

# The Flora and Fauna of Scottsdale's McDowell Sonoran Preserve

McDowell Sonoran Conservancy



People Preserving Nature

In partnership with the  
City of Scottsdale



The flora and fauna survey of Scottsdale's McDowell Sonoran Preserve was made possible by generous grants from the Nina Mason Pulliam Charitable Trust, the Arizona Game and Fish Department Heritage Fund, and an anonymous donor.



*Cover photo by: Ed Mertz*

# The Flora and Fauna of Scottsdale's McDowell Sonoran Preserve

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A Project of the McDowell Sonoran Field Institute

## THE MCDOWELL SONORAN CONSERVANCY

The McDowell Sonoran Conservancy champions the sustainability of the McDowell Sonoran Preserve for the benefit of this and future generations. As stewards, we connect the community to the Preserve through education, research, advocacy, partnerships and safe, respectful access.

## THE MCDOWELL SONORAN FIELD INSTITUTE

The McDowell Sonoran Field Institute is the research center of the McDowell Sonoran Conservancy. Our mission is to study the environment of the McDowell Sonoran Preserve as well as the human history and human impacts on the Preserve. We do this by partnering with scientists and actively involving volunteers in research as citizen scientists. We use research results for long-term resource management, education, and to contribute to the broader scientific knowledge of natural areas.

## CONTRIBUTING AUTHORS

Kevin Bodmer, Stevan Earl, Dan Gruber, Russell Haughey, Steve Jones, Ron Rutowski, Walter Thurber, Dave Weber

## EDITOR

Melanie Tluczek

## REVIEWERS

Randy Babb, Brian Gootee, Len Marcisz

## DESIGN

Barbara Lightner

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## ABSTRACT

Scottsdale's McDowell Sonoran Preserve (MSP) is the largest urban preserve in the United States, encompassing over 30,000 acres of upper Sonoran Desert habitat located in Scottsdale, Arizona. The MSP forms a wildlife corridor between surrounding public lands; one that is vital to the ecological integrity of the area. This report contains the results of the first comprehensive flora and fauna survey of the MSP. The survey was conducted by the McDowell Sonoran Conservancy (MSC), a non-profit organization working in partnership with the City of Scottsdale to manage the MSP. This effort was unique in that the majority of the work was completed by volunteers who received a high level of training from partner scientists and MSC staff. Field collections ran from January, 2011 through November, 2013, and resulted in the documentation of 730 different plants and animals. This information forms a baseline data set that will be used for ecological resource planning, education, and further research and monitoring to track and maintain the health of the MSP natural resources.

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## INTRODUCTION

Scottsdale's McDowell Sonoran Preserve (MSP) is the largest urban preserve in the United States, encompassing over 30,000 acres of land set aside in perpetuity by the City of Scottsdale, Arizona. Protected lands, such as Scottsdale's MSP, provide critical refuge for native plants and animals that live near urban environments. At the same time the proximity to urban areas places tremendous strain on the ecological integrity of these systems through visitation, habitat fragmentation, and the introduction of exotic species.



View from Marcus Landslide trail.  
Photo by: M. Jensen

The McDowell Sonoran Conservancy (MSC), a 501(c)3 non-profit organization, manages the MSP through an agreement with the City of Scottsdale. The MSC originated in 1991 as a small group of citizens concerned about loss of Sonoran Desert habitat to urban sprawl. Beginning in 1994 the City of Scottsdale purchased parcels of land within the McDowell Mountains, with plans to extend northward to join with the Tonto National Forest. In 1995 and 2001 Scottsdale citizens voted on a tax to set the money aside for the purchase of land within a 34,000 acre area, referred to as the "Recommended Study Boundary (RSB)".

Today, the MSP ensures the protection of the over 730 types of plants and animals, numerous archeological and historical artifacts, and unique geologic features. In addition it forms a wild-life corridor that connects the Tonto National Forest with the McDowell Mountain Regional Park through areas that would otherwise be fragmented by urban development. MSC has over 500 volunteers supported by a small staff. Volunteers, called stewards, maintain and promote the MSP by patrolling trails, repairing damaged areas, greeting and providing information to visitors, providing educational hikes and programs for all ages, building relationships with the surrounding community, providing office and technical support for the staff, and aiding with scientific research.

The McDowell Sonoran Field Institute (MSFI), the research center of the MSC, began in 2010 with money generously provided by the Nina Mason Pulliam Charitable Trust to conduct a comprehensive survey of the flora and fauna of the MSP. This grant also funded the establishment of MSFI as the research center of MSC. The McDowell Sonoran Field Institute connects volunteers with scientific professionals and experts to conduct original research on the MSP ecology, geology, impacts of human use, and human history. This report contains the results of the MSFI three-year effort, which forms the first comprehensive biological inventory completed on MSP lands.

The primary objective of the flora and fauna survey was to develop a comprehensive inventory of the plants and animals within the MSP and to establish valuable baseline data for future investigations. A second but equally important objective was to engage volunteers and students in research activities. Through the MSFI citizen

science program, volunteers worked side-by-side with MSFI scientific partners to conduct fieldwork and collect observations to document flora and fauna. The information gained will serve as a valuable tool to develop management strategies for the MSP based on ecological principals, as well as enhance public enjoyment and appreciation of this living treasure.

## SCOTTSDALE'S MCDOWELL SONORAN PRESERVE

Scottsdale's McDowell Sonoran Preserve lies in northern Scottsdale, Arizona, between the Tonto National Forest to the north and the McDowell Mountain Regional Park and Fountain Hills Preserve to the south. Approximately 45 miles of the MSP's 86 mile boundary is lined with housing developments of varying density and design. The middle section of the MSP narrows to a section of approximately 450 yards wide, which connects the north and south areas of the MSP. The current and planned preserve lands fall entirely within the rectangular area between 33.59N to 33.82N and 111.76W to 111.93W.

### *Climate*

Central Arizona's climate regime includes two rainy seasons with intervening dry periods. The winter-spring rainy period from December through March, is driven by intermittent flows of moist air from the Pacific Ocean. April through June is generally very dry and hot. The second rainy season from late June to mid-September is often called the monsoon. Unsettled moist, tropical air from the south produces afternoon and evening thundershowers and occasionally heavy thunderstorms. October through December is usually dry, though remnants of Pacific hurricanes occasionally produce heavy rains (Dimmitt 1999).

The Flood Control District of Maricopa County maintains four weather stations and nine functional gages in or near the MSP. The average precipitation for the nine rain gauges between 2001 and 2012 was 8.7 inches across the MSP. The average yearly temperature was 71° F, with a range between 17° F and 118 °F (Flood Control District of Maricopa County 2013).

There are distinct differences in precipitation and temperature between the north and the south portions of the MSP. The Lost Dog Wash and Fraesfield rain gages provide rainfall records from 1991 to the present, and help illustrate this point. Average rainfall amounts from 1991 to 2010 ranged from 7.6 inches at the Lost Dog Wash station to 11.9 inches at the Fraesfield station. The greater precipitation in the north contributes to visibly higher density and variety of vegetation.

### *Riparian and Water Resources*

Natural water sources are scarce on the MSP. Only one perennial stream flows from a pipe across a section of trail on the west side of the McDowell Mountains. Another small stream flows intermittently on the north east side of Brown's Mountain. Both support small communities of aquatic vegetation. There are a total of nine wildlife water catchments on the MSP, three of which are known to be functional. In addition, several water holes left over from the cattle ranching operations of the early to mid-twentieth century retain water for portions of the year, providing temporary aquatic habitat. Numerous ephemeral pools and tinajas dot the MSP, and hold water after rain.

The MSP contains approximately 69 linear miles of dry wash, otherwise referred to as ephemeral

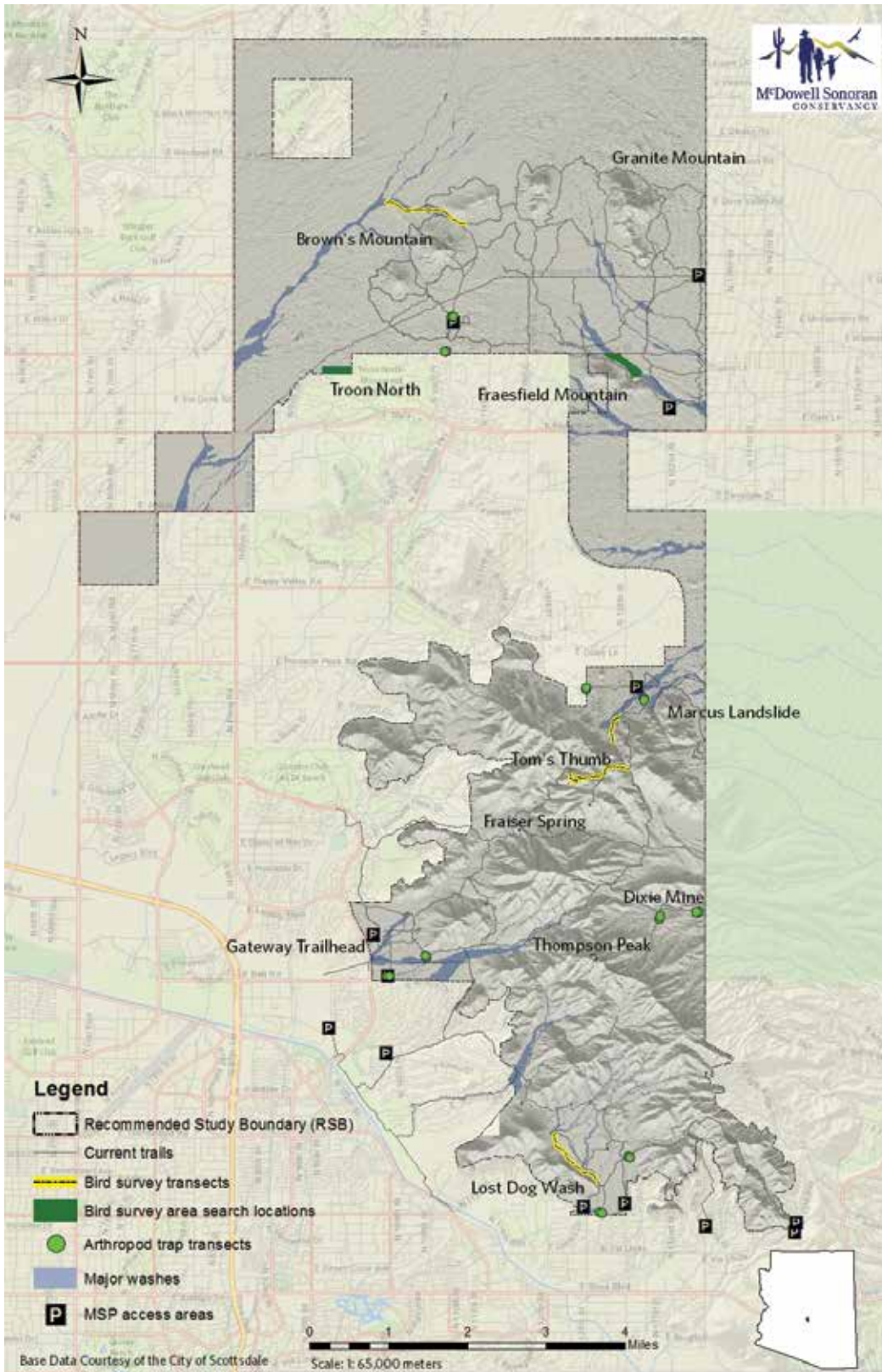


Figure 1: Map of Scottsdale's McDowell Sonoran Preserve Recommended Study Boundary and flora and fauna survey research locations, 2013.



streams. Ephemeral streams are riparian areas that contain water only part of the year following a rainfall. The increase in available water, combined with lower temperatures and greater nutrient availability, results in greater size, density, and diversity of vegetation in dry washes than surrounding areas. This produces more complex vertebrate and invertebrate communities in washes. Larger animals use washes to stay cool in hot summer months, to hide, and also as corridors for movement (Levick et al. 2008).

### ***Geology and Soils***

The MSP is at the northeastern limit of the Basin and Range Province of southern and western Arizona, near its boundary with the Central Mountain Province (Nations and Stump 1981). Elevations range from 1,690 feet southwest of the Lost Dog Wash access area to 4,059 feet at East End peak. The southern half of the MSP is composed of the McDowell Mountain range and material eroding from it. The northern part of the MSP is made up of the larger Pinnacle Peak Pediment. The pediment consists of shallowly sloping ground cut by washes due to ongoing erosion, and several small hills and peaks.

The northern and southern areas of the MSP have related but different geology. In the southern Preserve, the majority of the McDowell Mountains are composed of erosion resistant metamorphic rocks formed about 1.7 billion years ago. As a result, roughly one-third of the mountain slopes are exposed bedrock and the rest is thin soil over bedrock. These soils are well drained and resemble those found in the northeastern and southeastern corners of the McDowell Mountains, but with less iron, magnesium, and calcium.



Metamorphic rock outcrop. Photo by: D. Gruber

In contrast, the northeastern and southeastern corners of the McDowell Mountains are composed of granite. The northeastern area is comprised of 1.4 billion year old coarse-grained granite that weathers readily into unusual, spheroidal shapes. Mountain slopes here are covered with granite boulders set into clay, as well as a sand and gravel mix called grus. The southeastern area is granitoid with slightly different composition than the northeastern area but similar characteristics (Skotnicki 1996). This soil retains limited amounts of water, and large rainfalls rapidly create local drainage channels.



