanic areas.

House mouse. This species is associated with humans and will almost certainly be found at the monument in the future, most likely around the housing and administration offices.

Medium to Large Mammals

Black bear. Normally associated with woodlands, this species ranges throughout Arizona and may be found passing through the monument, most likely through the Ajo Mountains.

White-nosed coati. This species occurs in oak woodlands and along riparian areas and is most likely present in the Ajo Mountains.

Hooded skunk. This species is uncommon in southwestern Arizona, but its occurrence is a possibility.

Jaguar and jaguarundi. Both of these species are extremely rare in the region and occur to the south. A jaguar was collected from the Ajo Mountains in the 1910s (Hoffmeister 1986).

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Appendix A. Plant species that have been observed or collected at Organ Pipe Cactus NM based on the list by Rutman (2005). Species in bold-faced type are non-native.

Family	Scientific name	Common name
Acanthaceae	*Anisacanthus thurberi* (Torrey) A. Gray	Thurber's desert honeysuckle
	Carlowrightia arizonica A. Gray	Arizona wrightwort
	Dicliptera resupinata (Vahl) de Jussieu	Arizona foldwing
	Justicia californica (Bentham) D.N. Gibson	beloperone
	Justicia candicans (Nees) L.D. Benson	Arizona water-willow
	Justicia longii Hilsenbeck	longflower tubetongue
	Ruellia nudiflora (Engelmann & A. Gray) Urban	violet wild petunia
Agavaceae	*Agave *ajoenesis* W.C. Hodgson	
	Agave deserti Engelmann ssp. *simplex* Gentry	desert agave
	Agave schottii Engelmann	Schott's century plant
	Yucca baccata Torrey	banana yucca
Aizoaceae	***Mesembryanthemum crystallinum* Linnaeus**	**common iceplant**
	***Mesembryanthemum nodiflorum* Linnaeus**	**slenderleaf iceplant**
	Trianthema portulacastrum Linnaeus	desert horsepurslane
Amaranthaceae	***Amaranthus albus* Linnaeus**	**prostrate pigweed**
	Amaranthus fimbriatus (Torrey) Bentham ex S. Watson	fringed amaranth
	Amaranthus palmeri S. Watson	carelessweed
	Amaranthus x tucsonensis Henrickson	
	Gomphrena sonorae Torrey	Sonoran globe amaranth
	Tidestromia lanuginosa (Nuttall) Standley	woolly tidestromia
Anacardiaceae	*Rhus aromatica* Aiton var. trilobata (Nuttall) A. Gray ex S. Watson	skunkbush sumac
Apiaceae	*Bowlesia incana* Ruiz & Pavon	hoary bowlesia
	Daucus pusillus Michaux	American wild carrot
	Lomatium nevadensis (S. Watson) Coulter & Rose	Nevada biscuitroot
	Spermolepis echinata (Nuttall) Heller	bristly scaleseed
	Yabea microcarpa (Hooker & Arnott) Koso-Poljanski	false carrot
Apocynaceae	*Haplophyton crooksii* L.D. Benson	cockroachplant
Aristolochiaceae	*Aristolochia watsonii* Wooton & Standley	Watson's dutchman's pipe
Asclepiadaceae	*Asclepias linaria* Cavanilles	pineneedle milkweed
	Asclepias nyctaginifolia A. Gray	Mojave milkweed
	Asclepias subulata Decaisne	rush milkweed
	Funastrum cynanchoides (Decaisne) Schlechter ssp. *hartwegii* (Vail) Krings	Hartweg's twinevine
	Matelea cordifolia (A. Gray) Woodson	Sonoran milkvine
	Matelea parvifolia (Torrey) Woodson	spearleaf
	Metastelma arizonicum A. Gray	Arizona swallow-wort
Asteraceae	*Acamptopappus sphaerocephalus* (Harvey & A. Gray) A. Gray	pygmyflower rockjasmine
	Acourtia nana (A. Gray) Reveal & R.M. King	dwarf desertpeony
	Acourtia wrightii (A. Gray) Reveal & R.M. King	brownfoot
	Adenophyllum porophylloides (A. Gray) Strother	San Felipe dogweed
	Ambrosia ambrosioides (Cavanilles) W.W. Payne	ambrosia leaf burr ragweed
	Ambrosia confertiflora de Candolle	weakleaf burr ragweed
	Ambrosia cordifolia (A. Gray) W.W. Payne	Tucson burr ragweed
	Ambrosia deltoidea (Torrey) W.W. Payne	triangle burr ragweed
	Ambrosia dumosa (A. Gray) W.W. Payne	burrobush
	Artemisia *dracunculoides* Pursh	tarragon
	Artemisia ludoviciana Nuttall ssp. *albula* (Wooton) D.D. Keck	white sagebrush
	Baccharis brachyphylla A. Gray	shortleaf baccharis
	Baccharis salicifolia (Ruiz & Pavon) Persoon	mule's fat
	Baccharis sarothroides A. Gray	desertbroom
	Baileya multiradiata Harvey & A. Gray	desert marigold

Family	Scientific name	Common name
Asteraceae	*Baileya pleniradiata* Harvey & A. Gray ex A. Gray	woolly desert marigold
	Bebbia juncea (Bentham) Greene var. *aspera* Greene	sweetbush
	Brickellia californica (Torrey & Gray) A. Gray	California brickellbush
	Brickellia coulteri A. Gray var. *coulteri*	Coulter's brickellbush
	Brickellia frutescens A. Gray	shrubby brickellbush
	Calycoseris wrightii A. Gray	white tackstem
	***Carthamnus tinctorius* Linnaeus**	**distaff thistle**
	***Centaurea melitensis* Linnaeus**	**Maltese star-thistle**
	Chaenactis carphoclinia A. Gray var. *carphoclinia*	pebble pincushion
	Chaenactis stevioides Hooker & Arnot	Steve's dustymaiden
	Cirsium neomexicanum A. Gray	New Mexico thistle
	Conyza canadensis (Linnaeus) Cronquist	Canadian horseweed
	Conyza coulteri A. Gray	Coulter's horseweed
	Eclipta prostrata (Linnaeus) Linnaeus	false daisy
	Encelia farinosa A. Gray var. *farinosa*	goldenhills
	Encelia farinosa x *E frutescens* hybrid	
	Encelia frutescens A. Gray var. *frutescens*	button brittlebush
	Ericameria cuneata (A. Gray) McClatchie var. *spathulata* (A. Gray) H.M. Hall	cliff goldenbush
	Ericameria laricifolia (A. Gray) Shinners	turpentine bush
	Erigeron divergens Torrey & Gray var. *divergens*	spreading fleabane
	Eriophyllum lanosum (A. Gray) A. Gray	white easterbonnets
	Eupatorium pauperculum A. Gray	Santa Rita snakeroot
	Eupatorium solidaginifolium A. Gray	shrubby thoroughwort
	Evax multicaulis de Candolle	spring pygmycudweed
	Filago arizonica A. Gray	Arizona cottonrose
	Filago californica Nuttall	California cottonrose
	Filago depressa A. Gray	dwarf cottonrose
	Gaillardia arizonica A. Gray	Arizona blanketflower
	Geraea canescens Torrey & A. Gray	hairy desertsunflower
	Gnaphalium palustre Nuttall	western marsh cudweed
	Gnaphalium wrightii A. Gray	Wright's cudweed
	Gutierrezia arizonica (A. Gray) M.A. Lane	Arizona snakeweed
	Gutierrezia sarothrae (Pursh) Britton & Rusby	broom snakeweed
	Gymnosperma glutinosum (Sprengel) Lessing	gumhead
	***Helianthus annuus* Linnaeus**	**common sunflower**
	Hymenoclea monogyra Torrey & A. Gray ex A. Gray	singlewhorl burrobrush
	Hymenoclea salsola Torrey & A. Gray ex A. Gray var. *pentalepis* (Rydberg) L.D. Benson	burrobrush
	Hymenothrix wislizenii A. Gray	TransPecos thimblehead
	Isocoma acradenia (Greene) Greene	alkali goldenbush
	***Lactuca serriola* Linnaeus**	**prickly lettuce**
	Machaeranthera asteroides (Torrey) Greene var. *glandulosa* B.L. Turner	New Mexico tansyaster
	Machaeranthera carnosa (A. Gray) G.L. Nesom var. *carnosa*	shrubby alkaliaster
	Machaeranthera coulteri (A. Gray) B.L. Turner & D.B. Horne var. *arida* (B.L. Turner & D.B. Horne) B.L. Turner	arid tansyaster
	Machaeranthera gracilis (Nuttall) Shinners var. *gooddingii* (A. Nelson) B.L. Turner & Hartman	slender goldenweed
	Machaeranthera pinnatifida (Hooker) Shinners ssp. *gooddingii* (A. Nelson) B.L. Turner & Hartman	Goodding's tansyaster
	Machaeranthera tagetina Greene	mesa tansyaster
	Malacothrix fendleri A. Gray	Fendler's desertdandelion
	Malacothrix glabrata (A. Gray ex D.C. Eaton) A. Gray	smooth desertdandelion
	Malacothrix sonorae W.S. Davis & P.H. Raven	Sonoran desertdandelion
	Monoptilon *bellioides* (A. Gray) H.M. Hall	Mojave desertstar

Family	Scientific name	Common name
Asteraceae	*Packera quercetorum* (Greene) C. Jeffrey	Oak Creek ragwort
	Palafoxia arida B.L. Turner & M.I. Morris var. *arida*	desert palafox
	Parthenice mollis A. Gray	annual monsterwort
	Pectis linifolia Linnaeus	romero macho
	Pectis papposa Harvey & A. Gray var. *papposa*	manybristle cinchweed
	Perityle ajoensis T.K. Todsen	Ajo rockdaisy
	Perityle emoryi Torrey	Emory's rockdaisy
	Pleurocoronis laphamioides (Rose) R.M. King & H. Robinson	
	Pluchea odorata (Linnaeus) Cassini var. *odorata*	sweetscent
	Pluchea sericea (Nuttall) Coville	arrowweed
	Porophyllum gracile Bentham	slender poreleaf
	Prenanthella exigua (A. Gray) Rydberg	brightwhite
	Psilostrophe cooperi (A. Gray) Greene	whitestem paperflower
	Rafinesquia californica Nuttall	California plumseed
	Rafinesquia neomexicana A. Gray	New Mexico plumseed
	Senecio flaccidus Lessing var. *monoensis* (Greene) B.L. Turner & T.M. Barkley	Mono ragwort
	Senecio lemmonii A. Gray	Lemmon's ragwort
	Senecio mohavensis A. Gray	Mojave ragwort
	Senecio quercetorum Greene	
	***Sonchus asper* (Linnaeus) Hill**	**spiny sowthistle**
	***Sonchus oleraceus* Linnaeus**	**common sowthistle**
	Stephanomeria exigua Nuttall ssp. exigua	small wirelettuce
	Stephanomeria pauciflora (Torrey) Nelson var. *pauciflora*	brownplume wirelettuce
	Stylocline gnaphalioides Nuttall	mountain neststraw
	Stylocline micropoides A. Gray	woollyhead neststraw
	Thymophylla concinna (A. Gray) Strother	Sonoran pricklyleaf
	Thymophylla pentachaeta (de Candolle) Small var. *belenidium* (de Candolle) Strother	fiveneedle pricklyleaf
	Townsendia annua Beaman	annual Townsend daisy
	Trichoptilium incisum (A. Gray) A. Gray	yellowdome
	Trixis californica Kellogg var. *californica*	American threefold
	Uropappus lindleyi (de Candolle) Nuttall	Lindley's silverpuffs
	Viguiera parishii Greene	Parish's goldeneye
	Zinnia acerosa (de Candolle) A. Gray	desert zinnia
Berberidaceae	*Berberis haematocarpa* Wooton	red barberry
	Berberis harrisoniana Kearney & Peebles	Harrison's barberry
Bignoniaceae	*Chilopsis linearis (*Cavanilles) Sweet ssp. *arcuata* (Fosberg) Henrickson	desert willow
Boraginaceae	*Amsinckia intermedia* Fischer & C.A. Meyer var. *echinata* (A. Gray) Wiggins	common fiddleneck
	Amsinckia tessellata A. Gray	bristly fiddleneck
	Cryptantha angustifolia (Torrey) Greene	Panamint cryptantha
	Cryptantha barbigera (A. Gray) Greene	bearded cryptantha
	Cryptantha maritima (Greene) Greene	Guadalupe cryptantha
	Cryptantha pterocarya (Torrey) Greene var. *cycloptera* (Greene) J.F. Macbride	wingnut cryptantha
	Harpogonella palmeri A Gray	Palmer's grapplinghook
	Heliotropium curassavicum Linnaeus	salt heliotrope
	Lappula occidentalis (S. Watson) Greene	flatspine stickseed
	Pectocarya heterocarpa (I.M. Johnson) I. M. Johnson	chuckwalla combseed
	Pectocarya platycarpa Munz & I.M. Johnston	broadfruit combseed
	Pectocarya recurvata I.M. Johnston	curvenut combseed
	Plagiobothrys arizonicus (A. Gray) Greene	Arizona popcornflower
	Plagiobothrys jonesii A. Gray	Mojave popcornflower
	Tiquilia canescens (de Candolle) A.T. Richardson	woody crinklemat
Brassicaceae	*Boechera perennans* (S. Watson) W.A. Weber	perennial rockcress