Granitic rock formations near Cholla Mountain. Photo by: M. Jensen

The transition areas between the granite and metamorphic rock and associated soil are visibly distinct.

Camp (1986) noted two general soil types for the MSP area. On the higher slopes of the range and the upper bajada are Gran-rock outcrop-Lehmans soils. These are very shallow to shallow soils, well-drained alluvium and colluvium. The surface is very gravelly and loamy; subsoils are very gravelly and clayey. On the lower bajadas and on the Pinnacle Peak Pediment are Eba-Pinaleno soils, which are deeper, well-drained alluvium. The surface is gravelly and loamy; subsoils are gravelly and loamy or clayey. Camp further described the Eba-Pinaleno soils on the western side of the McDowell Mountain range as extremely cobbly or extremely gravelly, and as non-calcareous to a depth of 20 inches or more.

An unusual feature of the northern MSP is the appearance of geologically young (15 - 25 million years old) volcanic deposits from the nearby Superstition Mountains. Brown's Mountain, the most prominent feature in the northern Preserve, is a layer cake of tertiary-era deposits of basalt and tuff. These two igneous rocks also appear in several large linear dikes that cross the northern area generally in a north-south alignment. Basalt is solidified flowing lava, which forms a fine-grained dark colored rock with significant iron, calcium, magnesium, and other useful nutrients. It erodes into fine soil that locally covers the underlying granitic grus. This soil can hold slightly more available water than the underlying and surrounding area. Tuff is solidified wind-blown volcanic ash that usually is fine-grained but light colored because of the high proportion of quartz and relative paucity of iron and magnesium. Tuff also weathers to fine-grained soil over the sandy to gravelly layer below.



Brown's Mountain. Photo by: M. Jensen

### **Cultural History**

Humans have inhabited and utilized the area within the MSP for approximately 7,000 years. The earliest humans, referred to as the Archaic people, moved in and out of the MSP area between 5,000 BC and 500 AD. Between 100 AD and 1450 AD, Hohokam culture made use of resources in the McDowell Mountains and surrounding area. While there are no known permanent habitations in the MSP, both the Archaic people and the Hohokam established many seasonal and temporary sites.

After the collapse of the Hohokam culture, Yavapai people occupied the area as hunter-gatherers (Wright 2002). They established temporary resource procurement and food processing sites, some of them on former Hohokam facilities.

The Native American inhabitants utilized many plants still growing on the MSP today, including saguaro (*Carnegiea gigantea*), velvet mesquite (*Prosopis velutina*), paloverde (*Parkinsonia microphylla*), devil's claw (*Proboscidea spp.*), yucca plants (*Yucca sp.*), wolfberry (*Lycium spp.*), prickly pear (*Opuntia spp.*), buckhorn cholla (*Cylindropuntia acanthocarpa*) and jojoba

(*Simmondsia chinensis*). Seeds and greens from ephemeral plants provided food as well. There is evidence that a limited amount of Hohokam agave (*Agave murpheyi*), an endangered succulent, was cultivated on the MSP (Hodgson 2001).



Prickly pear (*Opuntia sp.*) fruit. Photo by: M. Jensen

Euro-American settlement began in the 1860's. Mining and ranching were the primary draws to the area. A US Army site, Camp McDowell, was established in 1865 along the Verde River to the east of the modern MSP. After the Fort McDowell Mohave-Apache Reservation (now the Fort McDowell Yavapai Nation) was established in 1903, mining and ranching began in earnest.

Several ranches operated in and near what is now the MSP (Jones 2012). Edwin (E. O.) Brown operated Brown's Ranch in the northern MSP beginning as early as 1916. The Brown Ranch, known today as Brown's Ranch, continued operating primarily in the northern portion of the MSP until the 1970s. Many of the structures developed there remain today.

Miguel Ochoa established a ranch site in a canyon southwest of the current Tom's Thumb trailhead in 1919. The remnant structures in the area include a well and cistern in the canyon, with irrigation pipe leading northeast to at least two other cattle watering stations within the MSP. Windmill Pasture, with a well and other ranching facilities, is in the MSP near the eastern boundary.

As the metropolitan area developed, the area was increasingly utilized for recreational activities, from hiking and horseback riding to hunting to motorcycle riding. Between 2005 and 2010, use of the MSP lands dramatically increased by 93%. Currently the MSP receives over 300,000 visitors per year including hikers, cyclists, and equestrians.

### ***Ecosystem Disturbances***

Disturbances to an ecosystem can be defined as "A relatively discrete event that disrupts the structure of an ecosystem, community, or population, and changes resource availability or the physical environment" (Dodson et al. 1998). Disturbance is part of the ecological process within all environments, including the Sonoran Desert. Common disturbances include fire and flood. In an urban environment habitat fragmentation and trampling by off-trail hiking and vehicle use occur more frequently than non-urbanized environments.

The MSP has had three major fires in recent history. In the 1980s a 250 acre area near Lost Dog Wash burned. In 1992, the Granite fire burned approximately 2,000 acres from the Brown's Ranch area south to the Jomax Road alignment.



Brittlebush (*Encelia farinosa*) on old burn area near Tom's Thumb. Photo by: S. Jones

In 1995, the Rio fire burned about 5000 acres of the MSP from Fraesfield Mountain south to Windgate Pass, including the East End and Tom's Thumb areas. These areas are now covered primarily with brittle bush (*Encelia farinosa*), a shrub known to thrive in disturbed areas.

Major flood events are few and far between on the MSP. There have been a handful of notable floods in and around the MSP since 1970, and records of a small number possible floods going back to 1937 (Hadder 2013). Vegetation in washes typically regenerates within a few years of a flood event, as it is adapted to repeated disturbance.

Habitat fragmentation is a component of urban ecosystems. Approximately half of the MSP boundary areas are surrounded by urban development, which has over the years altered the movement of various animal species in and around the MSP. Housing density and development design has differential effects on how, when and where animals move. The narrow middle section of the MSP is bisected by Dynamite/Rio Verde Road running east to west, and 128th Street running north to south. As animals move between the north and south ends of the MSP

these roads pose a potential risk (Arizona Game and Fish Department 2013).

Illegal off-trail use presents one of the major ecosystem disturbances on the MSP. Unauthorized trails cut by hikers and cyclists cause plant degradation and potentially increase disturbance to animals. Vehicular use was allowed on the former State Trust Land which comprises much of the MSP. Historically the areas were used by road vehicles, All Terrain Vehicles (ATVs), and dirt bikes. Once these lands became part of the MSP vehicular use was prohibited except by special permit. Although much of the perimeter of the MSP is enclosed by metal piping, unauthorized vehicle use of the northern MSP still occurs.

## METHODS FOR THE BIOLOGICAL INVENTORIES

The McDowell Sonoran Field Institute flora and fauna survey was completed almost entirely by volunteers, using a model that ensured scientific oversight of projects, survey-specific training for volunteers, and a deep connection of the community to the resources and the scientific work. The survey was split into seven sub-surveys based on plant or animal groups with differing methods of observation and identification. These were: 1) flora, 2) ground-dwelling arthropods (spiders, scorpions, etc...), 3) large, day-flying insects 4) reptiles and amphibians 5) birds 6) small mammals and 7) large mammals. Scientists and experts from partner organizations (principal investigators) donated their time to lead each of the sub-surveys (hereafter referred to collectively as the surveys) between 2011 and 2013. Randy Babb, a senior biologist and naturalist working for the Arizona Game and Fish Department (AZGFD), oversaw the fauna surveys (Figure 2.)

Each principal investigator designed their specific survey in accordance with recognized standards in their field. They created data sheets, training workshops, and selected sites for study. They trained volunteers, led field teams, reviewed and logged data, reported research results, and reviewed information and educational materials produced by MSC. Principal investigators and their teams were encouraged to collect and share observations of organisms among themselves.

Volunteers from MSC, Scottsdale Community College (SCC), Arizona State University (ASU), and the surrounding community underwent specialized, survey-specific training in order to participate in the surveys and collect data. A number of volunteers from MSC received further training in data collection and note taking and

became field crew leaders. These volunteer leaders helped teach and mentor incoming volunteers.

Interns from SCC, Northern Arizona University (NAU), ASU, and several other universities worked alongside principal investigators to secure and maintain equipment, help train volunteers, identify specimens, organize data, create educational material and write results.

In early 2011 MSC hired a full time research coordinator to oversee the planning and development of the Field Institute, support the principal investigators with necessary supplies and resources, coordinate the volunteers, manage intern time and tasks, work with the City of Scottsdale to ensure permit compliance, and maintain detailed records of research progress.

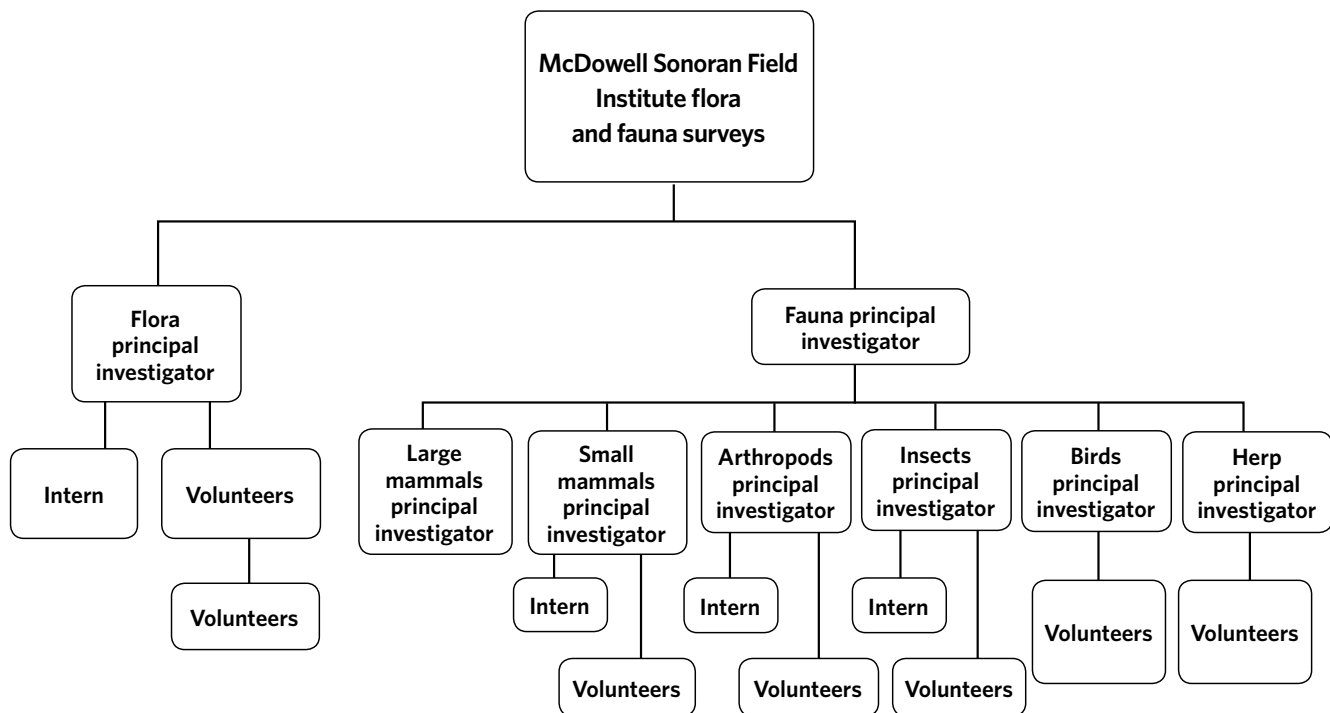


Figure 2: Organizational structure of the McDowell Sonoran Field Institute flora and fauna surveys.

<b>Survey</b>	<b>Principal Investigator</b>	<b>Partner Organization</b>
Flora	Steve Jones	Independent botanist
Ground-dwelling arthropods	Stevan Earl	Arizona State University, Central Arizona-Phoenix Long-Term Ecological Research (CAP-LTER)
Large, day-flying insects	Ron Rutowski	Arizona State University School of Life Sciences (SOLS)
Reptiles and amphibians	Dave Weber	North American Field Herping Association
Birds	Walter Thurber	Desert Rivers Audubon Society
Small mammals	Russ Haughey	Scottsdale Community College Center for Native and Urban Wildlife (CNUW)
Large mammals	Kevin Bodmer	Arizona Game and Fish Department
Fauna oversight	Randy Babb	Arizona Game and Fish Department

Table 1. Principal investigators and partner organizations for the McDowell Sonoran Field Institute flora and fauna surveys, 2011-2013.

All surveys were done in compliance with City of Scottsdale research permit requirements. Mammals, reptiles and amphibians that were caught, handled, and released were done so in compliance with AZGFD scientific collecting permit guidelines.