Family	Scientific name	Common name
Brassicaceae	***Brassica nigra* (Linnaeus) W.D.J. Koch**	**black mustard**
	***Brassica tournefortii* Gouan**	**Asian mustard**
	Caulanthus lasiophyllus (Hooker & Arnott) Payson	California mustard
	Descurainia pinnata (Walter) Britton	western tansymustard
	Draba cuneifolia Nuttall ex Torrey & A. Gray	wedgeleaf draba
	***Eruca sericea* Bentham**	
	Erysimum capitatum (Douglas ex Hooker) Greene	sanddune wallflower
	Lepidium densiflorum Schrader	common pepperweed
	Lepidium lasiocarpum Nuttall	shaggyfruit pepperweed
	Lepidium thurberi Wooton	Thurber's pepperweed
	Lesquerella tenella A. Nelson	Moapa bladderpod
	Lyrocarpa coulteri Hooker & Harvey var. coulteri	Coulter's lyrepod
	***Rorippa microphylla* (Boenn. ex Reichenb.) Hyl. ex A.& D. Löve**	**onerow yellowcress**
	Schoenocrambe linearifolia (A. Gray) Rollins	slimleaf plainsmustard
	***Sisymbrium irio* Linnaeus**	**London rocket**
	***Sisymbrium orientale* Linnaeus**	**Indian hedgemustard**
	Streptanthella longirostris (S. Watson) Rydberg	longbeak streptanthella
	Streptanthus carinatus A. Gray	lyreleaf jewelflower
	Thelypodium wrightii A. Gray ssp. *wrightii*	Wright's thelypody
	Thysanocarpus curvipes Hooker	sand fringepod
Burseraceae	*Bursera microphylla* A. Gray	elephant tree
Cactaceae	*Carnegia gigantea* (Engelmann) Britton & Rose	saguaro
	Cylindropuntia acanthocarpa (Engelmann & J.M. Bigelow) F.M. Knuth var. *coloradensis* (L.D. Benson) Pinkava	Colorado buckhorn cholla
	Cylindropuntia acanthocarpa (Engelmann & J.M. Bigelow) Knuth var. *major* (Engelmann & J.M. Bigelow) Pinkava	buckhorn cholla
	Cylindropuntia arbuscula (Engelmann) F. M. Knuth	Arizona pencil cholla
	Cylindropuntia bigelovii (Engelmann) F. M. Knuth var. *bigelovii*	teddybear cholla
	Cylindropuntia fulgida (Engelmann) F.M. Knuth var. *fulgida*	jumping cholla
	Cylindropuntia fulgida (Engelmann) F.M. Knuth var. *mamillata* (Schott ex Engelmann) J.M. Coulter	jumping cholla
	Cylindropuntia leptocaulis (de Candolle) F.M. Knuth	Christmas cactus
	Cylindropuntia ramosissima (Engelmann) F.M. Knuth	branched pencil cholla
	Cylindropuntia spinosior (Engelmann) F.M. Knuth	walkingstick cactus
	Cylindropuntia versicolor (Engelmann ex J.M. Coulter) F.M. Knuth	staghorn cholla
	Echinocereus engelmannii (Parry ex Englemann) Lemaire var. *acicularis* L.D. Benson	Engelmann's hedgehog cactus
	Echinocereus nicholii (L.D. Benson) B.D. Parfitt	Nichol's hedgehog cactus
	Echinocereus santaritensis W. Blum & Rutow	Mojave mound cactus
	Echinocereus erectocentrus (J.M. Coulter) Britton & Rose var. *acunensis* (W.T. Marshall) Bravo	redspine fishhook cactus
	Ferocactus cylindraceus (Engelmann) Orcutt	California barrel cactus
	Ferocactus emoryi (Engelmann) Orcutt	Emory's barrel cactus
	Ferocactus wislizeni (Englemann) Britton & Rose	candy barrelcactus
	Grusonia kunzei (Rose) Pinkava	devil's cholla
	Grusonia parishii (Orcutt) Pinkava	matted cholla
	Mammillaria grahamii Engelmann	Graham's nipple cactus
	Mammillaria tetrancistra Engelmann	common fishhook cactus
	Mammillaria thornberi Orcutt	Thornber's nipple cactus
	Opuntia chlorotica Engelmann & J.M. Bigelow	dollarjoint pricklypear
	Opuntia engelmannii Salm-Dyck var. *engelmannii*	cactus apple
	Opuntia engelmannii Salm-Dyck var. *flavispina* (L.D. Benson) Pinkava & Parfitt	cactus apple
	***Opuntia engelmannii* Salm-Dyck var. *linguiformis* (Griffiths) B.D. Parfitt & Pinkava**	**cactus apple**
	Opuntia phaeacantha Englemann	tulip pricklypear

Family	Scientific name	Common name
Cactaceae	*Pachycereus schottii* (Engelmann) D.R. Hunt	senita cactus
	Peniocereus greggii (Engelmann) Britton & Rose var. *transmontanus* (Engelmann) Backeberg	nightblooming cereus
	Peniocereus striatus (Brandegee) F. Buxbaum	gearstem cactus
	Stenocereus thurberi (Engelmann) Buxbaum	organpipe cactus
Campanulaceae	*Nemacladus glanduliferus* Jepson	glandular threadplant
	Triodanis biflora (Ruiz & Pavon) Greene	clasping Venus' looking-glass
Capparaceae	*Capparis atamisquea* Kuntze	vomitbush
	Polanisia dodecandra (Linnaeus) de Candolle ssp. *trachysperma* (Torrey & A. Gray) H.H. Iltis	sandyseed clammyweed
	Wislizenia refracta Engelmann ssp. *refracta*	spectacle fruit
Caryophyllaceae	*Achyronychia cooperi* Torrey & A. Gray	onyxflower
	Cerastium texanum Britton	Texas chickweed
	Herniaria hirsuta Linnaeus var. *cinerea* (de Candolle) Loret & Barrandon	hairy rupturewort
	Loeflingia squarrosa Nuttall	spreading pygmyleaf
	Silene antirrhina Linnaeus	sleepy silene
Chenopodiaceae	*Atriplex canescens* (Pursh) Nuttall var. *canescens*	fourwing saltbush
	Atriplex elegans (Moquin-Tandon) D. Dietrich	wheelscale saltbush
	Atriplex lentiformis (Torrey) S. Watson	big saltbush
	Atriplex linearis S. Watson	thinleaf fourwing saltbush
	Atriplex pacifica A. Nelson	Davidson's saltbush
	Atriplex polycarpa (Torrey) S. Watson	cattle saltbush
	***Chenopodium murale* Linnaeus**	**nettleleaf goosefoot**
	Chenopodium watsonii A. Nelson	Watson's goosefoot
	Monolepis nuttalliana (Schultes) Greene	Nuttall's povertyweed
	Nitrophylla occidentalis (Moquin-Tandon) S. Watson	boraxweed
	***Salsola tragus* Linnaeus**	**prickly Russian thistle**
	Suaeda nigra (Rafinesque) J.F. Macbride	Mojave seablite
Commelinaceae	*Commelina erecta* Linnaeus	whitemouth dayflower
Convulvulaceae	*Cuscuta californica* Hooker & Arnott	chaparral dodder
	Cuscuta salina Engelmann	saltmarsh dodder
	Cuscuta tuberculata Kunth	tubercle dodder
	Cuscuta umbellata Kunth	flatglobe dodder
	Evolvulus alsinoides Linnaeus var. *angustifolia* Torrey	slender dwarf morning-glory
	Ipomoea costellata Torrey	crestrib morning-glory
	Ipomoea cristulata Hallier	Transpecos morning-glory
	Ipomoea hederacea Jacquin	ivyleaf morning-glory
	Jacquemontia pringlei A. Gray	Pringle's clustervine
Crassulaceae	*Crassula connata* (Ruiz & Pavon) Berger	sand pygmyweed
	Dudleya arizonica Rose	*chalk dudleya*
	Graptopetalum rusbyi (Greene) Rose	San Francisco River leatherpetal
Crossosomataceae	*Crossosoma bigelovii* S. Watson	ragged rockflower
Cucurbitaceae	*Brandegea bigelovii* (S. Watson) Cogniaux	desert starvine
	Cucurbita digitata A. Gray	fingerleaf gourd
	Echinopepon wrightii (A. Gray) Watson	wild balsam apple
	Marah gilensis (Greene) Greene	Gila manroot
	Tumamoca macdougalii Rose	Tumamoc globeberry
Cupressaceae	*Juniperus coahuilensis* (Martinez) Gaussen ex R.P. Adams	redberry juniper
Cyperaceae	*Cyperus laevigatus* Linnaeus	smooth flatsedge
	Cyperus mutisii (Kunth) Andersson	Mutis' flatsedge
	Cyperus odoratus Linnaeus	fragrant flatsedge

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Cyperaceae	*Cyperus squarrosus* Linnaeus	bearded flatsedge
	Eleocharis geniculata (Linnaeus) Roemer & Schultes	Canada spikesedge
	Eleocharis rostellata (Torrey) Torrey	beaked spikerush
	Scirpus americanus Persoon	
Ephedraceae	*Ephedra aspera* Engelmann ex S. Watson	rough jointfir
Euphorbiaceae	Acalypha californica Bentham	California copperleaf
	Croton sonorae Torrey	Sonoran croton
	Ditaxis adenophora (A. Gray) Pax & K. Hoffmann	desert silverbush
	Ditaxis lanceolata (Bentham) Pax & K. Hoffmann	narrowleaf silverbush
	Ditaxis neomexicana (Muller Argoviensis) A. Heller	New Mexico silverbush
	Euphorbia abramsiana Wheeler	Abrams' sandmat
	Euphorbia albomarginata Torrey & A. Gray	whitemargin sandmat
	Euphorbia arizonica Engelmann	Arizona sandmat
	Euphorbia capitellata Engelmann	head sandmat
	Euphorbia eriantha Bentham	beetle spurge
	Euphorbia florida Engelmann	Chiricahua Mountain sandmat
	Euphorbia heterophylla Linnaeus	Mexican fireplant
	***Euphorbia hyssopifolia* Linnaeus**	**hyssopleaf sandmat**
	Euphorbia melanadenia Torrey	squaw sandmat
	Euphorbia micromera Boissier	Sonoran sandmat
	Euphorbia pediculifera Engelmann var. *pediculifera*	Carrizo Mountain sandmat
	Euphorbia polycarpa Bentham	smallseed sandmat
	***Euphorbia prostrata* Aiton**	**prostrate sandmat**
	Euphorbia setiloba (Engelmann ex Torrey) Millspaugh	Yuma sandmat
	Jatropha cardiophylla (Torrey) Muller Argoviensis	sangre de cristo
	Jatropha cinerea (Ortega) Muller Argoviensis	Arizona nettlespurge
	Jatropha cuneata Wiggins & Rollins	physicnut
	Sebastiana bilocularis S. Watson	arrow poision plant
	Stillingia linearifolia S. Watson	queen's-root
	Tragia nepetifolia Cavanilles	catnip noseburn
Fabaceae	*Acacia angustissima* (Miller) Kuntze var. *suffrutescens* (Rose) Isely	prairie acacia
	Acacia constricta Bentham	whitethorn acacia
	Acacia greggii A. Gray	catclaw acacia
	Astragalus didymocarpus Hooker & Arnott var. *dispermus* (A. Gray) M.E. Jones	dwarf white milkvetch
	Astragalus lentiginosus var. *australis* Barneby	freckled milkvetch
	Astragalus lentiginosus var. *yuccanus* M.E. Jones	yucca milkvetch
	Astragalus nuttallianus de Candolle var. *imperfectus* (Rydberg) Barneby	turkeypeas
	Astragalus nuttallianus de Candolle var. *austrinus* (Small) R.C. Barneby	smallflowered milkvetch
	Calliandra eriophylla Bentham var. *eriophylla*	fairyduster
	Coursetia microphylla A. Grya	rosary babybonnets
	Dalea mollis Bentham	hairy prairie clover
	Dalea pogonathera A. Gray var. *pogonathera*	bearded prairie clover
	Dalea pringlei A. Gray var. *pringlei*	Pringle's prairie clover
	Desmodium procumbens (Miller) A.S. Hitchcock var. *procumbens*	western trailing ticktrefoil
	Galactia wrightii A. Gray	Wright's milkpea
	Lotus humistratus Greene	foothill deervetch
	Lotus rigidus (Bentham) Greene	shrubby deervetch
	Lotus salsuginosus Greene var. *brevivexillus* Ottley	coastal bird's-foot trefoil
	Lotus strigosus (Nuttall) Greene var. *tomentellus* (Greene) Isely	strigose bird's-foot trefoil
	Lupinus arizonicus (S. Watson) S. Watson	Arizona lupine
	Lupinus concinnus Agardh	scarlet lupine
	Lupinus sparsiflorus Bentham	Mojave lupine

Family	Scientific name	Common name
Fabaceae	*Marina parryi* (Torrey & A. Gray ex A. Gray) Barneby	Parry's false prairie-clover
	***Medicago polymorpha* Linnaeus**	**burclover**
	***Melilotus indicus* (Linnaeus) Allioni**	**annual yellow sweetclover**
	Mimosa distachya Cavanilles var. *laxiflora* (Bentham) Barneby	Arizona mimosa
	Nissolia schottii (Torrey) A. Gray	Schott's yellowhood
	Olneya tesota A. Gray	desert ironwood
	***Parkinsonia aculeata* Linnaeus**	**Jerusalem thorn**
	Parkinsonia florida (Bentham ex A. Gray) S. Watson	blue paloverde
	Parkinsonia microphylla Torrey	yellow paloverde
	Phaseolus acutifolius A. Gray ssp. *acutifolius*	tepary bean
	Phaseolus filiformis Bentham	slimjim bean
	Prosopis glandulosa Torrey var. *torreyana* (L.D. Benson) M.C. Johnston	western honey mesquite
	Prosopis pubescens Bentham	screwbean mesquite
	Prosopis velutina Wooton	velvet mesquite
	Psorothamnus spinosus (A. Gray) Barneby	smoketree
	Rhynchosia senna Gillies ex Hooker & Arnott var. *texana* (Torrey & A. Gray) M.C. Johnston	Texas snoutbean
	Senna covesii (A. Gray) Barneby & Irwin	Coves' cassia
	Tephrosia vicioides Schlechtendal	
	Trifolium wormskioldii Lehmann var. *arizonicum* (Greene) Barneby	spinytooth clover
	Vicia ludoviciana Nuttall var. *ludoviciana*	Louisiana vetch
Fagaceae	*Quercus turbinella* Greene	Sonoran scrub oak
Fouqieriaceae	Fouquieria splendens Engelmann ssp. *splendens*	ocotillo
Gentianaceae	*Centaurium calycosum* (Buckley) Fernald	Arizona centaury
	Eustoma exaltatum (Linnaeus) G. *don forma albiflorum* Benke	catchfly prairie gentian
Geraniaceae	***Erodium cicutarium* (Linnaeus) L'Heritier ex Aiton**	**redstem stork's bill**
	Erodium texanum A. Gray	Texas stork's bill
	Geranium carolinianum Linnaeus	Carolina geranium
Hydrophyllaceae	*Eucrypta chrysanthemifolia* (Bentham) Greene var. *bipinnatifida* (Torrey) Constance	spotted hideseed
	Eucrypta micrantha (Torrey) A. Heller	dainty desert hideseed
	Nama hispidum A. Gray	bristly nama
	Phacelia affinis A. Gray	limestone phacelia
	Phacelia ambigua M.E. Jones	purplestem phacelia
	Phacelia caerulea Green	skyblue phacelia
	Phacelia distans Bentham	distant phacelia
	Phacelia neglecta M.E. Jones	alkali phacelia
	Phacelia pedicellata A. Gray	pedicellate phacelia
	Phacelia ramosissima Douglas ex Lehmann	branching phacelia
	Pholistoma auritum (Lindley) Lilja var. *arizonicum* (M.E. Jones) Constance	Arizona fiestaflower
Iridaceae	*Sisyrinchium demissum* Greene	stiff blue-eyed grass
Juncaceae	*Juncus articus* Willdenow var. *mexicanus* (Willdenow ex Roemer & Schultes) Balslev	Mexican rush
	Juncus bufonius Linnaeus	toad rush
	Juncus cooperi Engelmann	Cooper's rush
Krameriaceae	Krameria erecta Willdenow ex Schultes	littleleaf ratany
	Krameria grayi Rose & Painter	white ratany
Lamiaceae	*Hedeoma nanum* (Torrey) Briquet var. *macrocalyx* W.S. Stewart	dwarf false pennyroyal
	Hyptis emoryi Torrey	desert lavender
	Monardella arizonica Epling	Arizona monardella
	Salazaria mexicana Torrey	Mexican bladdersage
	Salvia columbariae Bentham	chia
	Salvia pinguifolia (Fernald) Wooton & Standley	rock sage
	Teucrium cubense Jacquin ssp. *depressum* (Small) McClintock & Epling	small coastal germander
	Teucrium glandulosum Kellog	common germander

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Liliaceae	*Allium macropetalum* Rydberg	largeflower onion
	Calochortus kennedyi Porter	desert mariposa lily
	Dichelostemma capitatum (Bentham) Wood ssp. *pauciflorum* (Torrey) Keator	bluedicks
	Hesperocallis undulata A. Gray	desert lily
	Zephyranthes longifolia Hemsley	copper zephyrlily
Linaceae	*Linum perenne* Linnaeus ssp. *lewisii* (Pursh) Hulten	prairie flax
Loasaceae	*Eucnide rupestris* (Baillon) H.J. Thomson & W.R. Ernst	rock nettle
	Mentzelia affinis Greene	yellowcomet
	Mentzelia involucrata Watson	whitebract blazingstar
	Mentzelia isolata H.S. Gentry	isolated blazingstar
	Mentzelia multiflora (Nuttall) A. Gray	Adonis blazingstar
	Petalonyx linearis Greene	narrowleaf sandpaper plant
	Petalonyx thurberi Gray var. thurberi	Thurber's sandpaper plant
Malpighiaceae	*Janusia gracilis* A. Gray	slender janusia
Malvaceae	*Abutilon abutiloides* (Jacquin) Garcke ex Britton & Wilson	shrubby indian mallow
	Abutilon incanum (Link) Sweet	pelotazo
	Abutilon malacum S. Watson	yellow Indian mallow
	Abutilon palmeri A. Gray	Palmer's Indian mallow
	Anoda pentaschista A. Gray	field anoda
	Eremalche exilis (A. Gray) Greene	white mallow
	Herrisantia crispa (Linnaeus) Bricicky	bladdermallow
	Hibiscus biseptus S. Watson	Arizona rosemallow
	Hibiscus coulteri Harvey	desert rosemallow
	Hibiscus denudatus Bentham var. *denudatus*	paleface
	Horsfordia alata (S. Watson) A. Gray	pink velvetmallow
	Horsfordia newberryi (S. Watson) A. Gray	Newberry's velvetmallow
	Malva parviflora Linnaeus	cheeseweed mallow
	Malvastrum bicuspidatum (S. Watson) Rose ssp. *bicuspidatum*	shrubby false mallow
	Rhynchosida physocalyx (A. Gray) Fryxell	buffpetal
	Sida abutifolia Miller	spreading fanpetals
	Sphaeralcea ambigua A. Gray ssp. *ambigua*	apricot globemallow
	Sphaeralcea coulteri (S. Watson) A. Gray	Coulter's globemallow
	Sphaeralcea emoryi Torrey	Emory's globemallow
	Sphaeralcea laxa Wooton & Standley	caliche globemallow
Martyniaceae	*Proboscidea altheaefolia* (Bentham) Decaisne	desert unicorn-plant
	Proboscidea parviflora (Wooton) Wooton & Standley ssp. *parviflora*	doubleclaw
Molluginaceae	*Mollugo cerviana* Seringe	threadstem carpetweed
Moraceae	*Ficus carica* Linnaeus	edible fig
	***Morus microphylla* Buckley**	**Texas mulberry**
Najadaceae	*Najas marina* Linnaeus	spiny naiad
Nolinaceae	*Nolina microcarpa* S. Watson	sacahuista
Nyctaginaceae	*Allionia incarnata* Linnaeus	trailing windmills
	***Boerhavia coccinea* Miller**	**scarlet spiderling**
	Boerhavia erecta Linnaeus	erect spiderling
	Boerhavia intermedia Linnaeus	fivewing spiderling
	Boerhavia megaptera Standley	Tucson Mountain spiderling
	Boerhavia pterocarpa S. Watson	Apache Pass spiderling
	Boerhavia spicata Choisy	creeping spiderling
	Boerhavia wrightii A. Gray	largebract spiderling
	Commicarpus scandens (Linnaeus) Standley	climbing wartclub
	Mirabilis laevis (Bentham) Curran var. *villosa* (Kellogg) Spellenberg	wishbone-bush
	Mirabilis multiflora (Torrey) A. Gray	Colorado four o'clock

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Oleaceae	*Foresteria phillyreoides* (Bentham) Torrey	desert olive
	Menodora scabra A. Gray	rough menodora
Onagraceae	*Camissonia boothii* (Douglas) P.H. Raven ssp. *condensatus* (Munz) P.H. Raven	shredding suncup
	Camissonia californica (Torrey & A. Gray) P.H. Raven	California suncup
	Camissonia chamaenerioides (A. Gray) P.H. Raven	longcapsule suncup
	Camissonia claviformis (Torrey & Fremont) P.H. Raven ssp. *aurantiaca* (Watson) Raven	browneyes
	Camissonia claviformis (Torrey & Fremont) P.H. Raven ssp. *peeblesii* (Munz) P.H. Raven	Peebles' browneyes
	Camissonia claviformis (Torrey & Fremont) P.H. Raven ssp. *rubescens* (P.H. Raven) P.H. Raven	browneyes
	Camissonia claviformis (Torrey & Fremont) P.H. Raven ssp. *rubescens* (P.H. Raven) P.H. Raven	browneyes
	Epilobium canum (Greene) P.H. Raven ssp. *latifolium* (Hooker) P.H. Raven	hummingbird trumpet
	Gaura parvifolia Hooker	velvetweed
	Oenothera arizonica (Munz) W.L. Wagner	California evening-primrose
	Oenothera primiveris A. Gray	desert evening-primrose
Orobanchaceae	*Orobanche cooperi* (A. Gray) A. Heller	desert broomrape
	Orobanche fasciculata Nuttall	clustered broomrape
Oxalidaceae	*Oxalis albicans* Kunth	radishroot woodsorrel
Papaveraceae	*Argemone gracilenta* Greene	Sonoran pricklypoppy
	Argemone ochroleuca Sweet	
	Eschscholtzia californica Chamisso ssp. *mexicana* (Greene) C. Clark	California poppy
	Eschscholzia minutiflora S. Watson	pygmy poppy
Phytolaccaceae	*Plantago patagonica* Jacquin	woolly plantain
	Rivina humilis Linnaeus	rougeplant
Plantaginaceae	*Plantago ovata* Forsskal	desert Indianwheat
Plumbaginaceae	*Plumbago zeylanica* Linnaeus	wild leadwort
Poaceae	*Aristida adscensionis* Linnaeus	sixweeks threeawn
	Aristida californica Thurberi var. *glabrata* Vasey	Santa Rita threeawn
	Aristida parishii Hitchcock	Parish's threeawn
	Aristida purpurea Nuttall var. *nealleyi* (Vasey) Allred	blue threeawn
	Aristida purpurea Nuttall var. *purpurea*	purple threeawn
	Aristida ternipes Cavanilles var. *gentilis* (Henrard) Allred	spidergrass
	Aristida ternipes Cavanilles var. *ternipes*	spidergrass
	Avena fatua Linnaeus	wild oat
	Bothriochloa barbinodis (Lagasca) Herter	cane bluestem
	Bouteloua aristidoides (Kunth) Grisebach	needle grama
	Bouteloua barbata (Lagasca) Herter	sixweeks grama
	Bouteloua curtipendula (Michaux) Torrey	sideoats grama
	Bouteloua repens (Humboldt, Bonpland & Kunth) Scribner & Merrill	slender grama
	Bouteloua rothrockii Vasey	Rothrock's grama
	Bouteloua trifida Thurber ex S. Watson	red grama
	Brachiaria arizonica (Scribner & Merrill) S.T. Blake	Arizona signalgrass
	***Bromus carinatus* Hooker & Arnott**	**California brome**
	***Bromus rubens* Linnaeus**	**red brome**
	***Cenchrus echinatus* Linnaeus**	**southern sandbur**
	Chloris virgata Swartz	feather fingergrass
	Cottea pappophoroides Kunth	cotta grass
	Cynodon dactylon* (Linnaeus) Persoon var. *dactylon	**Bermudagrass**
	Dactyloctenium aegyptium* (Linnaeus) *Willdenow	**Egyptian grass**
	Dasyochloa pulchella (Kunth) Willdenow ex Rydberg	low woollygrass
	Digitaria californica (Bentham) Henrard	Arizona cottontop
	Distichlis spicata (Linnaeus) Greene	inland saltgrass
	***Echinochloa colonum* (Linnaeus) Link**	**jungle rice**

Family	Scientific name	Common name
Poaceae	*Elymus elymoides* (Rafinesque) Swezey	squirreltail
	Enneapogon desvauxii P. Beauvois	nineawn pappusgrass
	***Eragrostis cilianensis* (Allioni) Vignolo ex Janchen**	**stinkgrass**
	Eragrostis *lehmanniana* Nees	**Lehmann lovegrass**
	Eragrostis lugens Nees	mourning lovegrass
	Eriochloa acuminata* (J. Presl) Kunth var. *acuminata	**tapertip cupgrass**
	Eriochloa aristata Vasey	bearded cupgrass
	Festuca microstachys Nuttall	plains bristlegrass
	Festuca octoflora Rydberg	sixweeks fescue
	Heteropogon contortus (Linnaeus) P. Beauv ex Roemer & Schultes	tanglehead
	Hilaria belangeri (Steudel) Nash	curly-mesquite
	Hilaria rigida (Thurber) Bentham ex Scribner	big galleta
	***Hordeum murinum* Linnaeus ssp. *glaucum* (Steudel) Tzvelev**	**smooth barley**
	Leptochloa dubia (Kunth) Nees	green sprangletop
	Leptochloa fusca (Linnaeus) Kunth ssp. *uninervia* (J. Presl) N. Snow	Mexican sprangletop
	Leptochloa panicea (Retzius) Ohwi ssp. *brachiata* (Steudel) N. Snow	mucronate sprangeltop
	Lycurus setosus (Nuttall) C. Reeder	bristly wolfstail
	Melica frutescens Scribner	woody melicgrass
	Muhlenbergia appressa C.O. Goodding	Devils Canyon muhly
	Muhlenbergia dumosa Scribner ex Vasey	bamboo muhly
	Muhlenbergia emersleyi Vasey	bullgrass
	Muhlenbergia fragilis Swallen	delicate muhly
	Muhlenbergia microsperma (de Candolle) Trinius	littleseed muhly
	Muhlenbergia porteri Scribner ex Beal	bush muhly
	Muhlenbergia rigens (Bentham) Hitchcock	deergrass
	Muhlenbergia tenuifolia (Kunth) Kunth	slimflower muhly
	Panicum antidotale Retzius	blue panicum
	Panicum hallii Vasey	Hall's panicgrass
	Panicum hirticaule J. Presl var. *hirticaule*	Mexican panicgrass
	***Panicum obtusum* Kunth**	**vine mesquite**
	***Pennisetum ciliare* (Linnaeus) Link**	**buffelgrass**
	***Pennisetum setaceum* (Forsskal) Chiovenda**	**crimson fountaingrass**
	***Phalaris minor* Retzius**	**littleseed canarygrass**
	Phragmites australis (Cavanilles) Trinius ex Steudel	common reed
	Poa annua Linnaeus	annual bluegrass
	Poa bigelovii Vasey & Scribner	Bigelow's bluegrass
	***Polypogon monspeliensis* (Linnaeus) Desfontaines**	**annual rabbitsfoot grass**
	***Polypogon viridis* (Gouan) Breistroffer**	**beardless rabbitsfoot grass**
	***Schismus arabicus* Nees**	**Arabian schismus**
	***Schismus barbatus* (Loefling ex Linnaeus) Thellung**	**common Mediterranean grass**
	Setaria grisebachii E. Fournier	Grisebach's bristlegrass
	Setaria leibmannii E. Fournier	Liebmann's bristlegrass
	Setaria macrostachya Humboldt, Bonpland & Kunth	desert fescue
	***Sorghum halepense* (Linnaeus) Persoon**	**Johnsongrass**
	Sporobolus airoides (Torrey) Torrey	alkali sacaton
	Sporobolus cryptandrus (Torrey) Gray	sand dropseed
	Sporobolus flexuosus (Thurber ex Vasey) Rydberg	mesa dropseed
	Sporobolus pyramidatus (Lamarck) Hitchcock	Madagascar dropseed
	Stipa speciosa Trinius & Ruprecht var. *speciosa*	desert needlegrass
	Trichloris crinita (Lagascea) Parodi	false Rhodes grass
	Tridens eragrostoides (Vasey & Scribner) Nash	lovegrass tridens

Family	Scientific name	Common name
Poaceae	*Tridens muticus* (Torrey) A. Gray var. *muticus*	slim tridens
	***Triticum aestivum* L.**	**common wheat**
Polemoniaceae	*Eriastrum diffusum* (A. Gray) Mason	miniature woollystar
	Eriastrum eremicum (Jepson) H. Mason	desert woollystar
	Gilia flavocincta A Nelson ssp. *australis* (A.D. & V.E. Grant) A.G. Day & V.E. Grant	lesser yellowthroat gilia
	Gilia stellata Heller	star gilia
	Ipomopsis multiflora (Nuttall) V. Grant	manyflowered ipomopsis
	Langloisia setosissima (Torrey & A. Gray) Greene	Great Basin langloisia
	Linanthus aureus (Nuttall) Greene	golden linanthus
	Linanthus bigelovii (A. Gray) Greene	Bigelow's linanthus
	Linanthus demissus (A. Gray) Greene	desertsnow
	Phlox tenuifolia E. Nelson	Santa Catalina Mountain phlox
Polygalaceae	*Polygala macradenia* A. Gray	glandleaf milkwort
	Chorizanthe brevicornu Torrey	brittle spineflower
	Chorizanthe currugata (Torrey) Torrey & A. Gray	wrinkled spineflower
	Chorizanthe rigida (Torrey) Torrey & A. Gray	devil's spineflower
	Eriogonum abertianum Torrey	Abert's buckwheat
	Eriogonum deflexum Torrey	flatcrown buckwheat
	Eriogonum fasciculatum Bentham var. *polifolium* (Bentham) Torrey & A. Gray	Eastern Mojave buckwheat
	Eriogonum inflatum Torrey & Fremont	desert trumpet
	Eriogonum thomasii Torrey	Thomas' buckwheat
	Eriogonum trichopes Torrey	little deserttrumpet
	Eriogonum wrightii Torrey ex Bentham var. *nodosum* (Small) Reveal	bastardsage
	***Polygonum argyrocoleon* Steudel ex Kunze**	**silversheath knotweed**
	Pterostegia drymarioides Fischer & Meyer	woodland pterostegia
	Rumex hymenosepala Torrey	canaigre dock
Portulacaceae	*Calandrinia ciliata* (Ruiz & Pavon) de Candolle	fringed redmaids
	Cistanthe monandra (Nutall) Hershkovitz	common pussypaws
	Claytonia perfoliata (Donn ex Willdenow) ssp. *mexicana* (Rydberg) John M Miller & K.L. Chambers	miner's lettuce
	Phemeranthus aurantiacus (Englemann) Kiger	orange fameflower
	Portulaca halimoides Linnaeus	silkcotton purslane
	***Portulaca oleraceae* Linnaeus**	**little hogweed**
	Portulaca suffrutescens Engelmann	shrubby purslane
	Portulaca umbraticola Kunth ssp. *lanceolata* J.F. Matthews & Ketron	wingpod purslane
	Talinum paniculatum (Jacquin) Gaertner	jewels of Opar
Potamogetonaceae	*Stuckenia pectinatus* (Linnaeus) Borner	sago pondweed
Primulaceae	***Anagallis arvensis* L.**	**scarlet pimpernel**
	Androsace occidentalis Pursh	western rockjasmine
Pteridaceae	*Argyrochosma limitanae* (Maxon) Windham ssp. *limitanae*	southwestern false cloakfern
	Astrolepis cochisensis (Goodding) D.M. Bentham & Windham ssp. *cochisensis*	Cochise scaly cloakfern
	Astrolepis sinuata (Lagasca ex Swartz) D.M. Benham & Windham ssp. *sinuata*	wavy scaly cloakfern
	Bommeria hispida (Kuhn) L. Underwood	copper fern
	Cheilanthes lindheimeri Hooker	fairyswords
	Cheilanthes parryi (D.C. Eaton) Domin	Parry's lipfern
	Cheilanthes villosa Davenport ex Maxon	villous lipfern
	Cheilanthes wrightii Hooker	Wright's lipfern
	Cheilanthes yavapensis T. Reeves ex Windham	graceful lipfern
	Notholaena californica D.C. Eaton ssp. californica	California cloak fern
	Notholaena standleyi Maxon	star cloak fern
	Pellaea truncata Goodding	spiny cliffbrake
	Pentagramma triangularis (Kaulfuss) Yatskievych, Windham & Wollenweber	goldback fern