### **Flora**

The flora team collected plants during spring and fall flowering seasons from January 2011 through November of 2013. The principal investigator trained teams of volunteers to collect and press plants for herbarium-quality vouchers, and to take detailed notes. Larger teams covered the MSP trails in the spring and fall growing seasons of 2011 and 2012. Individuals and small teams

later visited off-trail areas of interest while searching for specific plant specimens. In 2012 and 2013, the principal investigator provided small teams of volunteers with “lookout lists”, or lists of plants that would be expected in the MSP but had not yet been found. When volunteers located these plants they photographed them and reported back to the principal investigator, who later visited the site to collect if necessary.

Due to the poor spring rainfall regimes in 2011 and 2012, the team added a seed bank project to the study. A seedbank is a collection of un-germinated seeds contained within a unit of soil.



Volunteers press plants collected on the flora survey.  
Photo by: M. Jensen



Early results of the MSFI seedbank study in the Scottsdale Community College greenhouse.  
Photo by: C. Hull

Stewards collected soil samples from 23 separate locations in the MSP in the fall of 2012. An intern and volunteers placed the soil under optimal conditions in the greenhouse at SCC from November, 2012 to August, 2013 (Jones and Hull 2013), in order to germinate and identify plants that may lie dormant in the soil, waiting for the right amount of rain. The principal investigator and intern harvested and identified plants that germinated, pressed them, and included them in the flora collection.

All data from field collections and the seedbank study were entered in to the Southwest Environmental Information Network (SEINet), a publically available database. Voucher specimens were given to herbaria at ASU and the Desert Botanical Garden (DBG) in Phoenix. Excess specimens were given to the teaching collection at SCC.

In addition to a flora catalog, the principal investigator mapped the biotic communities of the MSP. A biotic community is a distinct association of plants and animals. This association can be reliably indicated by the three dominant shrub and succulent species (Brown et al. 1979).

The flora principal investigator, along with an intern and volunteers, began mapping the biotic communities in 2011 and as of this report are completing the map using a combination of field observation and aerial photograph analysis. Principal investigators for the fauna teams used preliminary biotic community maps to inform their choice of sampling locations. The completed biotic community map will be made available in a subsequent publication.

### ***Invertebrates***

The Field Institute divided the invertebrates into two separate survey groups, the ground-dwelling arthropods and the large, day-flying insects. Each survey was led by a separate principal investigator. This allowed them to obtain a greater level of detail by employing different capture and identification techniques.

### ***Ground dwelling arthropods***

Investigators with the Central Arizona–Phoenix Long-Term Ecological Research (CAP LTER) project at ASU took a systematic approach to

the survey, and monitored ground-dwelling arthropods at select locations within the MSP. This sampling method was intended to provide insight regarding influence of the developed areas around the MSP, referred to as the wildland-urban interface, on the arthropod community within the protected area. Volunteers aided the principal investigator and intern in sample collection and later identification.

The team established 10 pitfall trap locations, each consisting of 10 traps spaced 16 feet (5 meters) apart along a line established perpendicular to slopes (see Figure 1). Each pitfall trap location along the wildland-urban interface was paired with one in the MSP interior, for a total of five pairs. One of the five pairs was a control, set away from the wildland-urban interface. Trap locations were selected specifically to include relatively similar geomorphological characteristics, including elevation (2,000-3,000 feet), slope ( $\leq 20\%$ ), and aspect ( $0\text{-}270^\circ$ ,  $315\text{-}360^\circ$ ) to minimize extraneous factors.

The research team used the simple but effective technique of pitfall trapping to sample ground-dwelling arthropods at these locations. Pitfall traps were made of 16 ounce plastic cups set into the ground uncovered for 72 hours, after which researchers and volunteers collected the arthropods trapped in the cups and preserved them in 70% ethanol for later microscope identification by a student intern working with an expert. The intern and expert also trained several volunteers to identify specimens to the order and family level.

Researchers conducted sampling quarterly so as to compare results with other CAP-LTER research sites around the Phoenix area. The sampling in the MSP provided additional information for the

CAP LTER valley-wide project, as well as generating a list of arthropod taxa for the MSFI flora and fauna records.



Volunteers setting pitfall traps for arthropod survey. Photo by: M. Jensen

### ***Large day-flying insects***

There are an estimated 100,000 insect species worldwide, and the MSP likely contains hundreds. The specific goals of the survey were 1) to generate a list of the flying insects that MSP users would be likely to inquire about, and would therefore provide the most educational potential, and 2) develop a first list of flying insects for research purposes. Surveys began in the fall of 2011 collections continued through September, 2013.



The principal investigator, interns, students and volunteers documented insects along major trails in the MSP. A special emphasis was given to the Gateway Loop Trail, Lost Dog Wash Trail, Brown's Ranch Trail, Tom's Thumb Trail, Tom's Thumb Canyon, Dixie Mine, and Marcus Landslide Trail. These represent areas of the MSP that are diverse in topography, vegetative community, aspect, and elevation. In select



Ron Rutowski and intern Emily Roberge searching for insects. Photo by: M. Jensen

cases interns and students were permitted to travel off trail to collect specimens. Volunteers were encouraged to independently photograph insects and submit them to the principal investigator, who then worked with interns to identify insects from both photographs and specimens to the lowest possible taxonomic level.

In addition there were three night-time light trapping events, one near the Tom's Thumb trailhead and two at a cattle tank north of Tom's Thumb trailhead. Light trapping consists of setting up light colored sheets backlit by ultraviolet lights and mercury vapor lamps, upon which insects land and can be studied. These events ran from about 5:00 PM to 9:00 PM and included both

daylight observations and observations after sunset. Although the stated purpose of the survey was to document day-flying insects, these night-time events provided insight into species that can be seen in the early morning and evening around trailhead lights.



Volunteers light-trapping for insects. Photo by: M. Jensen

### ***Reptile and Amphibian Survey***

The reptile and amphibian survey team consisted primarily of the principal investigator, volunteers from the North American Field Herping Association (NAFHA), and MSC stewards. Volunteers underwent a three-hour training session that covered safety, techniques, and animal identification before participating in a survey. Survey teams hiked over diverse areas of the MSP, focusing on areas near the Lost Dog, Sunrise, Gateway, Tom's Thumb, Marcus Landslide, Rock Knob, Dixie Mine, Granite Mountain, and Browns Ranch.

The teams employed several methods to observe, identify, and collect information on reptiles and amphibians. The most common was

visual observation. This included chance sightings by MSC and MSP staff, volunteers, and visitors in the MSP as well as observations made on organized trips.

In order to locate more cryptic species the survey teams used a method called cover lifting. This includes lifting rocks, logs, and other such naturally occurring items as well as artificial cover (sheets of corrugated tin, wood, and other natural items) found within the MSP. Cover was replaced to its original position to maintain the integrity of the micro-environments beneath. The survey team also employed a method called road cruising while driving to and from survey locations on roads adjacent to the MSP. Animals were photographed in order to document accurate identification and proof of their existence on the MSP. These photos were submitted to the principal investigator along with location, date, time, temperature, humidity, and behavioral notes.

Reptiles and amphibians are most active in warm months, at night during the summertime, and after rains. The reptile and amphibian surveys



Dave Weber photographing a common chuckwalla. Photo by: M. Jensen

were conducted monthly starting in March and ending in October or November, depending on temperatures. During the summer months surveys were conducted at night, and in cooler months they were conducted during the day. The survey ran for nearly three years starting in March, 2011 and ending in October, 2013.

### ***Bird Survey***

Experienced and intermediate level birders from the Audubon Society and the MSC conducted the bird surveys in small two-four person survey teams. Each team included at least one highly experienced birder. The bird survey began in January of 2012 and ended in September of 2013. The team conducted diurnal surveys in January, March, April, May, late August, and September. The intent was to sample the summer and winter bird populations and catch the typical spring and fall migrants. The survey schedule was weighted toward the spring in order to document breeding species on the MSP. The principal investigator completed a few additional surveys



Walter Thurber and volunteer birding at Lost Dog Wash. Photo by: McDowell Sonoran Field Institute trail camera.



Hummingbird collecting nesting material.  
Photo by: M. Jensen

in order to check for evidence of breeding in the early summer.

Surveys began within an hour of sunrise and lasted between 1.5 and 7.0 hours in length, with an average survey time of 4 hours. The survey team recorded time of day, temperature, precipitation, general wind speed, and cloud cover at the beginning and end of each survey.

The observers documented each species seen or heard, the number of individual birds and any breeding evidence. Breeding was confirmed by observation of nest building activity, a nest with eggs or young, or adults carrying food to a nest or feeding a fledgling. Evidence of probable breeding includes singing, courtship or copulation, or territorial or agitated behavior.

The diurnal survey sites were located at Lost Dog Wash, the washes at Fraesfield Mountain and Brown's Ranch, the tree line adjacent to the Troon North community, the canyon below Tom's Thumb, and the ridge at Tom's Thumb (Figure 1). These six sites were distributed across the MSP, represent various elevations and vegetative communities, and were reasonably accessible to survey teams. The transect lengths ranged from 0.4 to 1.0 mile. The survey team conducted area searches in the riparian areas at Fraesfield and Troon locations, which were 29 and 23 acres, respectively.

The team conducted nocturnal surveys along a 0.8 mile stretch of trail between Lost Dog and Ringtail trails. This involved passive listening for nocturnal bird calls and using recordings of bird calls to encourage callback. Nocturnal survey months were March and May.

### ***Small Mammal Survey***

The principal investigator, intern, students and MSC volunteers documented small and medium sized mammals using a variety of methods. Students and volunteers were required to take a one-hour workshop to learn safety, techniques, and mammal identification before participating.

The trapping season was February through May and September through November. Teams trapped monthly between these time frames as long as the weather was neither too hot nor too cold to pose a mortality risk to the small mammals captured. The teams trapped at the Gateway trailhead, Tom's Thumb, Dixie Mine, Thompson Peak, Fraesfield Mountain, Brown's Mountain, Granite Mountain trailhead, and Sunrise trailhead.

To trap small mammals, the teams used Sherman live-traps placed in lines approximately 32 feet (10 meters) apart and baited with oats, seeds, and peanut butter. Traps were set in the evening and checked early the next morning. Depending on the number of volunteers, the teams set out 40 to 120 traps per night. Mammal species captured were measured, weighed, and identified, then released at the location where they were trapped. The process was repeated for two consecutive nights. In addition, teams set out 3 to 5 Tomahawk traps near rock outcrops and along washes during each trapping session.



Collecting data on the small mammal survey.  
Photo by: M. Jensen

In May of 2012 a bat biologist from AZGFD led a team of volunteers to Dixie Mine to set up fine-mesh nets (mist nets) to capture bats as they flew through the canyon.

The small mammal survey intern placed motion-triggered, infrared trail cameras at Tom's Thumb Spring, Lost Dog Wash, Thompson Peak, Marcus Landslide, and 128th Street cattle tank. McDowell Sonoran Conservancy interns and staff set and checked the cameras, as well as managed the photograph database. Photo monitoring started in spring, 2012 and ended in May, 2013.

### ***Large Mammal Population Survey***

Collaborative efforts between the AZGFD, the City of Scottsdale, and the MSC resulted in an aerial survey of large mammals (including deer and collared peccary) in the MSP / Game Management Unit (GMU) 25 M. On January 17th and 18th, 2013, AZGFD performed aerial wildlife surveys by helicopter. The surveys were broken down into two separate flights totaling 3.9 hours.

The first survey was flown on the evening of January 17th and covered the newly acquired northern portion of the MSP and adjoining State Trust Land, as wildlife habitat is contiguous in nature. The second survey was flown on the morning of January 18th. This flight covered the McDowell Mountains Range or southern portion of the MSP as well as the McDowell Mountain Regional Park (MMRP).

## FINDINGS

### Flora

The flora survey resulted in a total of 757 individual specimens collected from the MSP between February 2011 and November 2013. This included 65 separate plant families, 235 genera, 368 plants identified to species and 380 including varieties. The most well represented families were: sunflower (Asteraceae, 64 species), grass (Poaceae 44 species), pea and bean (Fabaceae 18 species), cactus (Cactaceae 15 species), and euphorbs (Euphorbiaceae, 15 species).

Before starting the survey, the principal investigator used a mathematical formula from Bowers and McLaughlin (1982) to estimate the number of taxa expected within an area with the size, elevation range, and habitat of the MSP. The formula predicted 319 taxa within the MSP. The current count of 380 taxa exceeds this, and is comparable to totals from nearby flora studies (Jones and Hull, 2013).

The flora survey produced several surprises. Three species were new records for Maricopa County. These were: annual windmills (*Allionia choisyi*), Windham's scaly cloakfern (*Astrolepis windhamii*), and pink purslane (*Portulaca pilosa*). Ivyleaf morning-glory (*Ipomoea hederacea*), and wingpod purslane (*Portulaca umbraticola*) have only otherwise been collected from the Sonoran Desert National Monument in southern Maricopa County. In addition, the principal investigator discovered a hybrid between canyon bursage (*Ambrosia ambrosioides*) and cheesebush (*Ambrosia salsola*) in the north section of the MSP. There are three known plants representing this parentage, at South Mountain

and on the Barry Goldwater Military Range in Maricopa County, and at Sabino Canyon in Pima County.