Family	Scientific name	Common name
Punicaceae	***Punica granatum* Linnaeus**	**pomegranate**
Ranunculaceae	*Anemone tuberosa* Rydberg	tuber anemone
	Clematis drummondii Torrey & A. Gray	Drummond's clematis
	Delphinium scaposum Greene	tall mountain larkspur
	Myosurus cupulatus S. Watson	Arizona mousetail
	Myosurus minimus Linnaeus	tiny mousetail
Resedaceae	*Oligomeris linifolia* (Vahl) Macbride	lineleaf whitepuff
Rhamnaceae	*Ziziphus obtusifolia* (Hooker ex Torrey & Gray) Gray	lotebush
	Condalia globosa I.M. Johnston var. *pubescens* I.M. Johnston	bitter snakewood
	Rhamnus betulifolia Greene	beechleaf frangula
	Rhamnus ilicifolia Kellogg	hollyleaf redberry
Rosaceae	*Vauquelinia californica* (Torrey) Sargent ssp. *sonorensis* W.J. Hess & Henrickson	Sonora rosewood
Rubiaceae	*Galium aparine* L.	stickywilly
	Galium microphyllum A. Gray	bracted bedstraw
	Galium stellatum Kellog var. *eremicum* Hilend & Howell	starry bedstraw
Ruppiaceae	*Ruppia cirrhosa* (Petagna) Grande	spiral ditchgrass
Rutaceae	*Ptelea trifoliata* Linnaeus	common hoptree
Salicaceae	*Populus fremontii* S. Watson ssp. *fremontii*	Fremont cottonwood
	Salix gooddingii C.R. Ball	Goodding's willow
Sapindaceae	*Dodonaea viscosa* Jacquin var. *angustifolia* (Linnaeus f.) Bentham	Florida hopbush
	Sapindus marginatus Willdenow	wingleaf soapberry
Saururaceae	*Anemopsis californica* (Nuttall) Hooker & Arnott	yerba mansa
Saxifragaceae	*Ribes quercetorum* Greene	rock gooseberry
Scrophulariaceae	*Antirrhinum cyathiferum* Bentham	dog's-mouth
	Antirrhinum filipes A. Gray	Filipes snapdragon
	Antirrhinum nuttalianum Bentham ssp. *subsessile* (A. Gray) D. Thompson	Texas toadflax
	Antirrhinum watsonii Vasey & Rose	Watson's snapdragon
	Castilleja exserta (A. Heller) Chuang & Heckard ssp. *exserta*	exserted Indian paintbrush
	Castilleja lanata Gray	Sierra woolly Indian paintbrush
	Keckiella antirrhinoides (Bentham) Straw ssp. *microphylla* (A. Gray) Straw	snapdragon penstemon
	Linaria canadensis (Linnaeus) Dumont de Courset var. *texana* (Scheele) Pennell	lesser snapdragon
	Maurandya antirrhiniflora Humboldt & Bonpland ex Willdenow ssp. *antirrhiniflora*	roving sailor
	Mimulus guttatus de Candolle	seep monkeyflower
	Mimulus rubellus A. Gray	little redstem monkeyflower
	Penstemon parryi A. Gray	Parry's beardtongue
	Penstemon pseudospectabilis M.E. Jones var. *pseudospectabilis*	desert beardtongue
	Stemodia durantifolia (Linnaeus) Swartz	whitewoolly twintip
	Veronica peregrina Linnaeus var. *xalapensis* (Kunth) Pennell	hairy purslane speedwell
Selaginellaceae	*Selaginella arizonica* Maxon	Arizona spikemoss
	Selaginella eremophila Maxon	desert spikemoss
Simaroubaceae	*Castela emoryi* (A. Gray) Moran & Felger	crucifixion thorn
Simmondsiaceae	*Simmondsia chinensis* (Link) C.K. Schneider	jojoba
Solanaceae	***Calibrachoa parviflora* (Jussieu) D'Arcy**	**seaside petunia**
	Capsicum annuum Linnaeus var. *aviculare* (Dierbach) D'Arcy & Eschbaugh	cayenne pepper
	Datura discolor Bernhardi	desert thorn-apple
	Lycium andersonii A. Gray var. *andersonii*	water jacket
	Lycium berlandieri Dunal var. *longistylum* C.L. Hitchcock	Berlandier's wolfberry
	Lycium brevipes Benth	Baja desert-thorn
	Lycium californicum Nuttall ex A. Gray var. *californicum* A. Gray	California desert-thorn
	Lycium exsertum A. Gray	Arizona desert-thorn
	Lycium fremontii A. Gray var. *fremontii*	Fremont's desert-thorn
	Lycium macrodon A. Gray var. *macrodon*	desert wolfberry

Family	Scientific name	Common name
Solanaceae	*Lycium parishii* A. Gray var. *parishii*	Parish's desert-thorn
	Nicotiana clevelandii A. Gray	Cleveland's tobacco
	Nicotiana obtusifolia M. Martens & Galeotti	desert tobacco
	***Physalis acutifolia* (Miers) Sandwith**	**sharpleaf groundcherry**
	Physalis crassifolia Bentham var. *versicolor* (Rydberg) Waterfall	yellow nightshade groundcherry
	Physalis lobata Torrey	Chinese lantern
	***Solanum americanum* Miller**	**American black nightshade**
	Solanum douglasii Dunal	greenspot nightshade
	Solanum hindsianum Bentham	Hinds' nightshade
	Solanum xanti A. Gray	chaparral nightshade
Sterculiaceae	*Ayenia filiformis* S. Watson	TransPecos ayenia
	Ayenia microphylla A. Gray	dense ayenia
Tamaricaceae	***Tamarix aphylla* (Linnaeus) H. Karston**	**Athel tamarisk**
	***Tamarix ramosissima* Ledebour**	**saltcedar**
Typhaceae	*Typha domingensis* Persoon	southern cattail
Ulmaceae	*Celtis pallida* Torrey	spiny hackberry
	Celtis reticulata Torrey	netleaf hackberry
Urticaceae	*Parietaria hespera* Hinton var. hespera	rillita pellitory
Verbenaceae	*Aloysia wrightii* A. Heller ex Abrams	Wright's beebrush
	Glandularia bipinnatifida (Nuttall) Nuttall var. *bipinnatifida*	Dakota mock vervain
	Glandularia gooddingii (Briquet) Solbrig	southwestern mock vervain
	***Lantana camara* Linnaeus**	**lantana**
	Tetraclea coutleri Gray	Coulter's wrinklefruit
	Verbena neomexicana (A. Gray) Small	hillside vervain
	Verbena officinalis Linnaeus ssp. *halei* (Small) S.C. Barber	Texas vervain
Viscaceae	*Phoradendron californicum* Nuttall	mesquite mistletoe
Zanichelliaceae	*Zanichellia palustris* Linnaeus	horned pondweed
Zygophyllaceae	*Fagonia californica* Bentham ssp. *longipes* (Standley) Felger & C.H. Lowe	California fagonbush
	Kallstroemia californica (S. Watson) Vail	California caltrop
	Kallstroemia grandiflora Torrey ex A. Gray	Arizona poppy
	Larrea divaricata Cavanilles ssp. *tridentata* (Sesse & Mocino ex DeCandolle) Felger & Lowe	creosote bush

Appendix B. Amphibian and reptile species recorded at Organ Pipe Cactus NM based on list by Rosen and Lowe (1996) and voucher specimens (Appendix F).

Order	Family	Scientific name	Common name	ESA[a]	BLM[b]	USFS[c]	AZG&F[d]
Anura	Pelobatidae	*Scaphiopus couchii*	Couch's spadefoot				
	Bufonidae	*Bufo alvarius*	Sonoran desert toad				
		Bufo punctatus	red-spotted toad				
		Bufo cognatus	Great Plains toad				
		Bufo retiformis	Sonoran green toad				
Testudines	Kinosternidae	*Kinosternon sonoriense longifemorale*	Sonoran mud turtle	C		X	
	Testudinidae	*Gopherus agassizii*	desert tortoise	SC			X
Squamata	Eublepharidae	*Coleonyx variegates*	western banded gecko				
	Iguanidae	*Dipsosaurus dorsalis*	desert iguana				
		Sauromalus obesus	common chuckwalla	SC	X		
	Crotaphytidae	*Crotaphytus collaris*	eastern collared lizard				
		Gambelia wislizenii	long-nosed leopard lizard				
	Phrynosomatidae	*Callisaurus draconoides*	zebra-tailed lizard				
		Sceloporus magister	desert spiny lizard				
		Sceloporus clarkia	Clark's spiny lizard				
		Uta stansburiana	common side-blotched lizard				
		Urosaurus graciosus	long-tailed brush lizard				
		Urosaurus ornatus	ornate tree lizard				
		Phrynosoma platyrhinos	desert horned lizard				
		Phrynosoma solare	regal horned lizard				
	Teiidae	*Cnemidophorus burti*	canyon spotted whiptail	SC	X	X	
		Cnemidophorus tigris	western whiptail (tiger whiptail)				
	Helodermatidae	*Heloderma suspectum*	Gila monster				
	Leptotyphlopidae	*Leptotyphlops humilis*	western blind snake				
	Boidae	*Charina trivirgata trivirgata*	rosy boa	SC	X		
	Colubridae	*Phyllorhynchus decurtatus*	spotted leaf-nosed snake				
		Phyllorhynchus browni	saddled leaf-nosed snake				
		Masticophis flagellum	coachwhip				
		Masticophis bilineatus	Sonoran whipsnake				
		Salvadora hexalepis	western patch-nosed snake				
		Pituophis catenifer	gopher snake				
		Arizona elegans	glossy snake				
		Lampropeltis getula	common kingsnake				
		Rhinocheilus lecontei	long-nosed snake				
		Thamnophis cyrtopsis	black-necked garter snake				
		Sonora semiannulata	western ground snake				
		Chionactis occipitalus	western shovel-nosed snake				
		Chionactis palarostris	Sonoran shovel-nosed snake			X	
		Chilomeniscus cinctus	variable sandsnake				
		Tantilla hobartsmithi	southwestern black-headed snake				
		Trimorphodon biscutatus	western lyre snake				
		Hypsiglena torquata	night snake				
	Elapidae	*Micruroides euryxanthus*	Sonoran coral snake				

Order	Family	Scientific name	Common name	ESA[a]	BLM[b]	USFS[c]	AZG&F[d]
	Viperidae	*Crotalus atrox*	western diamond-backed rattlesnake				
		Crotalus cerastes	sidewinder				
		Crotalus mitchellii	speckled rattlesnake				
		Crotalus molossus	black-tailed rattlesnake				
		Crotalus tigris	tiger rattlesnake				
		Crotalus scutulatus	Mojave rattlesnake				

[a] "SC" = "Species of Concern"; "C" = "Candidate Species" under the Endangered Species Act (HDMS 2004).

[b] "Sensitive" species; USDA Forest Service (HDMS 2004).

[c] "Sensitive" species; Bureau of Land Management (HDMS 2004).

[d] "Wildlife Species of Concern"; Arizona Game and Fish Department (HDMS 2004).

Appendix C. Bird species recorded at Organ Pipe Cactus NM based on lists by Groschupf et al. (1988; Gros), Tibbitts and Dickson (2005; T&D), and Benson et al. (2001; BE). Species in bold-faced type are non-native. Underlined species are neotropical migrants (Rappole 1995).

Order Family	Scientific name	Common name	Gros	T&D	BE	ESA[a]	BLM[b]	USFS[c]	AZ[d]	APF[e]	USFWS[f]
Anseriformes											
Anatidae	*Chen caerulescens*	snow goose		X							
	Branta canadensis	Canada goose	X								
	Aix sponsa	wood duck	X								
	Anas strepera	gadwall	X								
	Anas americana	American wigeon	X								
	Anas platyrhynchos	mallard	X								
	Anas discors	blue-winged teal	X								
	Anas cyanoptera	cinnamon teal	X								
	Anas clypeata	northern shoveler	X								
	Anas acuta	northern pintail	X								
	Anas crecca	green-winged teal	X								
	Aythya valisineria	canvasback	X								
	Aythya americana	redhead	X								
	Aythya collaris	ring-necked duck	X								
	Aythya affinis	lesser scaup	X								
	Bucephala albeola	bufflehead	X								
	Bucephala clangula	common goldeneye	X								
	Lophodytes cucullatus	hooded merganser	X								
	Mergus merganser	common merganser	X								
	Mergus serrator	red-breasted merganser	X								
	Oxyura jamaicensis	ruddy duck	X								
Galliformes											
Odontophoridae											
Callipepla gambelii		Gambel's quail	X								
Gaviiformes											
Gaviidae	*Gavia immer*	common loon	X								
Podicipediformes											
Podicipedidae	*Tachybaptus dominicus*	least grebe	X								
	Podilymbus podiceps	pied-billed grebe	X								
	Podiceps nigricollis	eared grebe	X								
	Aechmophorus occidentalis	western grebe	X								
Pelecaniformes											
Pelecanidae	*Pelecanus erythrorhynchos*	American white pelican	X								
	Pelecanus occidentalis	brown pelican	X			LE		X			
Phalacrocoracidae											
	Phalacrocorax auritus	double-crested cormorant	X								
Ciconiiformes											
Ardeidae	*Ixobrychus exilis*	least bittern	X						X		
	Ardea herodias	great blue heron	X								
	Ardea alba	great egret	X						X		
	Egretta thula	snowy egret	X						X		
	Bubulcus ibis	cattle egret	X								
	Butorides virescens	green heron	X								
	Nycticorax nycticorax	black-crowned night-heron	X								
Threskiornithidae											
	Plegadis chihi	white-faced Ibis	X			SC		X			
	Platalea ajaja	roseate spoonbill	X								

Order Family	Scientific name	Common name	Gros	T&D	BE	ESA[a]	BLM[b]	USFS[c]	AZ[d]	APF[e]	USFWS[f]
Ciconiiformes											
Ciconiidae	*Mycteria americana*	wood stork	X			LE					
Cathartidae	*Coragyps atratus*	black vulture	X								
	Cathartes aura	turkey vulture	X								
Falconiformes											
Accipitridae	*Pandion haliaetus*	osprey	X						X		
	Elanus leucurus	white-tailed kite	X								
	Circus cyaneus	northern harrier	X								
	Accipiter striatus	sharp-shinned hawk	X					X			
	Accipiter cooperii	Cooper's hawk	X								
	Buteogallus anthracinus	common black-hawk	X					X	X	X	
	Parabuteo unicinctus	Harris's hawk	X								
	Buteo swainsoni	Swainson's hawk	X								
	Buteo albicaudatus	white-tailed hawk	X								
	Buteo albonotatus	zone-tailed hawk	X								
	Buteo jamaicensis	red-tailed hawk	X								
	Buteo regalis	ferruginous hawk	X			SC			X		
	Aquila chrysaetos	golden eagle	X								
Falconidae	*Caracara cheriway*	crested caracara	X						X		
	Falco sparverius	American kestrel	X								
	Falco columbarius	merlin	X								
	Falco peregrinus	peregrine falcon	X			SC			X		X
	Falco mexicanus	prairie falcon	X								
Gruiformes											
Rallidae	*Laterallus jamaicensis*	black rail	X			SC			X		X
	Rallus limicola limicola	Virginia rail	X								
	Porzana carolina	sora	X								
	Gallinula chloropus	common moorhen	X								
	Fulica americana	American coot	X								
Gruidae	*Grus canadensis*	sandhill crane	X								
Charadriiformes											
Charadriidae	*Charadrius semipalmatus*	semipalmated plover	X								
	Charadrius vociferus	killdeer	X								
Recurvirostridae											
	Himantopus mexicanus	black-necked stilt	X								
	Recurvirostra americana	American avocet	X								
Scolopacidae	*Tringa melanoleuca*	greater yellowlegs	X								
	Tringa flavipes	lesser yellowlegs	X								
	Tringa solitaria	solitary sandpiper	X								
	Catoptrophorus semipalmatus	willet	X								
	Actitis macularia	spotted sandpiper	X								
	Numenius americanus	long-billed curlew	X								
	Calidris mauri	western sandpiper	X								
	Calidris minutilla	least sandpiper	X								
	Calidris bairdii	Baird's sandpiper	X								
	Calidris himantopus	stilt sandpiper	X								
	Limnodromus scolopaceus	long-billed dowitcher	X								
	Gallinago gallinago	common snipe	X								
	Phalaropus tricolor	Wilson's phalarope	X								
	Phalaropus lobatus	red-necked phalarope	X								
	Phalaropus fulicarius	red phalarope	X								

Order / Family	Scientific name	Common name	Gros	T&D	BE	ESA[a]	BLM[b]	USFS[c]	AZ[d]	APF[e]	USFWS[f]
Charadriiformes											
Laridae	*Larus philadelphia*	Bonaparte's gull	X								
	Larus heermanni	Heermann's gull	X								
	Larus delawarensis	ring-billed gull	X								
	Larus californicus	California gull	X								
	Larus argentatus	herring gull	X								
	Sterna hirundo	common tern	X								
	Sterna forsteri	Forster's tern	X								
	Sterna antillarum	least tern	X								
	Chlidonias niger	black tern	X								
Columbiformes											
Columbidae	***Columba livia***	**rock pigeon**	X								
	Patagioenas fasciata	band-tailed pigeon	X								
	Zenaida asiatica	white-winged dove	X								
	Zenaida macroura	mourning dove	X								
	Columbina inca	Inca dove	X								
	Columbina passerina	common ground-dove	X		X						
Cuculiformes											
Cuculidae	*Geococcyx californianus*	greater roadrunner	X								
Strigiformes											
Tytonidae	*Tyto alba*	barn owl	X								
Strigidae	*Megascops kennicottii*	western screech-owl	X								
	Bubo virginianus	great horned owl	X								
	Glaucidium brasilianum cactorum	cactus ferruginous pygmy-owl	X		X	LE			X		
	Athene cunicularia hypugaea	burrowing owl	X			SC	X				
	Micrathene whitneyi	elf owl	X		X						X
	Asio otus	long-eared owl	X								
	Aegolius acadicus	northern saw-whet owl	X								
Caprimulgiformes											
Caprimulgidae	*Chordeiles acutipennis*	lesser nighthawk	X								
	Phalaenoptilus nuttallii	common poorwill	X		X						
	Caprimulgus ridgwayi	buff-collared nightjar			X						
Apodiformes											
Apodidae	*Chaetura vauxi*	Vaux's swift	X								
	Aeronautes saxatalis	white-throated swift	X								
Trochilidae	*Cynanthus latirostris*	broad-billed hummingbird	X								
	Archilochus alexandri	black-chinned hummingbird	X								
	Calypte anna	Anna's hummingbird	X								
	Calypte costae	Costa's hummingbird	X							X	
	Stellula calliope	calliope hummingbird	X								
	Selasphorus platycercus	broad-tailed hummingbird	X								
	Selasphorus rufus	rufous hummingbird	X								
	Selasphorus sasin	Allen's hummingbird	X								
Coraciiformes											
Alcedinidae	*Ceryle alcyon*	belted kingfisher	X						X		
Piciformes											
Picidae	*Melanerpes lewis*	Lewis's woodpecker	X								
	Melanerpes formicivorus	acorn woodpecker	X								
	Melanerpes uropygialis	Gila woodpecker	X		X						X

Order / Family	Scientific name	Common name	Gros	T&D	BE	ESA[a]	BLM[b]	USFS[c]	AZ[d]	APF[e]	USFWS[f]
Piciformes											
Picidae	*Sphyrapicus varius*	yellow-bellied sapsucker	X								
	Sphyrapicus nuchalis	red-naped sapsucker		X							
	Sphyrapicus ruber	red-breasted sapsucker	X								
	Picoides scalaris	ladder-backed woodpecker	X								
	Colaptes auratus	northern flicker	X								
	Colaptes chrysoides	gilded flicker		X	X					X	X
Passeriformes											
Tyrannidae	*Camptostoma imberbe*	northern beardless-tyrannulet		X							
	Contopus cooperi	olive-sided flycatcher	X			SC					
	Contopus sordidulus	western wood-pewee	X								
	Empidonax traillii	willow flycatcher	X		X				X		
	Empidonax hammondii	Hammond's flycatcher	X								
	Empidonax wrightii	gray flycatcher	X								
	Empidonax occidentalis	cordilleran flycatcher		X							
	Sayornis nigricans	black phoebe	X								
	Sayornis phoebe	eastern phoebe	X								
	Sayornis saya	Say's phoebe	X								
	Pyrocephalus rubinus	vermilion flycatcher	X								
	Myiarchus cinerascens	ash-throated flycatcher	X		X						
	Myiarchus nuttingi	Nutting's flycatcher			X						
	Myiarchus tyrannulus	brown-crested flycatcher	X		X						
	Tyrannus melancholicus	tropical kingbird	X						X		
	Tyrannus vociferans	Cassin's kingbird	X								
	Tyrannus crassirostris	thick-billed kingbird	X						X		
	Tyrannus verticalis	western kingbird	X								
	Tyrannus forficatus	scissor-tailed flycatcher	X								
Laniidae	*Lanius ludovicianus*	loggerhead shrike	X			SC		X			
Vireonidae	*Vireo bellii*	Bell's vireo	X		X			X			X
	Vireo vicinior	gray vireo	X								
	Vireo huttoni	Hutton's vireo	X								
	Vireo gilvus	warbling vireo	X								
	Vireo olivaceus	red-eyed vireo	X								
Corvidae	*Cyanocitta stelleri*	Steller's jay	X								
	Aphelocoma californica	western scrub-jay	X								
	Nucifraga columbiana	Clark's nutcracker	X								
	Corvus corax	common raven	X								
Alaudidae	*Eremophila alpestris*	horned lark	X								
Hirundinidae	*Progne subis*	purple martin	X							X	
	Tachycineta bicolor	tree swallow	X								
	Tachycineta thalassina	violet-green swallow	X								
	Stelgidopteryx serripennis	northern rough-winged swallow	X								
	Riparia riparia	bank swallow	X								
	Petrochelidon pyrrhonota	cliff swallow	X								
	Hirundo rustica	barn swallow	X								
Remizidae	*Auriparus flaviceps*	verdin	X		X						
Aegithalidae	*Psaltriparus minimus*	bushtit	X								
Sittidae	*Sitta canadensis*	red-breasted nuthatch	X								
Certhiidae	*Certhia americana*	brown creeper	X								
Troglodytidae	*Campylorhynchus brunneicapillus*	cactus wren	X		X						

Order Family	Scientific name	Common name	Gros	T&D	BE	ESA[a]	BLM[b]	USFS[c]	AZ[d]	APF[e]	USFWS[f]
Passeriformes											
Troglodytidae	*Salpinctes obsoletus*	rock wren	X								
	Catherpes mexicanus	canyon wren	X		X						
	Thryomanes bewickii	Bewick's wren	X								
	Troglodytes aedon	house wren	X								
	Cistothorus palustris	marsh wren	X								
Regulidae	*Regulus satrapa*	golden-crowned kinglet	X								
	Regulus calendula	ruby-crowned kinglet	X								
Sylviidae	*Polioptila caerulea*	blue-gray gnatcatcher	X								
	Polioptila melanura	black-tailed gnatcatcher	X		X						
Turdidae	*Sialia mexicana*	western bluebird	X								
	Sialia currucoides	mountain bluebird	X								
	Myadestes townsendi	Townsend's solitaire	X								
	Catharus ustulatus	Swainson's thrush	X		X						
	Catharus guttatus	hermit thrush	X								
	Turdus migratorius	American robin	X								
	Ixoreus naevius	varied thrush	X								
Mimidae	*Mimus polyglottos*	northern mockingbird	X		X						
	Oreoscoptes montanus	sage thrasher	X								
	Toxostoma rufum	brown thrasher	X								
	Toxostoma bendirei	Bendire's thrasher	X								
	Toxostoma curvirostre	curve-billed thrasher	X		X						
	Toxostoma crissale	crissal thrasher	X		X						X
	Toxostoma lecontei	Le Conte's thrasher	X								
Sturnidae	***Sturnus vulgaris***	**European starling**	X								
Motacillidae	*Anthus rubescens*	American pipit	X								
	Anthus spragueii	Sprague's pipit	X						X		X
Bombycillidae	*Bombycilla cedrorum*	cedar waxwing	X								
Ptilogonatidae	*Phainopepla nitens*	phainopepla	X		X						
Parulidae	*Vermivora chrysoptera*	golden-winged warbler	X								
	Vermivora peregrina	Tennessee warbler	X								
	Vermivora celata	orange-crowned warbler	X								
	Vermivora ruficapilla	Nashville warbler	X								
	Vermivora virginiae	Virginia's warbler	X								
	Vermivora luciae	Lucy's warbler	X		X					X	
	Dendroica petechia	yellow warbler	X								
	Dendroica magnolia	magnolia warbler	X								
	Dendroica caerulescens	black-throated blue warbler	X								
	Dendroica coronata	yellow-rumped warbler	X								
	Dendroica nigrescens	black-throated gray warbler	X								
	Dendroica virens	black-throated green warbler	X								
	Dendroica townsendi	Townsend's warbler	X								
	Dendroica occidentalis	hermit warbler	X								
	Dendroica graciae	Grace's warbler	X								
	Dendroica striata	blackpoll warbler	X								
	Mniotilta varia	black-and-white warbler	X								
	Setophaga ruticilla	American redstart	X						X		
	Seiurus aurocapilla	ovenbird		X							
	Seiurus noveboracensis	northern waterthrush	X								
	Oporornis tolmiei	MacGillivray's warbler	X								

Order Family	Scientific name	Common name	Gros	T&D	BE	ESA[a]	BLM[b]	USFS[c]	AZ[d]	APF[e]	USFWS[f]
Passeriformes											
Parulidae	*Geothlypis trichas*	common yellowthroat	X								
	Wilsonia pusilla	Wilson's warbler	X								
	Myioborus pictus	painted redstart	X								
	Icteria virens	yellow-breasted chat	X		X						
Thraupidae	*Piranga rubra*	summer tanager	X								
	Piranga olivacea	scarlet tanager	X								
	Piranga ludoviciana	western tanager	X		X						
Emberizidae	*Pipilo chlorurus*	green-tailed towhee	X		X						
	Pipilo maculatus	spotted towhee	X								
	Pipilo fuscus	canyon towhee	X		X						
	Pipilo aberti	Abert's towhee	X								
	Aimophila carpalis	rufous-winged sparrow	X							X	X
	Aimophila cassinii	Cassin's sparrow	X								
	Aimophila ruficeps	rufous-crowned sparrow	X		X						
	Spizella passerina	chipping sparrow	X								
	Spizella pallida	clay-colored sparrow	X								
	Spizella breweri	Brewer's sparrow	X								
	Spizella atrogularis	black-chinned sparrow	X								
	Passerculus sandwichensis	savannah sparrow	X								
	Pooecetes gramineus	vesper sparrow	X								
	Melospiza lincolnii	Lincoln's sparrow	X								
	Chondestes grammacus	lark sparrow	X								
	Melospiza georgiana	swamp sparrow	X								
	Amphispiza bilineata	black-throated sparrow	X		X						
	Amphispiza belli	sage sparrow	X								
Emberizidae	*Calamospiza melanocorys*	lark bunting	X								
	Ammodramus savannarum	grasshopper sparrow	X								
	Passerella iliaca	fox sparrow	X								
	Melospiza melodia	song sparrow	X								
	Zonotrichia albicollis	white-throated sparrow	X								
	Zonotrichia leucophrys	white-crowned sparrow	X								
	Zonotrichia atricapilla	golden-crowned sparrow	X								
	Junco hyemalis	dark-eyed junco	X								
Cardinalidae	*Cardinalis cardinalis*	northern cardinal	X		X						
	Cardinalis sinuatus	pyrrhuloxia	X		X						
	Pheucticus ludovicianus	rose-breasted grosbeak	X								
	Pheucticus melanocephalus	black-headed grosbeak	X		X						
	Passerina caerulea	blue grosbeak	X								
	Passerina amoena	lazuli bunting	X								
	Passerina cyanea	indigo bunting	X								
	Passerina versicolor	varied bunting	X		X						
	Passerina ciris	painted bunting	X								
	Spiza americana	dickcissel	X								
Icteridae	*Agelaius phoeniceus*	red-winged blackbird	X								
	Sturnella magna lilianae	eastern meadowlark	X								
	Sturnella neglecta	western meadowlark	X								
	Xanthocephalus xanthocephalus	yellow-headed blackbird	X								
	Euphagus cyanocephalus	Brewer's blackbird	X								

Order Family	Scientific name	Common name	Gros	T&D	BE	ESA[a]	BLM[b]	USFS[c]	AZ[d]	APF[e]	USFWS[f]
Passeriformes											
Icteridae	*Quiscalus mexicanus*	great-tailed grackle	X								
	Molothrus aeneus	bronzed cowbird	X		X						
	Molothrus ater	brown-headed cowbird	X		X						
	Icterus cucullatus	hooded oriole	X		X						
	Icterus bullockii	Bullock's oriole	X		X						
	Icterus parisorum	Scott's oriole	X		X						
Fringillidae	*Carpodacus purpureus*	purple finch	X								
	Carpodacus mexicanus	house finch	X		X						
	Carduelis pinus	pine siskin	X								
	Carduelis psaltria	lesser goldfinch	X		X						
	Carduelis lawrencei	Lawrence's goldfinch	X								
	Carduelis tristis	American goldfinch	X								
	Coccothraustes vespertinus	evening grosbeak	X								
Passeridae	***Passer domesticus***	**house sparrow**	X								

[a] "SC" = "Species of Concern"; "LE" = "Listed as Endangered" under the Endangered Species Act (HDMS 2004).

[b] "Sensitive" species; Bureau of Land Management (HDMS 2004).

[c] "Sensitive" species; USDA Forest Service (HDMS 2004).

[d] "Wildlife Species of Concern"; Arizona Game and Fish Department (HDMS 2004).

[e] "Priority" species; Arizona Partners in Flight (Latta et al. 1999).

[f] "Bird of Conservation concern"; U.S. Fish and Wildlife Service (2002).

Appendix D. Mammal species recorded at Organ Pipe Cactus NM based on list by Cockrum and Petryszyn (1986; C&P), the Organ Pipe Cactus National Monument Ecological Monitoring Program (NPS 1998a and b; EMP), and voucher specimens (Appendix F). Species in bold-faced type is non-native.