Hybrid between canyon ragweed (*Ambrosia ambrosioides*) and cheesebush (*Ambrosia salsola*).  
Photo by: S. Jones

The seedbank study provided insight into the potential of the MSP plant community. It produced a total of 36 taxa, 8 of which had not been collected prior to end of the survey. An aquatic plant, toad rush (*Juncus bufonius*) germinated in a tray from the large wash northeast of Brown's Mountain. This plant was not encountered during the field survey. Sand pygmy weed (*Crassula connata*) was rarely seen in the field during the survey, but was present in 26 of the

138 trays planted, occasionally in substantial numbers. Presumably it's very small size is in part responsible for the lack of field observations, or possibly the ideal conditions prevailing in a greenhouse setting. In contrast, curvenut combseed (*Pectocarya recurvata*) is a ubiquitous spring ephemeral in the MSP, but was completely absent from the greenhouse trays.



Toad rush (*Juncus bufonius*) from the seedbank collection. Photo by: S. Jones

The queen of the night cactus (*Peniocereus greggii* var. *transmontanus*) is a rare and protected plant, and is also difficult to find due to its cryptic appearance. Field work in the summer of 2011 revealed an unusually high number of these cacti in the East End area. Individuals were mapped and volunteers continue to document the locations of this species.



Queen of the Night (*Peniocereus greggii* var. *transmontanus*). Photo by: M. Jensen

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## Flora of Scottsdale's McDowell Sonoran Preserve

This list conforms to the nomenclature presented in USDA NRCS (2013).

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### ACANTHACEAE

*Anisacanthus thurberi* (Torr.) A. Gray

*Carlowrightia arizonica* A. Gray

*Justicia californica* (Benth.) D. Gibson

*Justicia longii* Hilsenb.

### ACANTHUS FAMILY

Thurber's desert honeysuckle

Arizona wrightwort

Beloperone

Siphonoglossa



Beloperone (*Justicia californica*).

Photo by: M. Jensen

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**AGAVACEAE**

*Agave americana* L.  
*Agave deserti* Engelm.  
*Agave murpheyi* F. Gibson  
*Agave toumeyana* Trel. var. *toumeyana*  
*Yucca baccata* Torr.  
*Yucca elata* (Engelm.) Engelm. var. *elata*

**AGAVE FAMILY**

American century plant  
Desert agave  
Hohokam Agave  
Toumey's century plant  
Banana yucca  
Soaptree yucca



Banana yucca (*Yucca baccata*).  
Photo by: M. Jensen

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**AMARANTHACEAE**

*Amaranthus albus* L.  
*Amaranthus fimbriatus* (Torr.) Benth. ex S. Wats.  
*Amaranthus torreyi* (A. Gray) Benth. ex S. Wats.  
*Tidestromia lanuginosa* (Nutt.) Standl.

**AMARANTH FAMILY**

Prostrate pigweed  
Fringed amaranth  
Torrey's amaranthus  
Woolly tidestromia



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**APIACEAE**

*Bowlesia incana* Ruiz & Pav.  
*Daucus pusillus* Michx.  
*Lomatium nevadense* (S. Wats.) Coult. & Rose

**CARROT FAMILY**

Hoary bowlesia  
American wild carrot  
Nevada biscuitroot

American wild carrot (*Daucus pusillus*).  
Photo by: M. Jensen

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**ARISTOLOCHIACEAE**

*Aristolochia watsonii* Woot. & Standl.

**BIRTHWORT FAMILY**

Watson's dutchman's pipe



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**ASCLEPIADACEAE**

*Asclepias nyctaginifolia* A. Gray  
*Matelea parvifolia* (Torr.) Woods.  
*Metastelma arizonicum* A. Gray  
*Sarcostemma cynanchoides* Decne. ssp. *hartwegii* (Vail) R. Holm

**MILKWEED FAMILY**

Mojave milkweed  
Spearleaf  
Arizona swallow-wort  
Climbing milkweed

Dwarf desertpeony (*Acourtia nana*).  
Photo by: M. Jensen

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**ASTERACEAE**

*Acamptopappus sphaerocephalus* (Harv. & A. Gray ex A. Gray) A. Gray var. *sphaerocephalus*  
*Acourtia nana* (A. Gray) Reveal & King  
*Acourtia wrightii* (A. Gray) Reveal & King  
*Adenophyllum porophylloides* (A. Gray) Strother

**SUNFLOWER FAMILY**

Rayless goldenhead  
Dwarf desertpeony  
Brownfoot  
San Felipe dogweed



Desert marigold (*Baileya multiradiata*).  
Photo by: M. Jensen

*Ambrosia ambrosioides* x *salsola*  
*Ambrosia ambrosioides* (Cav.) W.W. Payne  
*Ambrosia confertiflora* DC.  
*Ambrosia deltoidea* (Torr.) W.W. Payne  
*Ambrosia dumosa* (A. Gray) W.W. Payne  
*Ambrosia eriocentra* (A. Gray) W.W. Payne  
*Ambrosia monogyra* (Torr. & A. Gray) Strother & B.G.Baldwin  
*Ambrosia salsola* (Torr. & A. Gray) Strother & B.G.Baldwin  
*Artemisia ludoviciana* Nutt. ssp. *mexicana* (Willd. ex Spreng.) Keck  
*Baccharis brachyphylla* A. Gray  
*Baccharis salicifolia* (Ruiz & Pav.) Pers.  
*Baccharis sarothroides* A. Gray  
*Bahiopsis parishii* (Greene) E.E. Schilling & Panero  
*Baileya multiradiata* Harvey & A. Gray ex A. Gray  
*Bebbia juncea* (Benth.) Greene var. *aspera* Greene  
*Brickellia californica* (Torr. & A. Gray) A. Gray  
*Brickellia coulteri* A. Gray  
*Centaurea melitensis* L.  
*Chaenactis stevioides* Hook. & Arn.  
*Cirsium neomexicanum* A. Gray  
*Conyza canadensis* (L.) Cronq.  
*Dieteria asteroides* Torr. var. *glandulosa* (B.L. Turner) D.R. Morgan & R.L. Hartman  
*Encelia farinosa* A. Gray ex Torr.  
*Encelia virginensis* A. Nels.  
*Ericameria laricifolia* (A. Gray) Shinnars  
*Erigeron divergens* Torr. & A. Gray  
*Erigeron oreophilus* Greenm.  
*Eriophyllum lanosum* (A. Gray) A. Gray  
*Eriophyllum pringlei* A. Gray  
*Gnaphalium palustre* Nutt.  
*Gutierrezia sarothrae* (Pursh) Britt. & Rusby  
*Helianthus annuus* L.

Ragweed  
 Canyon ragweed  
 Slimleaf bursage  
 Triangle-leaf bursage  
 Burrowbush  
 Hollyleaf bursage  
 Burrobush  
 Cheesebush  
 White sagebrush  
 Shortleaf baccharis  
 Water wally  
 Desertbroom  
 Parish goldeneye  
 Desert marigold  
 Sweetbush  
 Brickellbush  
 Coulter's brickellbush  
 Maltese star-thistle  
 Pincushion flower  
 New Mexico thistle  
 Canadian horseweed  
 Spiny goldenweed  
 Brittlebush  
 Virgin River brittlebush  
 Turpentine bush  
 Spreading fleabane  
 Chaparral fleabane  
 Woolly eriophyllum  
 Pringle's woolly sunflower  
 Western marsh cudweed  
 Broom snakeweed  
 Common sunflower



Sweetbush (*Bebbia juncea*).  
Photo by: M. Jensen



New Mexico thistle (*Cirsium neomexicanum*).  
Photo by: M. Jensen



Brittlebush (*Encelia farinosa*).  
Photo by: M. Jensen



Camphorweed (*Heterotheca subaxillaris*).  
Photo by: S. Jones



*Heterotheca subaxillaris* (Lam.) Britt. & Rusby  
*Isocoma acradenia* (Greene) Greene  
*Lactuca serriola* L.  
*Lasthenia californica* DC. ex Lindl.  
*Layia glandulosa* (Hook.) Hook. & Arn.  
*Logfia arizonica* (A. Gray) J. Holub  
*Logfia filaginoides* (Hook. & Arn.) Morefield  
*Melampodium leucanthum* Torr. & A. Gray  
*Monoptilon bellioides* (A. Gray) Hall  
*Oncosiphon piluliferum* (L. f.) Kallersjo  
*Pectis papposa* Harvey & A. Gray var. *papposa*  
*Perityle emoryi* Torr.  
*Pluchea sericea* (Nutt.) Coville  
*Porophyllum gracile* Benth.  
*Pseudognaphalium canescens* (DC.) Anderb.  
*Psilostrophe cooperi* (A. Gray) Greene  
*Rafinesquia californica* Nutt.  
*Rafinesquia neomexicana* A. Gray  
*Senecio flaccidus* Less. var. *monoensis* (Greene) B.L. Turner & T.M. Barkl.  
*Senecio lemmonii* A. Gray  
*Sonchus oleraceus* L.  
*Stephanomeria pauciflora* (Torr.) A. Nels.  
*Stylocline gnaphaloides* Nutt.  
*Stylocline micropoides* A. Gray  
*Trixis californica* Kellogg  
*Uropappus lindleyi* (DC.) Nutt.  
*Xanthisma gracile* (Nutt.) D.R.Morgan & R.L.Hartman  
*Xanthisma spinulosum* (Pursh) D.R. Morgan & R.L. Hartman var. *gooddingii* (A. Nelson) D.R. Morgan & R.L. Hartman  
*Xanthisma spinulosum* (Pursh) D.R. Morgan & R.L. Hartman var. *paradoxum* (B. L. Turner & R. L. Hartman) D. R. Morgan & R. L. Hartman  
*Xanthium strumarium* L.

Camphorweed  
Alkali goldenbush  
Prickly lettuce  
California goldfields  
Whitedaisy tidytips  
Arizona fluffweed  
California fluffweed  
Plains blackfoot  
Mojave desertstar  
  
Manybristle cinchweed  
Emory's rockdaisy  
Arrowweed  
Slender poreleaf  
Wright's cudweed  
Whitestem paperflower  
California chicory  
New Mexico plumeseed  
Sand wash groundsel  
  
Lemmon's ragwort  
Common sowthistle  
Brownplume wirelettuce  
Everlasting nest straw  
Woollyhead neststraw  
American threefold  
Silver puffs  
Slender goldenweed  
Goodding's tansyaster  
  
Goodding's tansyaster  
  
Rough cocklebur



Plains blackfoot  
*(Melampodium leucanthum)*.  
Photo by: M. Jensen



Mojave desertstar  
*(Monoptilon bellioides)*.  
Photo by: M. Jensen



New Mexico plumeseed  
*(Rafinesquia neomexicana)*.  
Photo by: M. Jensen



Everlasting nest straw  
*(Stylocline gnaphaloides)*.  
Photo by: S. Jones.

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**BERBERIDACEAE**

*Berberis haematocarpa* Woot.

**BARBERRY FAMILY**

Bloodberry barberry



Bloodberry barberry  
(*Berberis haematocarpa*).  
Photo by: S. Jones

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**BORAGINACEAE**

*Amsinckia menziesii* (Lehm.) A. Nels. & J.F. Macbr. var.  
*intermedia* (Fisch & C.A. Mey.) Ganders

*Amsinckia tessellata* A. Gray

*Cryptantha barbiger* (A. Gray) Greene

*Cryptantha decipiens* (M.E. Jones) Heller

*Cryptantha muricata* (Hook. & Arn.) A. Nels. & J.F.  
Macbr.

*Cryptantha pterocarya* (Torr.) Greene var. *cycloptera*  
(Greene) J.F. Macbr.

*Cryptantha pterocarya* (Torr.) Greene var. *pterocarya*

*Harpagonella palmeri* A. Gray var. *arizonica* I.M.  
Johnston

*Pectocarya heterocarpa* (I.M. Johnston) I.M. Johnston

*Pectocarya platycarpa* (Munz & Johnston) Munz &  
Johnston

*Pectocarya recurvata* I.M. Johnston

*Pectocarya setosa* A. Gray

*Plagiobothrys arizonicus* (A. Gray) Greene ex A. Gray

*Plagiobothrys pringlei* Greene

**BORAGE FAMILY**

Common fiddleneck

Bristly fiddleneck

Bearded cryptantha

Gravelbar cryptantha

Pointed cryptantha

Wingnut cryptantha

Wingnut cryptantha

Arizona grapplinghook

Chuckwalla combseed

Broadfruit combseed

Curvenut combseed

Moth combseed

Arizona popcornflower

Pringle's popcornflower



Common fiddleneck  
(*Amsinckia menziesii*).  
Photo by: M. Jensen

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**BRASSICACEAE**

*Boechera perennans* (S. Wats.) W.A. Weber

*Brassica tournefortii* Gouan

*Caulanthus lasiophyllus* (Hook. & Arn.) Payson

*Descurainia pinnata* (Walt.) Britt. ssp. *ochroleuca*  
(Woot.) Detling

*Draba cuneifolia* Nutt. ex Torr. & A. Gray var. *integrifolia*  
S. Wats.

*Lepidium lasiocarpum* Nutt.

*Physaria tenella* (A. Nelson) O'Kane & Al-Shehbaz

*Sisymbrium irio* L.

*Thysanocarpus curvipes* Hook.

**MUSTARD FAMILY**

Perennial rockcress

Asian mustard

California mustard

Western tansymustard

Wedgeleaf draba

Shaggyfruit pepperweed

Moapa bladderpod

London rocket

Sand fringeopod



Cryptantha (*Cryptantha* sp.).  
Photo by: M. Jensen



Wedgeleaf draba (*Draba*  
*cuneifolia*).  
Photo by: C. Hull

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**CACTACEAE**

*Carnegiea gigantea* (Engelm.) Britton & Rose  
*Cylindropuntia acanthocarpa* (Engelm. & Bigelow) F.M. Knuth var. *coloradensis* (L.D.Benson) D.J.Pinkava  
*Cylindropuntia arbuscula* (Engelm.) Knuth  
*Cylindropuntia bigelovii* (Engelm.) Knuth var. *bigelovii*  
*Cylindropuntia fulgida* (Engelm.) Knuth  
*Cylindropuntia leptocaulis* (DC.) Knuth  
*Cylindropuntia* x *tetracantha* (Toumey) Knuth  
*Echinocereus engelmannii* (Parry ex Engelm.) Lem.  
  
*Ferocactus cylindraceus* (Engelm.) Orcutt  
*Mammillaria grahamii* Engelm.  
*Opuntia chlorotica* Engelm. & Bigelow  
*Opuntia engelmannii* Salm-Dyck  
*Opuntia phaeacantha* Engelm.  
*Opuntia* x *curvospina* Griffiths (pro sp.)  
*Peniocereus greggii* (Engelm.) Britt. & Rose var. *transmontanus* (Engelm.) Backeberg

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**CARYOPHYLLIACEAE**

*Herniaria hirsuta* L.  
*Loeflingia squarrosa* Nutt.  
*Minuartia douglasii* (Fenzl ex Torr. & A. Gray) Mattf.  
*Silene antirrhina* L.

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**CELASTRACEAE**

*Canotia holacantha* Torr.

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**CHENOPODIACEAE**

*Atriplex canescens* (Pursh) Nutt.  
*Atriplex elegans* (Moq.) D. Dietr. var. *elegans*  
*Chenopodium berlandieri* Moq.  
*Chenopodium pratericola* Rydb.  
*Chenopodium watsonii* A. Nels.

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**CACTUS FAMILY**

Saguaro  
Colorado buckhorn cholla  
Arizona pencil cholla  
Teddybear cholla  
Chain-fruit cholla  
Christmas cholla  
Tucson pricklypear  
Engelmann's hedgehog cactus  
California barrel cactus  
Graham's nipple cactus  
Dollarjoint pricklypear  
Cactus apple  
Tulip pricklypear  
Searchlight pricklypear  
Nightblooming cereus



Saguaro (*Carnegiea gigantea*).  
Photo by: M. Jensen



Christmas cholla (*Cylindropuntia leptocaulis*).  
Photo by: M. Jensen



Graham's nipple cactus (*Mammillaria grahamii*).  
Photo by: M. Jensen

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**CARNATION FAMILY**

Hairy rupturewort  
Spreading pygmyleaf  
Douglas' stitchwort  
Sleepy silene

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**BITTERSWEET FAMILY**

Crucifixion thorn

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**SPINACH FAMILY**

Fourwing saltbush  
Wheelscale saltbush  
Pitseed goosefoot  
Desert goosefoot  
Watson's goosefoot



Crucifixion thorn (*Canotia holacantha*).  
Photo by: S. Jones

*Monolepis nuttalliana* (J.A. Schultes) Greene  
*Salsola tragus* L.

Nuttall's povertyweed  
Prickly Russian thistle



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**CAPPARIDACEAE**

**CAPER FAMILY**

*Polanisia dodecandra* (L.) DC. ssp. *trachysperma* (Torr. & A. Gray) Iltis

Sandyseed clammyweed

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**CONVOLVULACEAE**

**MORNING GLORY FAMILY**

*Evolvulus arizonicus* A. Gray

Wild dwarf morning-glory

*Ipomoea cristulata* Hallier f.

Transpecos morning-glory

*Ipomoea hederacea* Jacq.

Ivyleaf morning-glory

Nuttall's povertyweed (*Monolepis nuttalliana*).  
Photo by: C. Hull



Ivyleaf morning-glory (*Ipomoea hederacea*).  
Photo by: E. Makings

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**CRASSULACEAE**

**STONECROP FAMILY**

*Crassula connata* (Ruiz & Pav.) Berger

Sand pygmyweed

*Dudleya saxosa* (M.E. Jones) Britt. & Rose ssp. *collomiae* (Rose ex Morton) Moran

Gila County liveforever

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**CROSSOSOMATACEAE**

**CROSSOSOMA FAMILY**

*Crossosoma bigelovii* S. Wats.

Ragged rockflower

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**CUCURBITACEAE**

**SQUASH FAMILY**

*Cucurbita digitata* A. Gray

Fingerleaf gourd

*Marah gilensis* Greene

Gila manroot



Ragged rockflower (*Crossosoma bigelovii*).  
Photo by: M. Jensen

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**CUPERESSACEAE**

**CYPRESS FAMILY**

*Juniperus coahuilensis* (Martinez) Gausson ex R.P. Adams

Redberry juniper

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**CUSCUTACEAE**

**DODDER FAMILY**

*Cuscuta indecora* Choisy

Bigseed alfalfa dodder

*Cuscuta umbellata* Kunth

Flatglobe dodder



Rough jointfir (*Ephedra aspera*).  
Photo by: C. Hull

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**EPHEDRACEAE**

*Ephedra aspera* Engelm. ex S. Wats.

**JOINT-FIR FAMILY**

Rough jointfir

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**EUPHORBIACEAE**

*Chamaesyce abramsiana* (L.C. Wheeler) Koutnik

*Chamaesyce arizonica* (Engelm.) Arthur

*Chamaesyce capitellata* (Engelm.) Millsp.

*Chamaesyce florida* (Engelm.) Millsp.

*Chamaesyce melanadenia* (Torr.) Millsp.

*Chamaesyce micromera* (Boiss. ex Engelm.) Woot. & Standl.

*Chamaesyce pediculifera* (Engelm.) Rose & Standl.

*Chamaesyce polycarpa* (Benth.) Millsp. ex Parish

*Chamaesyce revoluta* (Engelm.) Small

*Chamaesyce setiloba* (Engelm. ex Torr.) Millsp. ex Parish

*Ditaxis lanceolata* (Benth.) Pax & K. Hoffmann

*Ditaxis neomexicana* (Muell.-Arg.) Heller

*Euphorbia eriantha* Benth.

*Tragia nepetifolia* Cav.

*Tragia ramosa* Torr.

**POINSETTIA FAMILY**

Abrams' sandmat

Arizona sandmat

Head sandmat

Chiricahua Mountain sandmat

Red-gland spurge

Sonoran sandmat

Carrizo Mountain sandmat

Smallseed sandmat

Threadstem sandmat

Yuma sandmat

Narrowleaf silverbush

New Mexico silverbush

Beetle spurge

Catnip noseburn

Branched noseburn



Fairyduster (*Calliandra eriophylla*).

Photo by: M. Jensen



Desert lupine (*Lupinus sparsiflorus*).

Photo by: M. Jensen



Desert ironwood (*Olneya tesota*).

Photo by: M. Jensen

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**FABACEAE**

*Acacia constricta* Benth.

*Acacia greggii* A. Gray

*Astragalus nuttallianus* DC.

*Calliandra eriophylla* Benth.

*Lotus humistratus* Greene

*Lotus rigidus* (Benth.) Greene

*Lotus salsuginosus* var. *brevivexillus*

*Lotus strigosus* Greene var. *tomentellus* (Greene) Isely

*Lupinus concinnus* J.G. Agardh

*Lupinus sparsiflorus* Benth.

*Marina parryi* (Torr. & A. Gray) Barneby

**BEAN FAMILY**

Whitethorn acacia

Catclaw acacia

Smallflowered milkvetch

Fairyduster

Foothill deervetch

Shrubby deervetch

Coastal bird's-foot trefoil

Strigose bird's-foot trefoil

Bajada lupine

Desert lupine

Parry's false prairie-clover



Yellow paloverde (*Parkinsonia microphylla*).

Photo by: M. Jensen

<i>Mimosa aculeaticarpa</i> Ortega var. <i>biuncifera</i> (Benth.) Barneby	Catclaw mimosa
<i>Olneya tesota</i> A. Gray	Desert ironwood
<i>Parkinsonia florida</i> (Benth. ex A. Gray) S. Wats.	Blue paloverde
<i>Parkinsonia microphylla</i> Torr.	Yellow paloverde
<i>Prosopis juliflora</i> (Sw.) DC. var. <i>velutina</i> (Woot.) Sarg.	Mesquite
<i>Senna artemisioides</i> (Gaud. ex DC.) Randell	Silver senna
<i>Senna covesii</i> (A. Gray) Irwin & Barneby	Rattlebox senna
<i>Vicia ludoviciana</i> Nutt. ssp. <i>ludoviciana</i>	Louisiana vetch



Mesquite (*Prosopis juliflora*).  
Photo by: M. Jensen

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<b>FAGACEAE</b>	<b>OAK FAMILY</b>
<i>Quercus turbinella</i> Greene	Sonoran scrub oak



Sonoran scrub oak (*Quercus turbinella*).  
Photo by: M. Jensen

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<b>FOUQUIERIACEAE</b>	<b>OCOTILLO FAMILY</b>
<i>Fouquieria splendens</i> Engelm.	Ocotillo

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<b>GERANIACEAE</b>	<b>GERANIUM FAMILY</b>
<i>Erodium cicutarium</i> (L.) L'Hér. ex Ait.	Redstem stork's bill
<i>Erodium texanum</i> A. Gray	Texas stork's bill



Purplestem phacelia (*Phacelia crenulata*).  
Photo by: M. Jensen

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<b>HYDROPHYLLACEAE</b>	<b>WATERLEAF FAMILY</b>
<i>Emmenanthe penduliflora</i> Benth.	Whisperingbells
<i>Eucrypta chrysanthemifolia</i> (Benth.) Greene	Spotted hideseed
<i>Phacelia affinis</i> A. Gray	Limestone phacelia
<i>Phacelia crenulata</i> Torr. ex S. Wats. var. <i>ambigua</i> (M.E. Jones) J.F. Macbr.	Purplestem phacelia
<i>Phacelia cryptantha</i> Greene	Hiddenflower phacelia
<i>Phacelia distans</i> Benth.	Distant phacelia
<i>Phacelia ramosissima</i> Dougl. ex Lehm.	Branching phacelia
<i>Pholistoma auritum</i> (Lindl.) Lilja var. <i>arizonicum</i> (M.E. Jones) Constance	Arizona fiestaflower



White ratany (*Krameria bicolor*).  
Photo by: M. Jensen

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<b>JUNCACEAE</b>	<b>RUSH FAMILY</b>
<i>Juncus bufonius</i> L.	Toad rush

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**KRAMERIACEAE**

*Krameria bicolor* S. Watson

*Krameria erecta* Willd. ex J.A. Schultes

**RATANY FAMILY**

White ratany

Littleleaf ratany



Chia (*Salvia columbariae*).  
Photo by: M. Jensen

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**LAMIACEAE**

*Hedeoma nana* Greene ssp. *nana* (Torr.) Briq.

*Hyptis emoryi* Torr.

*Salazaria mexicana* Torr.

*Salvia columbariae* Benth.

**MINT FAMILY**

Dwarf false pennyroyal

Desert lavender

Mexican bladdersage

Chia



Bluedicks (*Dichelostemma capitatum*).  
Photo by: M. Jensen

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**LILIACEAE**

*Calochortus kennedyi* Porter

*Dichelostemma capitatum* (Benth.) Wood

*Nolina microcarpa* S. Wats.

**LILY FAMILY**

Desert mariposa lily

Bluedicks

Sacahuista



Slender janusia (*Janusia gracilis*).  
Photo by: S. Jones

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**LOASACEAE**

*Mentzelia affinis* Greene

*Mentzelia albicaulis* (Dougl. ex Hook.) Dougl. ex Torr.  
& A. Gray

*Mentzelia multiflora* (Nutt.) A. Gray

**STICKLEAF FAMILY**

Yellowcomet

Whitestem blazingstar

Adonis blazingstar

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**MALPHIGIACEAE**

*Janusia gracilis* A. Gray

**BARBADOS CHERRY FAMILY**

Slender janusia

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**MALVACEAE**

*Abutilon incanum* (Link) Sweet

*Abutilon palmeri* A. Gray

*Abutilon parvulum* A. Gray

*Ayenia filiformis* S. Wats.

*Herissantia crispa* (L.) Briz.

*Hibiscus coulteri* Harvey ex A. Gray

*Malva parviflora* L.

*Sida abutifolia* P. Mill.

**MALLOW FAMILY**

Pelotazo

Palmer's Indian mallow

Dwarf Indian mallow

Trans-Pecos ayenia

Bladdermallow

Desert rosemallow

Cheeseweed mallow

Spreading fanpetals



Apricot globemallow (*Sphaeralcea ambigua*).  
Photo by: M. Jensen

*Sphaeralcea ambigua* A. Gray ssp. *ambigua* Apricot globemallow  
*Sphaeralcea rusbyi* A. Gray Rusby's globemallow



Doubleclaw (*Proboscidea parviflora*).