Order Family	Scientific name	Common name	ESA[a]	BLM[b]	USFS[c]	AZG&F[d]	App G	C&P	EMP
Insectivora									
Soricidae	*Notiosorex crawfordi*	Crawford's desert shrew					X	X	
Chiroptera									
Phyllostomidae	*Macrotus californicus*	California leaf-nosed bat	SC	X		X	X	X	X
	Choeronycteris mexicana	Mexican long-tongued bat	SC	X		X			X
	Leptonycteris curasoae	Lesser (southern) long-nosed bat	LE		X	X	X	X	X
Vespertilionidae	*Myotis velifer*	cave myotis	SC	X			X	X	X
	Myotis californicus	California myotis					X	X	X
	Pipistrellus hesperus	western pipistrelle					X	X	X
	Eptesicus fuscus	big brown bat					X	X	X
	Lasiurus cinereus	hoary bat					X	X	X
	Corynorhinus townsendii	Townsend's big-eared bat	SC				X	X	X
	Antrozous pallidus	pallid bat					X	X	X
Molossidae	*Tadarida brasiliensis*	Brazilian free-tailed bat						X	X
	Nyctinomops femorosaccus	pocketed free-tailed bat		X			X	X	X
	Eumops perotis	western bonneted bat	SC				X		
	Eumops underwoodi	Underwood's bonneted bat	SC	X			X	X	X
Carnivora									
Procyonidae	*Procyon lotor*	northern raccoon						X	
	Bassariscus astutus	ringtail						X	
Mustelidae	*Taxidea taxus*	American badger					X	X	
Mephitidae	*Spilogale gracilis*	western spotted skunk						X	
	Mephitis mephitis	striped skunk						X	
	Conepatus mesoleucus	white-backed hog-nosed skunk						X	
Canidae	***Canis familiaris***	**feral dog**					X		
	Canis latrans	coyote					X	X	
	Vulpes macrotis	kit fox					X	X	
	Urocyon cinereoargenteus	common gray fox					X	X	
Felidae	*Puma concolor*	mountian lion						X	
	Lynx rufus	bobcat						X	
Rodentia									
Sciuridae	*Spermophilus variegatus*	rock squirrel						X	
	Spermophilus tereticaudus	round-tailed ground squirrel					X	X	
	Ammospermophilus harrisii	Harris' antelope squirrel					X	X	
Geomyidae	*Thomomys bottae*	Botta's pocket gopher					X	X	
Heteromyidae	*Perognathus amplus*	Arizona pocket mouse					X	X	X
	Perognathus longimembris	little pocket mouse					X	X	
	Chaetodipus penicillatus	Sonoran Desert pocket mouse					X	X	X
	Chaetodipus intermedius	rock pocket mouse	SC				X	X	X
	Chaetodipus baileyi	Bailey's pocket mouse					X	X	X
	Dipodomys deserti	desert kangaroo rat					X	X	
Heteromyidae	*Dipodomys spectabilis*	banner-tailed kangaroo rat					X	X	X
	Dipodomys merriami	Merriam's kangaroo rat					X	X	X
Muridae	*Peromyscus eremicus*	cactus mouse	SC		X		X	X	X
	Peromyscus merriami	Merriam's mouse					X	X	
	Peromyscus boylii	brush mouse							
	Onychomys torridus	southern grasshopper mouse						X	X

Order / Family	Scientific name	Common name	ESA[a]	BLM[b]	USFS[c]	AZG&F[d]	App G	C&P	EMP
Rodentia									
Muridae	*Neotoma albigula*	western white-throated woodrat					X	X	X
	Neotoma devia	Arizona woodrat						X	
	Sigmodon arizonae	Arizona cotton rat					X		X
Lagomorpha									
Leporidae	*Lepus alleni*	antelope jackrabbit						X	
	Lepus californicus	black-tailed jackrabbit						X	
	Sylvilagus audubonii	desert cottontail						X	
Artiodactyla									
Bovidae	*Ovis canadensis*	desert bighorn sheep					X	X	
Tayassuidae	*Pecari tajacu*	collared peccary						X	
Cervidae	*Odocoileus hemionus*	mule deer						X	
	Odocoileus virginianus	white-tailed deer						X	
Antilocapridae	*Antilocapra americana sonoriensis*	Sonoran pronghorn	LE					X	

[a] "SC" = "Species of Concern"; "LE" = "Listed as Endangered" under the Endangered Species Act (HDMS 2004).

[b] "Sensitive" species; Bureau of Land Management (HDMS 2004).

[c] "Sensitive" species; USDA Forest Service (HDMS 2004).

[d] "Wildlife Species of Concern"; Arizona Game and Fish Department (HDMS 2004).

Appendix E. Amphibian, reptile, and mammal species that may occur at Organ Pipe Cactus NM based on Rosen and Lowe (1996) and Cockrum and Petryszyn (1986).

Class	Order	Family	Scientific name	Common name
Amphibian	Anura	Hylidae	*Pternohyla fodiens*	northern casque-headed frog
		Microhylidae	*Gastrophryne olivacea*	Great Plains narrow-mouthed toad
Reptile	Squamata	Xantusiidae	*Xantusia vigilis*	desert night lizard
		Anguidae	*Elgaria kingii*	Madrean alligator lizard
Mammal	Chiroptera	Phyllostomidae	*Choeronycteris mexicana*	Mexican long-tongued bat
		Vespertilionidae	*Myotis yumanensis*	Yuma myotis
			Myotis thysanodes	fringed myotis
			Myotis leibii	eastern small-footed myotis
			Lasiurus borealis	eastern red bat
			Lasiurus ega	southern yellow bat
	Carnivora	Ursidae	*Ursus americanus*	American black bear
		Procyonidae	*Nasua narica*	white-nosed coati
		Mephitidae	*Mephitis macroura*	hooded skunk
		Felidae	*Panthera onca*	jaguar
			Herpailurus yaguarondi	jaguarundi
	Rodentia	Muridae	*Reithrodontomys megalotis*	western harvest mouse
			Reithrodontomys fulvescens	fulvous harvest mouse
			Peromyscus maniculatus	deer mouse
			Peromyscus crinitus	canyon mouse
			Mus musculus	house mouse

Appendix F. Known vertebrate voucher specimens from Organ Pipe Cactus NM.

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Amphibian				
Couch's spadefoot	65853–60	UCB	08/25/55	J. D. Anderson
	90702–03	NHMLAC		
	136423	UM	07/28/66	E. D. Brodie
Sonoran desert toad	91679	CAS	09/2/61	R. Bandar. D. Rentz
	8547	INHS	06/22/57	P. W. Smith, D. M. Smith, A. A. Smith
	65850–52	UCB	08/25/55	J. D. Anderson
	87021, 87035	NHMLAC		
	021798	USNM		E. A. Mearns
	10768–69	UA	06/20/64	T. J. Cox
	133459, 136394	UM	07/28/66	E. D. Brodie
red-spotted toad	52164	UCB	08/10/49	J. B. Gorman
	26269–70, 88086–87	NHMLAC		
	13324–27	UTEP		
	12022, 13806–07, 14919, 47945–46, 50619	UA	03/20/52, 10/25/64, 03/31/66, 10/22/87, 09/03/90	C. H. Lowe., W. S. Creighton, W. C. Sherbrooke, R. L. Bezy, P. C. Rosen
Great Plains toad	91680–87, 93807	CAS	09/02/61	R. Bandar, D. Rentz
	8550–51	INHS	06/21/57	P. W. Smith, D. M. Smith, A. A. Smith
	52174–78, 65848–49	UCB	08/10/49, 08/25/55	J. B. Gorman, J. D. Anderson
	42813, 47665–67	UA	06/11/52, 08/09/77	W. H. Woodin, J. K. Cross
	136039	UM	07/28/66	E. D. Brodie
bullfrog	47960	UA	07/10/85	S. Julander
Reptile				
western banded gecko	65696, 80186–87	UCB	08/25/55, 04/19/62, 03/25/64	J. D. Anderson, R. M. Gaffery
	3236, 93440–42, 93445–47	NHMLAC	04/20/42	
	1145, 1155, 1159, 1162, 33797, 47861, 47907–08, 48619, 50733	UA	05/19/56, 04/27/51, 05/14/71, 07/12/88, 05/10/88, 05/11/88, 05/18/89, 08/25/97	K. Justice, D. L. Braun, C. H. Lowe, P. C. Rosen, T. VanDevender
	30277, 73805–07	UI	06/02/52, 05/29/51	D. M. Smith, P. W. Smith, F. A. Shannon, H. K. Gloyd, R. Abbuhl
desert banded gecko *(C. v. variegates)*	5654, 5908, 5912–14	UI	03/29/49, 08/02/48, 08/10/48, 08/08/48	M. M. Hensley, W. L. Berger
Sonoran mud turtle	27987, 27993, 27996	UA	05/14/67, 05/23/65, 04/10/65	R. D. Krizman, T. J. Cox
desert iguana	115554	NHMLAC		
	021728, 061376	USNM	07/4/18	A. B. Howell, E. A. Mearns
	50081	UA		P. C. Rosen
common chuckwalla	39807, 48527	UA	06/4/53, 08/31/89	Woodin, Larson, P. C. Rosen
eastern collared lizard	76641	UCB	07/20/63	R. G. Crippen
	3982–83, 125984	NHMLAC	04/21/42	
	1511, 35715, 39904–05, 47868, 48845–46	UA	08/13/60, 04/14/73, 06/04/53, 04/30/88, 04/07/90	G. O. Gates, A. Cecil, R. Johnson, Woodin, Larson, P. C. Rosen
	5898–99	UI	08/04/48	Hensley, Burger
long-nosed leopard lizard	4016, 94703	NHMLAC	04/24/42	
	50080	UA	06/12/93	R. D. McCord
	5655	UI	05/02/49	D. M. Smith, M. Hensley

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Reptile				
zebra-tailed lizard	62598–00	Har		
	65684	UCB	08/20/55	J. D. Anderson
	8787–89, 94043,	NHMLAC	05/13/66	
	40, 66–67, 111, 137, 10470, 12665–66,28440–41, 37865–67, 40732, 40734, 42605, 47290, 47873–74, 48620, 49077	UA	08/06/49, 05/10/56, 05/20/56, 04/30/55, 10/12/63, 10/25/64, 04/12/68, 08/07/68, 04/27/75, 07/19/77, 06/04/53, 04/30/88, 07/02/89, 05/11/91	P. J. Lardner, R. C. Snyder, C. A. Reed, W. C. Sherbrooke, R. L. Bezy, D. Mulford, R. Small, S.Hale, J. K. Cross, W. H. Woodin, P. C. Rosen, C. H. Lowe, D. A.Parizek, K. E. Justice, R. E.Carpenter
	5943, 35783–86, 35794, 35878, 74520–21	UI	07/30/48, 06/15/54, 08/05/48	D. M. Smith, H. M. Smith, W. L. Burger, M. M. Hensley, W. L. Burger, F. A. Shannon, P. W. Smith, R. Abbuhl
	16953–54, 32311	UC	07/28/60, 07/03/49	H. Beargie, K. Beargie, Wesselman
	5656	UI	07/03/49	M. M. Hensley
desert spiny lizard	8892, 52935	NHMLAC	05/13/66	
	12668, 40706, 42614, 47973, 49142	UA	10/25/64, 06/03/53, 07/18/77, 09/17/88, 04/13/91	W. C. Sherbrooke, R. L. Bezy, Woodin, Larson, J. K. Cross, P. C. Rosen, K. McLarnan
	35802	UI		D. M. Smith, H. M. Smith, W. L. Burger, M. M. Hensley
Clark's spiny lizard	44031	UC	04/01/67	R. L. Brown, R. Holland
	80350, 198288	UCB	07/20/63, 06/24/73	B. K. Sullivan, R. R. Montancci, V. L. Vesterby
	17378	NHMLAC		
	2267, 2272, 12646–47, 12669, 27151, 40702, 47872	UA	06/08/51, 04/30/55, 10/25/64, 10/25/64, 04/14/73, 06/04/53, 04/30/88	C. H. Lowe, D. Mulford, W. C.Sherbrooke, R. L. Bezy, R. J. Johnson, Woodin, Larson, P. C.Rosen
	35804–10	UI	08/4/48	D. M. Smith, H. M. Smith, W. L. Burger, M. M. Hensley
common side-blotched lizard	16586, 76653	UCB	01/30/34, 07/20/63	L. Kellogg, R. G. Cripper
	5526, 98174–75, 98182	NHMLAC	04/24/42	
	27091–92	TMNH	09/07/66	W. B. Rhoten
	6893, 10467–68, 11415, 12580, 12658–61,40738, 41817–18, 48558	UA	05/01/55, 10/12/63, 04/30/56, 04/14/63, 10/25/64, 04/27/75, 06/06/53, 06/11/52, 06/02/89	P. J. Lardner, C. H. Lowe, J. Wright, W. C. Sherbrooke, R. L. Bezy, W. H. Woodin, Larson, P. C. Larson, A. Thomas
	32483–87	UC	06/19/64, 04/06/66	Beargie, Wesselman, N. Hadley
	5657, 5937–39, 77880–81	UI	07/6/49, 07/30/48, 08/05/48, 06/15/54, 05/29/51	M. Hensley, W. L. Burger, D. M. Smith, F. A. Shannon, P. W. Smith, R. Abbuhl, H. K. Gloyd
striped plateau lizard	166477–80	UM	07/12/73	A. E. Dunham
long-tailed brush lizard	49081, 49122	UA	05/11/91, 05/12/91	C. H. Lowe, P. C. Rosen

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Reptile				
ornate tree lizard	NA	FWMSH	04/01/64	
	16587, 56757	UCB	01/29/34, 04/30/52	M. M. Erickson, M. Larson
	76325–27, 97942, 123402	NHMLAC		
	061398	USNM	07/03/18	A. B. Howell
	3420, 3422, 3909, 3911, 3942, 3972, 3993, 4011, 4066, 12649–53, 40717, 40979, 42038–41	UA	10/25/64, 08/13/60, 04/30/55, 03/14/52, 04/17/75, 06/03/53, 06/06/53, 06/11/52	W. C. Sherbrooke, R. L. Bezy, G. O. Gates, A. D. Cecil, D. Mulford, C. H. Lowe, W. S.Creighton, J. J. Reed, M. W. Larson, W. H. Woodin
	50572–76	UC	06/19/64	Beargie, Wesselman
	5915, 5917–22, 35800, 50699–01	UI	07/30/48, 08/04/48, 03/16/61	D. M. Smith, H. M. Smith, W. L. Burger, M. M. Hensley, R. C. Schroeder
	166482–509	UM	07/12/73	A. E. Dunham
desert horned lizard	4406, 101597	NHMLAC		
	2052, 40220, 40575, 47931, 48771, 50082, 50148	UA	04/28/51, 04/27/75, 10/03/87, 03/25/89, 06/12/93, 04/21/93	C. H. Lowe, P. C. Rosen, E. B. Wirt
regal horned lizard	SH.4005–06	MSU	07/20/61, 07/21/61	R. G. Tuck
	101798–850	NHMLAC		
	061381	USNM	07/02/18	A. B. Howell
	40683, 42593, 47437, 47822, 50202	UA	06/10/52, 07/08/77, 09/13/87, 06/18/88, 06/10/93	W. H. Woodin, J. K. Cross, P. C. Rosen, R. D. McCord
canyon spotted whiptail	8586–87	INHS	06/21/57, 07/27/57	P. W. Smith, D. M. Smith, A. A. Smith, M. M. Hensley
	57047–48, 76655, 76779–81	UCB	04/28/51, 06/09/51, 07/20/63	C. H. Lowe, R. C. Stebbins, R. G. Crippen
	75844, 135450–51	NHMLAC		
	530, 5566–68, 5570–74, 5576–80, 14110–11, 43687, 47302–03, 48344	UA	04/28/55, 04/30/55, 06/09/51, 04/28/51, 07/04/51, 05/14/56, 06/24/62, 10/25/64, 10/25/64, 06/11/52, 08/03/89	W. C. Sherbrooke, R. L. Bezy, W. H. Woodin, E. B. Wirt, A. R. Phillips, J. J. Reed, A. Thomas, C. H. Lowe, K. E. Justice
	14627–29, 14635	UC	07/27/60, 07/28/60	H. Beargie, K. Beargie
	104330–31, 105426, 166481	UM	07/18/50, 06/09/51, 06/09/51, 07/12/73	W. E. Duellman, C. H. Lowe
western whiptail (tiger whiptail)	13635–36	CAS1	05/02/54	H. K. Gloyd
	56746	UCB	04/30/52	M. Larson, L. Talbot
	9027–30, 99979–82	NHMLAC	05/13/66	
	151–152, 509–510, 514–516, 5689, 5781, 5786, 5825, 5868,5885, 10469, 12569–79, 28647, 24607, 47821, 48556, 49393	UA	08/06/49, 04/15/51, 04/28/51, 06/08/51, 05/19/56, 05/14/56, 08/13/60, 05/01/55, 10/12/63, 04/14/63, 04/12/68, 07/20/77, 06/17/88, 05/20/89, 04/13/91	P. J. Lardner, J. Wright, R. C. Snyder, C. A. Reed, R. Small, J. K. Cross, P. C. Rosen, R. D. McCord, C. H. Lowe, K. Justice, G. O. Gates, A. D. Cecil, C. D. Belknap, J. J. Reed
	14669–73, 36355, 45468–80, 55517–39	UC	07/28/60, 04/06/66, 05/24/71, 06/04/82, 06/05/82	H. Beargie, K. Beargie, N. Hadley, D. M. Secoy, H. L. Taylor
	43217	UI	06/27/58	D. M. Smith, K. Williams, J. P. Kelley
western skink	35788–90, 35792–93	UI	07/30/48, 08/01/48, 08/04/48	D. M. Smith, H. M. Smith, W. L. Burger, M. M. Hensley
Gila monster	75109, 93895	NHMLAC		
	72056	TCWC	06/18/86	
	47961, 50698, 50729	UA	05/16/87, 09/05/96, 08/25/97	K. Wisner, A. C. Pate, P. C. Rosen
	4976	NHMLAC		

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Reptile				
western blind snake	47815	UA	06/12/88	P. C. Rosen
	5622	UI	07/2/49	D. M. Smith, M. Hensley
rosy boa	39554–55, 47398, 49396-PSV	UA	05/05/62, 11/29/52, 10/21/87, 03/20/90	O. Bronson, J. Martin, T. VanDevender, Baker, G. Ruffner, R. Joh
	5623, 6015	UI	04/11/49, 08/09/48	D. M. Smith, W. L. Burger, M. Hensley
western hog-nosed snake	4069, 4210–13	NHMLAC	04/24/42	
spotted leaf-nosed snake	CAS 91663	CAS	09/02/61	R. Bandar
	8018–26	INHS	06/14/55, 07/27/57, 06/20/57	P. W. Smith, D. M. Smith A. A. Smith, M. M. Hensley
	64236, 102786–88	NHMLAC		
	33844, 40815, 42709, 47814, 48544–45, 48569–70,49089–90, 49925, 50093–94, 50096, 50100, 50180	UA	05/14/71, 06/09/55, 07/09/77, 06/15/88, 05/21/89, 08/07/89, 06/26/89, 05/27/89, 05/24/90, 05/23/91, 04/24/92, 06/13/93, 06/10/93, 06/12/93, 06/14/93, 05/31/92	T. VanDevender, Woodin, Koehler, J. K. Cross, P. C. Rosen, J. B. Iverson, C. Wilson, S. Booth, D. A. Parize, C. H. Lowe
	5580–83, 5585–88, 5967, 84054–55	UI	04/24/49, 06/09/49, 06/14/49, 06/16/49, 06/25/49, 06/26/49, 07/28/48, 05/29/51	D. M. Smith, M. M. Hensley, W. L. Burger, F. A. Shannon, Supernaugh, R. Abbuhl, H. K. Gloyd
saddled leaf-nosed snake	41194	BYU	07/19/72	J. R. Ottley
	7576, 8016–18	INHS	06/17/54, 06/14/55, 07/31/57	P. W. Smith, D. M. Smith, A. A. Smith, M. M. Hensley
	62401	Har		
	53086–91, 102778	NHMLAC		
	193015, 292589–90	USNM	07/09/71	F. R. Gehlbach
	25792, 25811, 33825–26, 39512, 40349, 41192, 41466, 41478, 42594, 42613, 47811, 48539, 48541–42, 48568, 49088, 50088, 50090, 50144–45, 50178	UA	04/30/56, 06/24/62, 05/14/71, 06/11/53, 06/05/50, 06/09/52, 06/12/52, 06/10/52, 07/07/77, 07/19/77, 06/13/88, 07/02/89, 08/07/89, 05/25/89, 06/11/93, 05/20/93, 06/11/93, 05/29/92	C. H. Lowe, R. L. Bezy, T. VanDevender, W. H. Woodin, D. L. Braun, W. H. Woodin, J. K. Cross, P. C. Rosen, S. J. Booth, B. E.Martin, S. F. Hale, P. A. Holm, J. Howland
	40915	UC	07/18/69	R. L. Holland
	5568–71, 5573–77, 5579, 5648, 5969–70, 83993	UI	06/12/49, 06/13/49, 06/14/49, 06/16/49, 06/17/49, 06/18/49, 06/09/49, 06/24/49, 07/11/49, 07/20/49, 08/02/48, 09/09/48, 06/15/57	D. M. Smith, M. M. Hensley, W. L. Burger, F. A. Shannon
coachwhip	HE.13566	MSU	04/18/49	M. M. Hensley
	25600, 31757, 37822–23, 48837–38	UA	04/29/62, 09/22/69, 07/12/69, 05/08/83, 05/06/89, 05/07/89	R. L. Bezy, T. Mulroy, S. Hale, R. R. Johnson, P. C. Rosen
	5610	UI	05/12/49	D. M. Smith, M. Hensley
Sonoran whipsnake	35512, 39722, 47370, 50195, 50845-PSV	UA	06/06/53, 05/06/72, 06/21/93, 09/23/73, 06/04/53, 09/22/69	W. H. Woodin, Johnson, D. A. Parizek, B. E. Martin, Larson

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Reptile				
western patch-nosed snake	6502	INHS	06/02/52	P. W. Smith, D. M. Smith, A. A. Smith
	HE.13607	MSU	05/28/49	M. M. Hensley
	128211–12	UCB	06/22/76, 07/22/75	B. K. Sullivan, R. Garcia
	26273, 30640, 40214, 40562, 43007, 45094, 47852, 47884,47886, 47899–900, 47976–77, 48530–31, 48611, 48691, 48765–66, 48839–41, 49281, 50184–86, 50222, 50316, 50591	UA	04/30/56, 04/22/69, 05/24/50, 06/03/53, 07/06/78, 11/27/83, 04/10/88, 05/21/88, 05/19/88, 05/17/88, 04/16/88, 10/15/86, 04/15/89, 05/13/89, 03/29/89, 09/23/89, 03/28/89, 03/30/89, 05/08/89, 05/06/89, 05/12/91, 03/24/93, 03/25/93, 10/07/92, 05/03/95, 10/18/96	C. H. Lowe, T. Mulroy, W. H. Woodin, Larson, J. K. Cross, R. R. Johnson, P. C. Rosen, R. Irving, D. Anderson, E. B. Wirt, D. A. Parizek, T. R. Jones, C. W. Connor, C. Hedgcock, B. E. Martin
	31167	UC	04/3/66	R. Holland
	5561–67, 30330	UI	03/28/49, 04/04/49, 04/10/49, 04/23/49, 04/27/49, 05/12/49, 06/11/49, 06/02/49	D. M. Smith, P.W. Smith, A. Smith, M. M. Hensley
gopher snake	HE.13567	MSU	08/04/57	M. M. Hensley
	102199, 102201	NHMLAC		
	28828, 47851, 47957, 47962, 47975, 48560, 48836	UA	06/24/68, 05/24/88, 09/17/88, 08/26/86, 10/05/88, 06/15/89, 05/09/89	P. Gegenheimer, P. C. Rosen, M. Brown, E. B. Wirt, S. Booth
	5595, 83892	UI	04/30/49, 06/15/57	D. M. Smith, F. A. Shannon, F. L. Humphrey, M. M. Hensley
	135970	UM	07/28/66	E. D. Brodie
glossy snake	91674, 92463	CAS	09/02/61, 08/10/61	R. Bandar
	8607	INHS	06/12/57	P.W. Smith, D.M. Smith, A.A. Smith
	101977–78, 101982–84	NHMLAC		
	23989, 24035, 33853, 41015, 47807–08, 47922–23, 48529, 49082, 50196	UA	04/14/52, 06/24/62, 05/14/71, 06/15/88, 06/13/88, 09/13/87, 08/20/87, 05/19/89, 05/22/90, 06/10/93	T. J. Walker, R. L. Bezy, T. VanDevender, L. Woodin, P. C. Rosen, C. Connor, R. D. McCord
Arizona glossy snake *(A. e. noctivaga)*	41019, 42592, 48561	UA	05/10/50, 07/09/77, 05/27/89	W. H. Woodin, J. K. Cross, S. Booth
	5590–93	UI	03/26/49, 05/12/49, 07/02/49, 07/11/49	D. M. Smith, & M. Hensley
common kingsnake	HE.13565	MSU	08/04/57	M. M. Hensley
	40383, 45466–67, 47891, 47920, 48767, 49085, 50745	UA	05/18/75, 05/09/85, 05/08/88, 08/22/87, 08/19/88, 05/23/90, 04/13/85	Wallace, T. VanDevender, P. C. Rosen, E. B. Wirt, P. A. Holm
long-nosed snake	CAS 91673	CAS	09/02/61	R. Bandar
	34936, 102599–602	NHMLAC		
	26090, 41406, 45524, 47853, 47892–94, 47896–98, 47901, 47918–19, 48532–37, 48564–65, 48769–70, 50313–14	UA	04/8/66, 06/10/52, 05/08/83, 05/22/88, 05/11/88, 05/09/88, 05/16/88, 05/11/88, 08/22/87, 08/23/87, 05/04/89, 04/21/89, 05/04/89, 04/21/89, 04/15/89, 06/15/89, 05/27/89, 03/28/89, 03/29/89, 04/23/93, 09/11/91	R. L. Bezy, W. H. Woodin, R. R. Johnson, P. C. Rosen, S. J. Booth, E. B. Wirt, V. Carrasco
	5600, 5987	UI	04/21/49, 07/31/48	D. M. Smith, M. M. Hensley, W. L. Burger
black-necked garter snake	76321	NHMLAC		
western ground snake	2702	NHMLAC		J. C. Von Bleeker

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Reptile				
western shovel-nosed snake	52199, 64303	NHMLAC		
	39835, 49094, 49183	UA	06/5/50, 05/11/91, 05/12/91	W. H. Woodin, P. C. Rosen, C. H. Lowe
Sonoran shovel-nosed snake	HE.10735	MSU	06/11/49	M. M. Hensley
	34915, 52166–68, 67276,125992	NHMLAC	05/30/58	
	20967, 39834, 39836, 45468–69, 47818–20, 47854–58, 47887–89, 47903–06, 48231, 48303, 48548–55, 48574–75, 49616–17, 48768, 48842, 48874–75, 49097–102, 49331, 50103, 50151–54, 50172, 50199, 50734	UA	06/9/51, 07/07/56, 05/09/85, 06/16/88, 06/17/88, 06/18/88, 05/22/88, 05/23/88, 05/21/88, 05/20/88, 05/08/88, 05/07/88, 05/09/88, 05/06/88, 05/04/89, 05/21/89, 04/21/89, 05/15/89, 06/02/89, 07/01/89, 04/16/89, 04/18/89, 06/09/89, 06/06/89, 04/11/89, 08/19/88, 05/06/89, 05/29/89, 05/21/91, 05/21/90, 05/13/91, 05/23/90, 05/19/90, 09/19/87, 05/26/93, 05/12/93, 04/19/93, 05/20/93, 06/09/91, 06/16/93, 07/02/96	C. H. Lowe, O. Bronson, R. B. Loomis, T. VanDevender, P. C. Rosen, S. J. Booth, E. B. Wirt, B. E. Martin, Y. Petryszyn, J. S. Parizek, D. A. Parizek, P. A. Holm, S. S. Sartorius, C. W. Connor
	5602–06, 5906	UI	06/19/49, 06/12/49, 06/17/49, 06/20/49, 08/02/48	D. M. Smith, M. Hensley, W. L. Buger
variable sandsnake	42467, 24102, 47902, 48547, 48876, 49093, 49928, 50328	UA	06/01/52, 05/11/88, 04/21/89, 05/29/89, 05/29/91, 04/26/92, 10/01/95	Smith, Wallace, C. H. Lowe, P. C. Rosen, E. B. Wirt, D. Mello, S. Julander, P. A. Holm
	5608–09	UI	06/19/49, 07/11/49	D. M. Smith, M. Hensley
southwestern black-headed snake	48576–77	UA	03/29/90, 04/20/90	P. C. Rosen
western lyre snake	91672	CAS	09/02/61	R. Bandar
	39593, 47883–84, 49228, 49428	UA	05/17/50, 05/21/88, 05/19/90, 10/04/90	W. H. Woodin, P. C. Rosen, E. B. Wirt
	5618–20	UI	07/02/49, 07/03/49	D. M. Smith, M. M. Hensley
night snake	8027	INHS	06/14/55	P.W. Smith and D.M. Smith
	63455, 64308–09, 101826, 115799	NHMLAC		
	27150, 39741, 40386, 41223, 42596, 47817, 47972, 48546, 48571	UA	04/14/73, 06/11/52, 05/18/75, 06/11/53, 07/07/77, 06/17/88, 09/16/88, 07/01/89, 04/19/90	R. J. Johnson, W. H. Woodin, Wallace, Larson, J. K. Cross, P. C. Rosen
	5614–17, 47641–42	UI	05/13/49, 06/11/49, 06/12/49, 05/28/56	D. M. Smith, M. M. Hensley, M. B. Mittleman
Sonoran coral snake	3197	NHMLAC		
	39674, 47959, 47965, 48572–73, 48692, 49086–87	UA	09/17/88, 09/02/86, 05/29/89, 05/27/89, 04/14/89, 05/17/91, 05/23/90	P. C. Rosen, B. Mack, S. J. Booth, E. B. Wirt
western diamond-backed rattlesnake	92463	CAS	08/10/61	R. Bandar
	6513	INHS	06/2/52	W. Supernaugh
	3014, 34945, 104368–72, 115981	NHMLAC	04/21/62	
	33321	TCWC		
	061624	USNM	07/3/18	A. B. Howell
	27313–14, 37320, 42698, 47910–11, 48562–63, 48610, 48686–87, 48843, 50170	UA	08/6/64, 05/06/65, 08/09/77, 09/18/87, 08/24/87, 06/13/89, 04/20/89, 09/23/89, 08/18/88, 09/22/89, 07/29/89, 03/25/93	A. L. Gardner, T. J. Cox, J. K. Cross, P. C. Rosen, S. J. Booth, R. Johnson, K. Hiett, E. B. Wirt, T. R. Jones
	5624–25	UI	04/11/49, 07/04/49	D. M. Smith, M. Hensley