Photo by: S. Jones

**MARTYNIACEAE**

*Proboscidea althaeifolia* (Benth.) Dcne.  
*Proboscidea parviflora* (Woot.) Woot. & Standl.

**DEVIL'S CLAW FAMILY**

Desert unicorn-plant  
 Doubleclaw

**NYCTAGINACEAE**

*Allionia choisyi* Standl.  
*Allionia incarnata* L. var. *villosa* (Standl.) B.L. Turner  
*Boerhavia coccinea* P. Mill.  
*Boerhavia coulteri* (Hook. f.) S. Wats.  
*Boerhavia intermedia* M.E. Jones  
*Boerhavia spicata* Choisy  
*Boerhavia wrightii* A. Gray  
*Commicarpus scandens* (L.) Standl.  
*Mirabilis coccinea* (Torr.) Benth. & Hook. f.  
*Mirabilis laevis* (Benth.) Curran var. *villosa* (Kellogg) Spellenb.  
*Mirabilis multiflora* (Torr.) A. Gray var. *multiflora*  
*Menodora scabra* A. Gray

**FOUR O'CLOCK FAMILY**

Annual windmills  
 Trailing windmills  
 Scarlet spiderling  
 Coulter's spiderling  
 Fivewing spiderling  
 Creeping spiderling  
 Largebract spiderling  
 Climbing wartclub  
 Scarlet four o'clock  
 Wishbone-bush  
 Colorado four o'clock  
 Rough menodora



Annual windmills (*Allionia choisyi*).

Photo by: S. Jones

**ONAGRACEAE**

*Camissonia californica* (Nutt. ex Torr. & A. Gray) Raven  
*Camissonia confusa* Raven  
*Camissonia micrantha* (Hornem. ex Spreng.) Raven  
*Camissonia pallida* (Abrams) Raven  
*Clarkia epilobioides* (Nutt. ex Torr. & A. Gray) A. Nels. & J.F. Macbr.  
*Oenothera elata* Kunth ssp. *hirsutissima* (A. Gray ex S. Wats.) W. Dietr.  
*Oenothera primiveris* A. Gray ssp. *primiveris*

**EVENING PRIMROSE FAMILY**

California suncup  
 San Bernardino suncup  
 Miniature suncup  
 Paleyellow suncup  
 Canyon clarkia  
 Hooker's evening-primrose  
 Desert evening-primrose



Colorado four o'clock (*Mirabilis multiflora*).

Photo by: M. Jensen



Desert evening-primrose (*Oenothera primiveris*).

Photo by: M. Tluczek

**OROBANCHACEAE**

*Orobanche cooperi* (A. Gray) Heller

**BROOMRAPE FAMILY**

Desert broomrape



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**PAPAVERACEAE**

*Argemone pleiakantha* Greene

*Eschscholzia californica* Cham. ssp. *mexicana* (Greene)  
C. Clark

**POPPY FAMILY**

Southwestern  
pricklypoppy

California poppy



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**PLANTAGINACEAE**

*Plantago ovata* Forsk.

*Plantago patagonica* Jacq.

**PLANTAIN FAMILY**

Desert Indianwheat

Woolly plantain

Woolly plantain (*Plantago patagonica*).

Photo by: C. Hull

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**POACEAE**

*Aristida adscensionis* L.

*Aristida divaricata* Humb. & Bonpl. ex Willd.

*Aristida pansa* Woot. & Standl.

*Aristida purpurea* Nutt. var. *fendleriana* (Steud.) Vasey

*Aristida purpurea* Nutt. var. *nealleyi* (Vasey) Allred

*Aristida purpurea* Nutt. var. *parishii* (A.S. Hitchc.)  
Allred

*Aristida purpurea* Nutt. var. *purpurea*

*Aristida purpurea* Nutt. var. *wrightii* (Nash) Allred

*Avena fatua* L.

*Bothriochloa barbinodis* (Lag.) Herter

*Bouteloua aristidoides* (Kunth) Griseb.

*Bouteloua barbata* Lag.

*Bouteloua curtipendula* (Michx.) Torr. var. *caespitosa*  
Gould & Kapadia

*Bromus arizonicus* (Shear) Stebbins

*Bromus arvensis* L.

*Bromus berterianus* Colla

*Bromus carinatus* Hook. & Arn.

*Bromus marginatus* Nees Ex Steud.

*Bromus rubens* L.

*Cynodon dactylon* (L.) Pers.

*Dasyochloa pulchella* (Kunth) Willd. ex Rydb.

*Digitaria californica* (Benth.) Henr.

*Elymus elymoides* (Raf.) Swezey

**GRASS FAMILY**

Sixweeks threeawn

Poverty threeawn

Wooton's threeawn

Fendler's threeawn

Blue threeawn

Parish's threeawn

Purple threeawn

Wright's threeawn

Wild oat

Cane bluestem

Needle grama

Sixweeks grama

Sideoats grama

Arizona brome

Field brome

Chilean chess

Arizona brome

Mountain brome

Red brome

Bermudagrass

Low woollygrass

Arizona cottontop

Squirreltail



Poverty threeawn (*Aristida divaricata*).

Photo by: S. Jones



Low woollygrass  
(*Dasyochloa pulchella*).

Photo by: S. Jones



Stinkgrass (*Eragrostis cilianensis*).

Photo by: S. Jones

*Enneapogon desvauxii* Desv. ex Beauv.  
*Eragrostis cilianensis* (All.) Vign. ex Janchen  
*Heteropogon contortus* (L.) Beauv. ex Roemer & J.A. Schultes  
*Hilaria belangeri* (Steud.) Nash (Steud.)  
*Hilaria rigida* (Thurb.) Benth. ex Scribn.  
*Hordeum murinum* L. ssp. *glaucum* (Steud.) Tzvelev  
*Hordeum murinum* L. ssp. *leporinum* (Link) Arcang.  
*Leptochloa dubia* (Kunth) Nees  
*Leptochloa panicea* (Retz.) Ohwi ssp. *brachiata* (Steudl.) N. Snow  
*Muhlenbergia emersleyi* Vasey  
*Muhlenbergia microsperma* (DC.) Trin.  
*Muhlenbergia porteri* Scribn. ex Beal  
*Panicum hirticaule* J. Presl. ssp. *hirticaule*  
*Pappostipa speciosa* (Trin. & Rupr.) Romasch.  
*Pennisetum ciliare* (L.) Link  
*Pennisetum setaceum* (Forsk.) Chiov.  
*Phalaris minor* Retz.  
*Poa bigelovii* Vasey & Scribn.  
*Polypogon monspeliensis* (L.) Desf.  
*Schismus arabicus* Nees  
*Schismus barbatus* (Loefl. ex L.) Thellung  
  
*Sporobolus cryptandrus* (Torr.) A. Gray  
*Tridens muticus* (Torr.) Nash var. *muticus*  
*Urochloa arizonica* (Scribn. & Merr.) O. Morrone & F. Zuloaga  
*Vulpia microstachys* (Nutt.) Munro var. *ciliata* (Beal) Lonard & Gould  
*Vulpia microstachys* (Nutt.) Munro var. *pauciflora* (Scribn. ex Beal) Lonard & Gould  
*Vulpia octoflora* (Walt.) Rydb. var. *octoflora*

Nineawn pappusgrass  
Stinkgrass  
Tanglehead  
Curly-mesquite  
Big galleta  
Smooth barley  
Leporinum barley  
Green sprangletop  
Mucronate sprangletop  
Bullgrass  
Littleseed muhly  
Bush muhly  
Mexican panicgrass  
Desert needlegrass  
Buffelgrass  
Crimson fountaingrass  
Littleseed canarygrass  
Bigelow's bluegrass  
Annual rabbitsfoot grass  
Arabian schismus  
Common Mediterranean grass  
Sand dropseed  
Slim tridens  
Arizona signalgrass  
Eastwood fescue  
Pacific fescue  
Sixweeks fescue



Big galleta (*Hilaria rigida*).  
Photo by: S. Jones



Bush muhly (*Muhlenbergia porteri*).  
Photo by: S. Jones



Miniature woollystar (*Eriastrum diffusum*).  
Photo by: M. Jensen



Lesser yellowthroat gilia (*Gilia flavocincta*). Photo by: M. Jensen

**POLEMONIACEAE**

*Eriastrum diffusum* (A. Gray) Mason  
*Eriastrum eremicum* (Jepson) Mason

**PHLOX FAMILY**

Miniature woollystar  
Desert woollystar

<i>Gilia flavocincta</i> A. Nels.	Lesser yellowthroat gilia
<i>Gilia stellata</i> Heller	Star gilia
<i>Leptosiphon aureus</i> (Nutt.) J.M. Porter & L.A. Johnson ssp. <i>aureus</i>	Golden linanthus
<i>Phlox gracilis</i> (Hook.) Greene	Slender phlox
<i>Phlox tenuifolia</i> E. Nels.	Santa Catalina Mountain phlox



Golden linanthus  
(*Leptosiphon aureus*).  
Photo by: M. Jensen

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**POLYGONACEAE**

<i>Chorizanthe brevicornu</i> Torr.
<i>Eriogonum abertianum</i> Torr.
<i>Eriogonum deflexum</i> Torr. var. <i>deflexum</i>
<i>Eriogonum fasciculatum</i> Benth. var. <i>polifolium</i> (Benth.) Torr. & A. Gray
<i>Eriogonum inflatum</i> Torr. & Frém.
<i>Eriogonum palmerianum</i> Reveal
<i>Eriogonum trichopes</i> Torr.
<i>Eriogonum wrightii</i> Torr. ex Benth.
<i>Pterostegia drymarioides</i> Fisch. & C.A. Mey.
<i>Rumex hymenosepalus</i> Torr.

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**BUCKWHEAT FAMILY**

Brittle spineflower
Abert's buckwheat
Flatcrown buckwheat
Eastern Mojave buckwheat
Desert trumpet
Palmer's buckwheat
Little deserttrumpet
Bastardsage
Woodland pterostegia
Canaigre dock



Common pussypaws  
(*Cistanthe monandra*). Photo  
by: S. Jones

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**PORTULACACEAE**

<i>Calandrinia ciliata</i> (Ruiz & Pav.) DC.
<i>Cistanthe monandra</i> (Nutt.) Hershkovitz
<i>Claytonia perfoliata</i> Donn. Ex Willd. ssp. <i>mexicana</i> (Rydb.) J.M. Miller & K. Chambers
<i>Portulaca oleracea</i> L.
<i>Portulaca pilosa</i> L.
<i>Portulaca umbraticola</i> Kunth

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**PURSLANE FAMILY**

Fringed redmaids
Common pussypaws
Miner's lettuce
Little hogweed
Pink purslane
Wingpod purslane



Pink purslane (*Portulaca  
pilosa*).  
Photo by: S. Jones

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**PTERIDACEAE**

<i>Astrolepis cochisensis</i> (Goodding) Bentham and Windham ssp. <i>cochisensis</i>
<i>Astrolepis sinuata</i> (Lag. ex Sw.) Benham & Windham
<i>Astrolepis windhamii</i> Benham
<i>Cheilanthes covillei</i> Maxon

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**FERN FAMILY**

Cochise scaly cloakfern
Wavy scaly cloakfern
Windham's scaly cloakfern
Coville's lipfern



Windham's scaly cloakfern  
(*Astrolepis windhamii*).  
Photo by: S. Jones

<i>Cheilanthes parryi</i> (D.C. Eat.) Domin	Parry's lipfern
<i>Cheilanthes wrightii</i> Hook.	Wright's lipfern
<i>Notholaena standleyi</i> Maxon	Star cloak fern
<i>Pellaea truncata</i> Goodding	Spiny cliffbrake
<i>Pentagramma triangularis</i> (Kaulf.) Yatsk., Windham & Wollenw. ssp. <i>maxonii</i> (Weatherby) Yatsk., Windham & Wollen.	Maxon's goldback fern



Tuber anemone (*Anemone tuberosa*).

Photo by: M. Jensen

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**RANUNCULACEAE**

*Anemone tuberosa* Rydb.  
*Clematis drummondii* Torr. & A. Gray  
*Delphinium parishii* A. Gray  
*Delphinium scaposum* Greene

**BUTTERCUP FAMILY**

Tuber anemone  
Drummond's clematis  
Desert larkspur  
Tall mountain larkspur




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**RHAMNACEAE**

*Ziziphus obtusifolia* (Hook. Ex Torr. & A. Gray) A. Gray  
var. *canescens* (A. Gray) M.C. Johnston

**BUCKTHORN FAMILY**

Lotebush

Alderleaf mountain mahogany (*Cercocarpus montanus*).  
Photo by: S. Jones

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**ROSACEAE**

*Cercocarpus montanus* Raf.

**ROSE FAMILY**

Alderleaf mountain mahogany



Fremont cottonwood (*Populus fremontii*).

Photo by: R. Kleinman

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**RUBIACEAE**

*Galium aparine* L.  
*Galium stellatum* Kellogg ssp. *eremicum* (Hilend & Howell) Ehrend.

**MADDER FAMILY**

Stickywilly  
Starry bedstraw

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**SALICACEAE**

*Populus fremontii* S. Wats. ssp. *fremontii*  
*Salix goodingii* Ball

**WILLOW FAMILY**

Fremont cottonwood  
Goodding's willow



Wingleaf soapberry (*Sapindus saponaria*).

Photo by: S. Jones

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**SAPINDACEAE**

*Dodonaea viscosa* (L.) Jacq.  
*Sapindus saponaria* L.

**SOAPBERRY FAMILY**

Florida hopbush  
Wingleaf soapberry

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**SCROPHULARIACEAE**

*Castilleja applegatei* Fern. ssp. *martinii* (Abrams)  
Chuang & Heckard  
*Castilleja exserta* (Heller) Chuang & Heckard ssp.  
*exserta*  
*Keckiella antirrhinoides* (Benth.) Straw  
*Maurandella antirrhiniflora* (Humb. & Bonpl. ex Willd.)  
Rothm.  
*Mimulus guttatus* DC.  
*Penstemon pseudospectabilis* M.E. Jones ssp.  
*connatifolius* (A. Nels.) Keck  
*Penstemon subulatus* M.E. Jones  
*Sairocarpus nuttallianus* (Benth. ex A. DC.) D.A. Sutton  
*Veronica peregrina* L.

**SNAPDRAGON FAMILY**

Wavyleaf Indian  
paintbrush  
Exserted Indian  
paintbrush  
Snapdragon penstemon  
Snapdragon vine  
Seep monkeyflower  
Desert beardtongue  
Hackberry beardtongue  
Violet snapdragon  
Neckweed



Exserted Indian paintbrush  
(*Castilleja exserta*).  
Photo by: M. Jensen

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**SELAGINELLACEAE**

*Selaginella arizonica* Maxon

**SPIKEMOSS FAMILY**

Arizona spikemoss



Seep monkeyflower  
(*Mimulus guttatus*).  
Photo by: M. Jensen

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**SIMMONDSIACEAE**

*Simmondsia chinensis* (Link) Schneid.

**GOATNUT FAMILY**

Jojoba



Jojoba (*Simmondsia  
chinensis*).  
Photo by: M. Jensen

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**SOLANACEAE**

*Datura discolor* Bernh.  
*Lycium andersonii* A. Gray var. *andersonii*  
*Lycium andersonii* A. Gray var. *deserticola* (C.L. Hitchc.)  
C.L. Hitchc. ex Munz  
*Lycium andersonii* A. Gray var. *wrightii* A. Gray  
*Lycium berlandieri* Dunal  
*Lycium exsertum* A. Gray  
*Lycium fremontii* A. Gray  
*Lycium parishii* A. Gray  
*Nicotiana obtusifolia* Mertens & Galeotti  
*Physalis hederifolia* A. Gray  
*Solanum douglasii* Dunal  
*Solanum elaeagnifolium* Cav.

**POTATO FAMILY**

Desert thorn-apple  
Water jacket  
Water jacket  
Water jacket  
Berlandier's wolfberry  
Arizona desert-thorn  
Fremont's desert-thorn  
Parish's desert-thorn  
Desert tobacco  
Ivyleaf groundcherry  
Greenspot nightshade  
Silverleaf nightshade



Desert thorn-apple (*Datura  
discolor*).  
Photo by: M. Jensen

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**TAMARICACEAE**

*Tamarix chinensis* Lour.

**TAMARISK FAMILY**

Five-stamen tamarisk

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**TYPHACEAE**

*Typha domingensis* Pers.

**CATTAIL FAMILY**

Southern cattail

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**ULMACEAE**

*Celtis pallida* Torr.

*Celtis reticulata* Torr.

**ELM FAMILY**

Spiny hackberry

Netleaf hackberry

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Five-stem tamarisk (*Tamarix chinensis*).

Photo by: M. Jensen

**URTICACEAE**

*Parietaria hespera* Hinton var. *hespera*

**NETTLE FAMILY**

Rillita pellitory

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**VERBENACEAE**

*Aloysia wrightii* Heller ex Abrams

*Glandularia gooddingii* (Briq.) Solbrig

*Verbena bracteata* Lag. & Rodr.

**VERBENA FAMILY**

Wright's beebrush

Southwestern mock  
vervain

Bigbract verbena

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Netleaf hackberry (*Celtis reticulata*).

Photo by: M. Jensen

**VISCACEAE**

*Phoradendron californicum* Nutt.

**MISTELTOE FAMILY**

Mesquite mistletoe

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**ZYGOPHYLLACEAE**

*Kallstroemia californica* (S. Wats.) Vail

*Kallstroemia grandiflora* Torr. ex A. Gray

*Kallstroemia parviflora* J.B.S. Norton

*Larrea tridentata* (Sessé & Moc. ex DC.) Coville

*Tribulus terrestris* L.

**CALTROP FAMILY**

California caltrop

Arizona poppy

Warty caltrop

Creosote bush

Puncturevine

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Southwestern mock vervain (*Glandularia gooddingii*).

Photo by: M. Jensen



Creosote bush (*Larrea tridentata*).

Photo by: M. Jensen

## INVERTEBRATES

### *Ground-dwelling arthropods*

Arthropods, which include arachnids and insects, are well suited to monitoring ecological health. This diverse group of organisms typically reflects overall biological diversity of a system and includes several trophic levels.

The specific goals of the ground-dwelling arthropod study were to (1) develop a list of ground-dwelling arthropods in the MSP, (2) to examine arthropod assemblages in the context of ecological stress stemming from development pressure at the MSP boundary, and (3) establish baseline data for further investigations.

Arthropods are notoriously difficult to identify to the species level. Often entomologists identify a specimen to order, suborder, or family, especially when dealing with very small organisms. Instead



Green lynx spider (*Peucetia viridans*).  
Photo by: C. Hull

of referring to different types of arthropods as different species, the terms “taxa”, or “taxonomic group” are used. This allows the researchers to maintain accuracy and still account for the number of different arthropods documented. Table 2 shows the major, recognizable taxonomic groups, followed by the number of taxa within each group. For example, there were 27 different types of spiders (family Araneae) found in the course of the MSP survey.

A total of 7,761 specimens were captured in the pitfall traps between summer of 2012 and fall of 2013. Examination of these specimens resulted in 146 taxa of arthropods. Seventy six of the



Johnson's jumping spider (*Phidippus johnsoni*).  
Photo by: M. Jensen

146 were flying insects that had gotten caught in the pitfall traps, leaving 70 taxa of arthropods that were original to the survey. Ants (Family Formicidae) were by far the most common arthropods in the samples, constituting 45% of the total number of organisms. Beetles, spiders, ants, and true bugs were the most diverse taxonomic groups.

Arthropod Group	Taxonomic Group	Number of Unique Taxa
*Beetles	Order Coleoptera	29
Spiders	Family Araneae	27
Ants	Family Formicidae	23
*True Bugs	Order Hemiptera	17
*Bees and Wasps	Order Hymenoptera	12
*Flies	Order Diptera	10
Springtails	Family Isotomidae	4
Mites/Ticks	Subclass Acari	3
*Grasshoppers and Crickets	Order Orthoptera	3
Scorpions	Order Scorpiones	2
*Moths	Order Lepidoptera	2
Thrips	Family Thripidae	2
Centipede	Class Chilopoda	2
Pseudoscorpiones	Order Pseudoscorpiones	2
Bristletails	Subclass Microcoryphia	1
Silverfish	Order Zygentoma	1
Pillbug	Order Isopoda	1
*Termites	Family Termitoidae	1
Booklice	Suborder Psocoptera	1
Mantis	Family Mantodea	1
*Lacewings	Family Chrysopidae	1
Earwig	Order Dermaptera	1



Darkling beetle (*Eleodes armatus*).

Photo by: C. Allen



*Forelius pruinosus* ant.

Photo by: C. Allen

Table 2. Arthropods, including arachnids, centipedes, and insects found in the pitfall traps used by the ground-dwelling arthropod survey.

\*Arthropods also detected on the flying insect survey.

This preliminary assessment of ground-dwelling arthropods in the MSP indicates a diverse and vibrant community, with a substantial number of organisms having been collected during the relatively short analysis period. There were no sensitive species documented during this survey.

The results suggest relatively similar assemblages near to and at greater distances from the

MSP boundary, but with considerable variability among communities across the MSP. These differences may reflect the substantial variation in soil and vegetation, among other characteristics, across the MSP. Future analyses will include a more detailed examination of these environmental factors, and an in-depth analysis of specific taxonomic groups.



**Large day-flying insects**

Ninety-eight taxa of flying insects were documented on the MSP between fall of 2011 and the present. Most of the large, conspicuous, and abundant members of this fauna that are likely to be seen have been seen. The list of species is expected to continue to grow, albeit more slowly than the first two years of the survey.



Iron cross beetle (*Tegrodera aloga*).  
Photo by: L. Adrian

New additions are likely to be of species whose populations on the MSP are relatively small or that visit the MSP infrequently.

The diversity and abundance are typical of upper Sonoran Desert habitats throughout the region. As in other desert areas in the region, abundance and diversity varies seasonally, as suggested by the pattern of sightings for many species. For example, two large and conspicuous blister beetles, the master blister beetle and the iron cross beetle, have only been observed in the late spring and never at other times of the year.

The flying insect team did not document any sensitive or endangered species. However, monarch butterflies should visit the MSP, especially during their fall migration, but have not yet been reported. This species and its migration are described as threatened, which might warrant special attention to the occurrence of this species and its milkweed host plants on the MSP.

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**Large, Day-Flying Insects of Scottsdale’s McDowell Sonoran Preserve**

This list conforms to the nomenclature used in Bugguide.net (2013).

<p><b>DRAGONFLIES AND DAMSELFLIES</b></p> <p>Variiegated meadowhawk Familiar bluet Mexican amberwing Roseate skimmer Flame skimmer</p>	<p><b>ORDER ODONATA</b></p> <p><i>Sympetrum corruptum</i> <i>Enallagma civile</i> <i>Perithemis tenera</i> <i>Orthemis ferruginea</i> <i>Libellula saturate</i></p>
<p><b>GRASSHOPPERS AND CRICKETS</b></p> <p>Desert clicker</p>	<p><b>ORDER ORTHOPTERA</b></p> <p><i>Ligurotettix coquilletti</i></p>



Rosette skimmer dragonfly (*Orthemis ferruginea*).  
Photo by: M. Jensen

Pallid-winged grasshopper	<i>Trimerotropis pallidipennis</i>
Many-hued grasshopper	<i>Poeciltettix sanguineus</i>
Spur-throated grasshopper	<i>Barytettix humpreysii</i>
Blue-winged grasshopper	<i>Leprus Intermedius</i>
Elegant bush katydid	<i>Insara elegans</i>
Tree cricket	Family Oecanthinae
Green tree cricket	<i>Oecanthus sp.</i>



Desert clicker (*Ligurotettix coquilletti*).

Photo by: J. Weser

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**STICK INSECTS**

Walking stick

**ORDER PHASMIDA**

Order Phasmida

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**TERMITES**

Encrusting termite

Desert subterranean termite

**ORDER ISOPTERA**

*Gnathamitermes perplexus*

*Heterotermes aureus*



Walking stick (Family Phasmida).

Photo by: M. Jensen

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**MANTIS**

Praying mantis

**ORDER MANTODEA**

Family Mantidae

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**TRUE BUGS**

Assassin bug

Leafhopper assassin bug

Lace bug

Bordered bug

Cochineal insect

**ORDER HEMIPTERA**

Family Reduviidae

*Zelus spp.*

*Corythucha spp.*

*Largus spp.*

Family Dactylopiidae



Assassin bug (Family Reduviidae).

Photo by: M. Jensen

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**BEETLES**

Wood boring beetle

Blister beetle

Long beak meloid

Master blister beetle

Red-eared blister beetle

Iron cross beetle

Ornate checkered beetle

Weevil

Pinacate beetle

Seven-spotted lady beetle

Convergent lady beetle

Bloody net-wing beetle

**ORDER COLEOPTERA**

*Acmaeodera alicia*

*Gnathium sp.*

*Nemognatha sp.*

*Lytta magister*

*Lytta auriculata*

*Tegrodera aloga*

*Trichodes ornatus*

Family Curculionidae

*Eleodes spinipes*

*Coccinella septempunctata*

*Hippodamia convergens*

*Lycus sanguineus*



Ornate checkered beetle (*Trichodes ornatus*).

Photo by: E. Roberge

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**NET-WINGED INSECTS**

Green lacewing  
Ant lion

**ORDER NEUROPTERA**

Family Chrysopidae  
*Brachynemurus* sp.