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Reptile				
sidewinder	52571, 64281, 104467–69	NHMLAC		
	33329	TCWC		
	134309	USNM	06/26/49	M. Hensley
	27443–46, 27448–49, 27451, 27453, 27497, 27958	UA	10/08/60, 05/20/65, 09/17/88	W. G. Heath, T. J. Cox, P. C. Rosen
	5626, 5630, 5633, 53164, 84764, 84767	UI	05/01/49, 06/10/49, 03/28/63, 06/15/56	D. M. Smith, R. Brown, M. Hensley, F. A. Shannon, R. Abbuhl, L. Humphrey
speckled rattlesnake	41780, 49434	UA	12/06/75, 04/07/90	T. VanDevender, P. C. Rosen
black-tailed rattlesnake	5634	UI	04/21/49	D. M. Smith, & M. Hensley
	48764	UA	08/19/88	P.C. Rosen
tiger rattlesnake	27830, 47963, 48605, 48844, 50085	UA	09/05/60, 08/06/84, 04/23/89, 08/03/89, 06/10/93	J. Beatty, D. Anderson, P. C. Rosen
western rattlesnake	3119	NHMLAC		
Mojave rattlesnake	13095	CAS1	05/10/51	H. K. Gloyd
	6515, 8636, 8637	INHS	06/01/52, 07/27/57, 08/01/57	W. Supernaugh, P. W. Smith, M. M. Hensley
	64282–84, 105062–64	NHMLAC		
	27727, 27759, 41103, 42597, 47890, 47913, 47915, 47925–27, 47968, 48688, 50171	UA	05/26/56, 03/31/66, 06/12/50, 07/07/77, 05/19/88, 08/22/87, 09/27/87, 10/04/87, 08/23/87, 08/19/87, 09/16/88, 09/22/89, 04/12/93	D. D. Koehler, C. H. Lowe, W. H. Woodin, J. K. Cross, P. C. Rosen, E. B. Wirt, M. Daniels, D. Parizek
	5635–37, 6014, 84841	UI	04/18/49, 04/20/49, 08/04/48, 06/15/57	D. M. Smith, M.M. Hensley, W. L. Burger, F. A. Shannon, F. L. Humphrey
Bird				
Gambel's quail	64361–62	UCB	01/26/34, 01/27/34	L. Kellogg, S. H. Bowles
	1142	UA		
rough-legged hawk	4881	UA		
common tern	14621–22	UA		
elf owl	10	TCWC	06/23/32	W. P. Taylor
common poorwill	15143, 16762	UA		
red-naped sapsucker	64381	UCB	01/29/34	L. Kellogg
gilded flicker	64372, 64367–71	UCB	02/1/34, 01/26/34, 01/29/34, 01/31/34	M. M. Erickson, L. Kellogg
Say's phoebe	64392	UCB	02/2/34	M. M. Erickson
ash-throated flycatcher	64385	UCB	02/1/34	L. Kellogg
loggerhead shrike	64440–41	UCB	01/27/34, 02/02/34	M. M. Erickson
verdin	114	TCWC	06/23/32	W. P. Taylor
cactus wren	7503, 13108	UA		
	64408, 64425	UCB	01/29/34, 01/26/34	M. M. Erickson, L. Kellogg
canyon wren	64411–16	UCB	01/29/34, 01/30/34, 02/01/34	M. M. Erickson
black-tailed gnatcatcher	118	TCWC	06/22/32	W. P. Taylor
northern mockingbird	64419–20	UCB	01/27/34, 02/01/34	M. M. Erickson, L. Kellogg
sage thrasher	64409, 64423–24, 64426–27	UCB	01/30/34, 01/24/34, 01/26/34, 01/27/34	M. M. Erickson, L. Kellogg
crissal thrasher	64421	UCB	02/2/19	L. Kellogg
golden-winged warbler	9371	UA		
canyon towhee	64461	UCB		M. M. Erickson
white-crowned sparrow	64469	UCB	01/27/34	L. Kellogg
northern cardinal	83	TCWC	06/23/19	W. P. Taylor

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Mammal				
Crawford's desert shrew	24508, 24600, 25332	UA	07/5/83, 08/07/83, 04/19/87	Y. Petryszyn, W. E. Hall, C. A. Olsen
California leaf-nosed bat	23779, 23931–32	UA	07/8/79, 02/24/79	Y. Petryszyn, R. A. Gerhart
southern long-nosed bat	23780, 23778, 23899, 23901, 24452, 26073	UA	07/08/79, 07/09/79, 07/31/79, 07/28/79, 04/24/82, 10/1/82	Y. Petryszyn, J. W. Steiger
cave myotis	23784–85, 25973	UA	07/8/79, 09/08/93	Y. Petryszyn
California myotis	183586	UCB	01/26/45	D. G. Constantine
	23745, 23776–77, 26220	UA	07/31/79, 07/08/79, 07/09/79, 07/12/89	J. W. Steiger, Y. Petryszyn
western pipistrelle	61933	UCB	02/2/34	M. M. Erickson
	23782–83, 24320, 24444, 24483, 25976, 26061	UA	07/8/79, 05/31/79, 10/26/81, 09/26/81, 04/23/82, 09/07/93,	Y. Petryszyn, L. L. Zaffino, M. T. Brown
big brown bat	23746–48, 23900, 23902, 23982, 24442, 24482	UA	03/31/79, 07/28/79, 07/08/79, 09/14/79, 09/26/81, 04/23/82	R. A. Gerhart, J. W. Steiger, Y. Petryszyn, M. T. Brown
hoary bat	23981	UA	09/15/79	Y. Petryszyn
Townsend's big-eared bat	183618	UCB	06/29/45	D. G. Constantine
pallid bat	23933–34, 24504	UA	03/31/79, 04/24/82	R. A. Gerhart, Y. Petryszyn
pocketed free-tailed bat	23979–80, 24443, 24453, 24594, 24608–09, 24612, 24783–84	UA	05/31/79, 09/14/79, 09/26/81, 06/24/82, 09/27/81, 06/18/83, 06/15/83	L. L. Zaffino, Y. Petryszyn, M. T. Brown, R. Agte, E. Bernstein, J. Pickrel
western bonneted bat	26209	UA	02/2/95	Y. Petryszyn
Underwood's bonneted bat	23990, 24321–22, 24441, 24454, 24593	UA	09/14/79, 10/26/81, 06/24/82, 01/07/83, 06/18/83	J. W. Steiger, Y. Petryszyn
American badger	25508	UA	10/24/90	K. A. Jarik
feral dog	25359	UA	06/20/88	S. Russel, Y. Petryszyn
coyote	61949–51	UCB	02/01/34, 01/25/34, 01/26/34	L. Kellogg, M. M. Erickson
kit fox	25358	UA	09/23/88	S. Russel, Y. Petryszyn
common gray fox	61947–48	UCB	02/02/34, 01/26/34	A. M. Alexander
	25357	UA	06/01/1983	R. Bowers
round-tailed ground squirrel	149819–23	UK	7/18/50, 07/19/50, 07/20/50	A. Schwartz
	61953–60	UCB	01/28/34, 01/29/34	L. Kellogg, A. M. Alexander
	29451–52	TCWC	06/24/32	W. P. Taylor
Harris' antelope squirrel	149413–16	UK	07/19/50, 07/20/50	A. Schwartz
	61975–77	UCB	01/30/34, 01/31/34, 01/25/34	L. Kellogg, M. M. Erickson
	24582, 24948, 24994	UA	10/03/1981	G. Webb, A. May, D. Sutton
Botta's pocket gopher	62142, 62148–53, 62157, 62140–41, 62143–47, 62154–56	UCB	01/30/34, 01/31/34, 02/01/34, 01/29/34	M. M. Erickson, L. Kellogg
Arizona pocket mouse	149349–51	UK	07/19/50, 08/23/54	A. Schwartz
	17768, 24571, 24771, 24827–28, 24854, 24855, 24858–60, 24962, 24995, 26292	UA	07/29/68, 10/04/81, 10/03/82, 09/23/83, 10/02/82, 09/25/83, 09/24/83, 09/22/84	J. M. Mondean, S. Seidler, P. Holm, J. Morganflash, P. Casey, A. Wigg, K. Blum, J. E. McKendy, D. V. Smith, C. Bernstein, L. Kervin
little pocket mouse	24730–31	UA	10/07/83, 09/25/83	Y. Petryszyn, D. V. Smith

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Mammal				
Sonoran Desert pocket mouse	17769, 24484, 24644, 24647–48, 24773, 24865–66, 24919–20, 24956–59, 24991–93, 25014–17, 25030, 25034–35, 25138, 25143, 25217, 25232, 26310–11, 26404	UA	07/29/68, 09/26/81, 09/27/81, 09/25/82, 10/04/81, 10/03/81, 10/02/82, 10/03/82, 09/23/83, 09/24/82, 09/25/83, 09/24/83, 05/17/82, 09/23/84, 10/02/82, 10/01/84	S. D. Koerner, S. M. Russell, K. Kingsley, G. Webb, G. Delfrate, K. Blum, L. J. Risan, J. A. Mazzolini, K. E. Comstock, S. Seidler, A. J. Wigg, L. A. Weeks, M. J. Hazlett, B. Standley, K. Yamaguchi, J. E. McKendy, K. L. Madariaga, D. V. Smith, R. L. Moyer, C. H. Behrens, P. A. Holms, K. J. Stenberg, M. Rome, D. Duncan, R. Agte
rock pocket mouse	62250–68	UCB	01/29/34, 01/31/34, 02/01/34, 02/02/34, 02/03/34	A. M. Alexander, L. Kellogg
	29444	TCWC	06/24/32	W. P. Taylor
	24487, 24627–28, 24733, 24799–800, 24829, 24867, 24903, 24918, 24987–90, 25022–26, 25039, 25040–42, 25137, 25140–42, 25144	UA	04/23/82, 10/03/81, 09/25/81, 10/03/82, 09/23/83, 09/24/83, 09/25/82, 10/04/81, 09/27/81, 10/01/82, 09/25/83, 09/26/81	Y. Petryszyn, P. Holm, E. Sterling, K. Flanagan, D. Youkey, E. Moonga, P. Casey, L. J. Risan, A. Massolini, D. Stanley, A. Wigg, J. Cole, L. A. Weeks, K. R. Blum, R. L. Moyer, D. J. Hansen, K. Yamaguchi, J. Hazam, C. H. Behrans, J. M. Herron
Bailey's pocket mouse	24503, 24572–77, 24629–33, 24639–40, 24643, 24769–70, 25031–33, 25036–37, 25046–57, 25059–60, 25064–69, 25116–36, 25156, 25158, 26412	UA	09/26/81, 10/03/81, 09/27/81, 08/26/81, 10/04/81, 09/25/81	C. Szuter, G. Delfrate, P. Raimondi, G. Webb, R. Collins, P. S. Sutton, L. A. Weeks, J. A. Mazzolini, S. J. Fedorko, R. R. Jones, M. J. Hazlett, K. E. Comstock, D. J. Hansen, J. Cole, D. A. Stanley, R. Day, C. H. Behrens, E. Thoms, P. A. McGrath, S. Kohnke, E. G. Morrow, J. Cooley, R. Byers, M. T. Brown, R. Agte
desert kangaroo rat	62382–83	UCB	1/30/34, 01/31/34	A. M. Alexander
	24658, 24768	UA	09/24/83, 10/02/81	B. Standley, L. Weeks
banner-tailed kangaroo rat	149338–41	UK	07/17/50	A. Schwartz
Merriam's kangaroo rat	149220–21, 149223–29	UK	07/18/50, 07/19/50	A. Schwartz
	62363–68, 62372–77	UCB	01/30/34, 01/29/34, 02/03/34, 01/26/34, 01/24/34	M. M. Erickson, A. M. Alexander
	17767, 24564–68, 24615–17, 24620, 24624–26, 24767, 24804–05, 24807, 24825–26, 24841, 24843–47, 24852–53, 24923–37, 24963–71, 24978, 24980, 24997–002, 25004–13, 25018–20, 25043–45, 25077–84, 25086–115, 25139, 25146–150, 25153, 25155, 25198, 25712, 26091, 26143, 25153, 25155, 25198, 25712, 26091, 26143, 26145, 26146, 26226, 26254–55, 26273, 26290–91, 26321, 26370	UA	07/29/68, 10/03/81, 10/02/81, 10/04/81, 09/27/81, 10/02/82, 09/25/82, 10/08/83, 10/03/82, 10/01/82, 10/02/82, 09/26/82, 08/26/82, 09/24/82, 10/09/81, 11/21/82	S. Black, S. Seidler, G. Delfrate, L. Weeks, C. Lindquist, J. Hazain, J. Bates, A. May, D. Cralmer, P. Holm, E. A. Sterling, D. Hansen, P. S. Sutton, S. J. Fedorko, R. Jones, J. E. McKendry, N. Mays, D. Callison, M. J. Hazlett, G. W. Parry, S. A. Carroll, K. R. Blum, A. J. Wigg, K. O. Moyers, B. G. Nidetz, D. K. Duncan, R. Byers, K. L. Madariaga, E. Melink, M. J. Podborag, R. R. Jones, K. M. Flanagan, D. Stejskal, J. Buchanan, M. Bernas, J. Herron, R. Buyers, J. Cole, G. Montgomery, J. Brown, L. J. Risen

Taxon Common name	Field collection number	Collection[a]	Date(s)	Primary collector(s)
Mammal				
cactus mouse	62491–508	UCB	01/29/34, 01/30/34, 01/31/34, 02/01/34, 02/03/34, 01/03/34, 01/24/24, 01/25/34	L. Kellogg, A. M. Alexander, M. M. Erickson
	24445, 24484–86, 24492, 24809–11, 24943–47, 24996, 25145, 25157, 25789, 26289	UA	09/26/81, 04/23/82, 11/19/81, 09/24/83, 09/25/83, 09/23/83, 09/27/81, 10/04/81, 04/25/82, 05/14/82	M. T. Brown, Y. Petryszyn, R. Collins, C. Bernstein, D. Youkey, R. L. Moyer, K. E. Comstock, J. Bates, R. R. Jones, P. McGrath, M. Hazlett, J. V. Salmon
black-eared mouse	24817	UA	10/28/83	B. Standley
Merriam's mouse	25494	UA	12/7/88	Y. Petryszyn
western white-throated woodrat	62631–45, 182894	UCB	01/24/34, 01/25/34, 01/30/34, 01/31/34	A. M. Alexander, L. Kellogg, M. M. Erickson
	24649–50, 24842, 24864, 24938–42, 24949–55, 24972, 24981–86, 25038, 25070–76, 25151–52	UA	09/27/81, 11/21/82, 09/25/82, 04/25/82, 09/23/83, 09/24/83, 10/03/82, 10/01/82, 04/26/82, 10/04/81, 09/26/81, 10/03/81, 09/25/81	G. Webb, G. Delfrate, A. May, R. K. Bowers, M. Hazlett, D. Youkey, B. Standley, J. Hazarn, J. McKendy, S. Seidler, R. R. Jones, J. M. Bates, M. T. Brown, R. L. Moyer, R. Day, P. McGrath, L. A. Weeks, D. A. Stanley, D. J. Stejskal, J. S. Buchanon, K. E. Comstock, D. J. Hansen
Arizona cotton rat	25871	UA	06/30/92	Y. Petryszyn
desert bighorn sheep	25528	UA	04/14/91	P. Fernandez, P. Rosen

[a] BYU = Brigham Young University; CAS = California Academy of Science; CAS1 = Chicago Academy of Sciences; FWMSH = Fort Worth Museum of Science and History; Har = Museum of Comparitive Zoology, Harvard University; INHS = Illinois Natural History Survey; MSU = Michigan State University; NHMLAC = Natural History Museum of Los Angeles County; TCWC = Texas Cooperative Wildlife Collection; TMNH = Tulane Museum of Natural History; UC = University of Colorado Museum, UCB = Museum of Vertebrate Zoology, University of California, Berkeley; UI = University of Illinois, Museum of Natural History; UK = Museum of Natural History, University of Kansas; UM = University of Michigan; USNM = U. S. National Museum; UTEP = University of Texas, El Paso.