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**WASPS, BEES, SAWFLIES, ANTS**

European honey bee  
Gray hairy bee  
Tarantula hawk  
Ichneumon wasp  
Scolid wasp  
Cuckoo wasp  
Braconid wasp

**ORDER HYMENOPTERA**

*Apis mellifera*  
*Centris pallida*  
*Pepsis thisbe*  
Family Ichneumonidae  
Family Scoliidae  
Family Chrysididae  
Family Braconidae

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**CADDISFLY**

Caddisfly

**ORDER TRICOPTERA**

Tricoptera

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**BUTTERFLIES AND MOTHS**

Empress leilia  
Chalcedon checkerspot  
Queen  
California patch  
Snout  
Tiny checkerspot  
Painted lady  
Desert orange tip  
Sleepy orange  
Cloudless sulfur  
Checkered white  
Spring white  
Southern dog face  
Dainty sulfur  
Erichson's white skipper  
Pipevine swallowtail  
Grey hairstreak  
Reakirt's blue  
Great purple hairstreak  
Square spotted blue  
Holly blue

**ORDER LEPIDOPTERA**

*Asterocampa leilia*  
*Euphydryas chalcedona*  
*Danuas gilippus*  
*Chlosyne californica*  
*Libytheana carineta*  
*Microtia dymas*  
*Vanessa cardui*  
*Anthocharis pima*  
*Eurema nicippe*  
*Phoebis sennae*  
*Pontia protodice*  
*Pieris sisymbrii*  
*Zerene cesonia*  
*Nathalis iole*  
*Heliopetes domicella*  
*Battus philenor*  
*Strymon melinus*  
*Hemiargus isola*  
*Atlides halesus*  
*Euphilotes battoides*  
*Celastrina argioius*



Green lacewing (Family Chrysopidae).  
Photo by: M. Jensen



European honey-bee (*Apis mellifera*).  
Photo by: M. Garrick



Empress Leilia (*Asterocampa leilia*).  
Photo by: E. Roberge



Queen (*Danuas gilippus*).  
Photo by: M. Jensen

Marine blue  
 Mormon metalmark  
 Western pygmy blue  
 Common checkered-skipper  
 Northern white skipper  
 Uniden duskwing  
 Funereal duskwing  
 Arizona powdered skipper  
 White-lined sphinx  
 Geometrid moth  
 Noctuid moth  
 n/a  
 n/a  
 Palo verde webworm moth  
 White-lined sphinx moth  
 n/a  
 Arizona bird dropping moth  
 n/a  
 Staghorn cholla moth  
 Petrophila moth  
 n/a  
 Grass-veneer moth  
 Blastobasis moth  
 Chionodes moth  
 n/a  
 n/a  
 Mesquite webworm moth

*Leptotes marina*  
*Apodemia mormo*  
*Brephidium exile*  
*Pyrgus communis*  
*Heliopetes ericetorum*  
*Erynnis sp.*  
*Erynnis funeralis*  
*Systasea zampa*  
*Hyles lineata*  
 Family Geometridae  
 Family Noctuidae  
*Givira thedori*  
*Givira mucida*  
*Faculta inaequalis*  
*Hyles lineata*  
*Forsebia cinis*  
*Ponometia elegantula*  
*Acontia sp.*  
*Euscirrhopterus cosyra*  
*Petrophila sp.*  
*Pyrausta pseudonythesalis*  
*Euchromius ocellus*  
*Blastobasis sp.*  
*Chionodes sp.*  
*Aristotelia coralline*  
*Anacamptis sp.*  
*Friseria cockerelli*



Snout (*Libytheana carineta*).  
 Photo by: M. Jensen



Checkered white (*Pontia protodice*).  
 Photo by: M. Jensen



*Givira thedori* moth. No common name.  
 Photo by: M. Jensen

**FLIES**

Bot fly  
 Blow fly  
 Hover fly  
 Bee fly  
 Robber fly  
 Mosquito

**ORDER DIPTERA**

*Cuterebra austeni*  
*Lucillia sp.*  
 Family Syrphidae  
 Family Bombyliidae  
 Family Asilidae  
 Family Culicidae



Robber fly (Asilidae family).  
 Photo by: M. Jensen.

## Reptiles and amphibians

A total of 194 separate animals were located on the MSP between January, 2011 and November, 2013, comprising 35 distinct species. This includes 16 species of snakes, 15 species of lizards, 1 species of tortoise, and 3 toad species. The most commonly sighted species of snake was the western diamond-back. The most common lizard species were the western



Western diamond-back (*Crotalus atrox*).  
Photo by: D. Weber

side-blotch, Schott's tree lizard, western long-tailed brush lizard, and Sonoran tiger whiptail. Red-spotted toads were the most commonly sighted amphibian on the MSP.

Nearly all of the species expected to be found in the MSP habitat types were found, indicating a diverse reptile and amphibian community. A few of the species that were expected have not been located, possibly due to habitat degradation from prior unprotected usage (off-road vehicle and home construction).

Two species may exist in the MSP, but are beyond the edge of their known range; the Mexican spadefoot toad and ringneck snake. Volunteers will continue looking for these species, as well as others that may be on the MSP but are not yet documented. Three protected species were documented on the MSP. The common chuckwalla and the banded Gila monster are species of concern according to the US Fish and Wildlife Service. The Sonoran Desert tortoise is a species of concern in Arizona.

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## Reptiles and Amphibians of Scottsdale's McDowell Sonoran Preserve

This list conforms to the nomenclature presented in Moraity (2012).

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### FROGS AND TOADS

Red-spotted toad  
Couch's spadefoot  
Sonoran desert toad

### ANURA

*Anaxyrus punctatus*  
*Scaphiopus couchii*  
*Bufo alvarius*

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### LIZARDS

Desert iguana

### LACERTILIA

*Dipsosaurus dorsalis*



Coach's spadefoot toad (*Scaphiopus couchii*).  
Photo by: D. Weber

Common chuckwalla  
 Eastern collared lizard  
 Long-nosed leopard lizard  
 Zebra-tailed lizard  
 Greater earless lizard  
 Schott's tree lizard  
 Western long-tailed brush lizard  
 Western side-blotched lizard  
 Desert spiny lizard  
 Regal horned lizard  
 Sonoran tiger whiptail  
 Desert banded gecko  
 Gila monster

*Sauromalus ater*  
*Crotaphytus collaris*  
*Gambelia wislizenii*  
*Callisaurus draconoides*  
*Cophosaurus texanus*  
*Urosaurus ornatus schottii*  
*Urosaurus graciosus graciosus*  
*Uta stansburiana elegans*  
*Sceloporus magister*  
*Phrynosoma solare*  
*Aspidocellis tigris aethiops*  
*Coleonyx variegatus variegates*  
*Heloderma suspectum*



Long-nosed leopard lizard (*Gambelia wislizenii*).  
 Photo by: D. Weber



Gila monster (*Heloderma suspectum*).  
 Photo by: M. Jensen

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**SNAKES**

Western thread snake  
 Sonoran coral snake  
 Variable sand snake  
 Western ground snake  
 Smith's black-headed snake  
 Desert night-snake  
 Sonoran lyre snake  
 Sonoran gopher snake  
 Desert patch-nosed snake  
 Sonoran whipsnake  
 Coachwhip  
 Western long-nosed snake  
 California kingsnake  
 Western diamond-backed rattlesnake  
 Mojave rattlesnake  
 Northern black-tailed rattlesnake  
 Tiger rattlesnake

**SERPENTES**

*Leptotyphlops humilis*  
*Micruroides euryxanthus*  
*Chilomeniscus stamineus*  
*Sonora semiannulata*  
*Tantilla hobartsmithii*  
*Hypsiglena torquata*  
*Trimorphodon biscutatus*  
*Pituophis catenifer affinis*  
*Salvadora hexalepis hexalepis*  
*Coluber biliniatus*  
*Coluber flagellum*  
*Rhincheilus lecontei*  
*Lampropeltis getula californiae*  
*Crotalus atrox*  
*Crotalus scutulatus*  
*Crotalus molossus molossus*  
*Crotalus tigris*



Sonoran whipsnake (*Coluber biliniatus*).  
 Photo by: D. Weber

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**TORTOISES**

Sonoran desert tortoise

**TESTUDINIDAE**

*Gopherus agassizii*



Desert tortoise (*Gopherus agassizii*).  
 Photo by: L. Kalback

## Birds

The bird study was launched in January 2012, and the team completed the last survey for the two-year period in September, 2013. A total of 109 bird species were documented while at the survey locations, and an additional 19 species were documented on the way to or from a survey location, or photographed by volunteers and submitted to the principal investigator for identification. In total, the team documented 128 bird species on the MSP. Breeding was confirmed for 24 of these species.

While the MSP features prime Upper Sonoran Desert habitat, there is very little surface water available for birds and other wildlife. Water dependent cottonwood-willow riparian habitat is limited as well. Mature cottonwood-willow overstory is restricted to a few trees at Troon and small patches along the Prospector and Windmill trails. Despite this, a wide variety of bird species were documented on the MSP, including 12 species of water birds.

Elevations at the various survey sites ranged from 1,780 feet at Lost Dog Wash to 3,710 feet on Tom's Thumb Ridge. There was little temporal change in the species mix below the ridge. Atop the rocky ridge, however, the survey team found black-chinned sparrow, canyon wren, rufous-crowned sparrow and white-throated swift. The sparrows were unexpected, especially the black-chins which are normally found at higher elevations to the north and east.

The rarest find was a clay-colored sparrow along what is now the Feldspar Trail in April of 2013. This midwest species is seldom seen in Arizona. Some other noteworthy sightings include acorn woodpecker, golden eagle, greater pewee, Lawrence's goldfinch and Vaux's swift.



Gilded flicker (*Colaptes chrysoides*).  
Photo by: M. Jensen

Audubon Arizona has developed an Arizona "WatchList" that identifies species of special concern. Listing is based on an assessment of population size and trends, range size and threat levels. Four breeding species on that list have been observed on the MSP. These are bell's vireo, Bendire's thrasher, black-chinned sparrow and gilded flicker. Although none of these species has been confirmed breeding on the MSP, breeding is probable based on the frequency and time of year of these observations.

## Birds of Scottsdale's McDowell Sonoran Preserve

S = Supplemental (observed by survey team before or after official survey)

I = Incidental (other well documented reports)

This list conforms to the nomenclature presented in Chesser et al. (2013).

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### SWANS, GEESE AND DUCKS

American wigeon (I)

Mallard (I)

Cinnamon teal (I)

Green-winged teal (I)

### ANATIDAE

*Anas americana*

*Anas platyrhynchos*

*Anas cyanoptera*

*Anas crecca*



Green-winged teal (*Anas crecca*).

Photo by: M. Jensen

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### QUAIL

Gambel's quail

### ODONTOPHORIDAE

*Callipepla gambelii*

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### CORMORANTS

Neotropic cormorant

Double-crested cormorant

### PHALACROCORACIDAE

*Phalacrocorax brasilianus*

*Phalacrocorax auritus*



Gambel's quail (*Callipepla gambelii*).

Photo by: M. Jensen

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### BITTERNS, HERONS AND EGRETS

Great egret (I)

### ARDEIDAE

*Ardea alba*

---

### NEW WORLD VULTURES

Turkey vulture

### CATHARTIDAE

*Cathartes aura*

---

### KITES, EAGLES AND HAWKS

Northern harrier (I)

Sharp-shinned hawk

Cooper's hawk

Harris's hawk

Zone-tailed hawk

Red-tailed hawk

Golden eagle

### ACCIPITRIDAE

*Circus cyaneus*

*Accipiter striatus*

*Accipiter cooperii*

*Parabuteo unicinctus*

*Buteo albonotatus*

*Buteo jamaicensis*

*Aquila chrysaetos*



Red-tailed hawk (*Buteo jamaicensis*).

Photo by: M. Jensen

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### RAILS, GALLINULES, AND COOTS

Common moorhen (I)

American coot (I)

### RALLIDAE

*Gallinula chloropus*

*Fulica americana*



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**PLOVERS**

Killdeer (1)

**CHARADRIIDAE***Charadrius vociferus*

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**SANDPIPERS, PHALAROPES AND ALLIES**

Solitary sandpiper (1)

Least sandpiper (1)

**SCOLOPACIDAE***Tringa solitaria**Calidris minutilla*

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**PIGEONS AND DOVES**

Rock pigeon

Eurasian collared-dove

White-winged dove

Mourning dove

**COLUMBIDAE***Columba livia**Streptopelia decaocto**Zenaida asiatica**Zenaida macroura*

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**CUCKOOS AND THEIR ALLIES**

Greater roadrunner

**CUCULIDAE***Geococcyx californianus*

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**OWLS**

Western screech-owl

Great horned owl

Elf owl

**STRIGIDAE***Megascops kennicottii**Bubo virginianus**Micrathene whitneyi*

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**NIGHTHAWKS AND NIGHTJARS**

Lesser nighthawk

Common poorwill

**CAPRIMULGIDAE***Chordeiles acutipennis**Phalaenoptilus nuttallii*

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**SWIFTS**

Vaux's swift

White-throated swift

**APODIDAE***Chaetura vauxi**Aeronautes saxatalis*

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**HUMMINGBIRDS**

Black-chinned hummingbird

Anna's hummingbird

Costa's hummingbird

**TROCHILIDAE***Archilochus alexandri**Calypte anna**Calypte costae*

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**WOODPECKERS**

Acorn woodpecker (1)

Gila woodpecker

Ladder-backed woodpecker

**PICIDAE***Melanerpes formicivorus**Melanerpes uropygialis**Picoides scalaris*Killdeer (*Charadrius vociferus*).

Photo by: M. Jensen

White-winged dove (*Zenaida asiatica*).

Photo by: G. Andrejico

Great horned owl (*Bubo virginianus*).

Photo by: M. Jensen

Anna's hummingbird (*Calypte anna*).

Photo by: M. Jensen

Northern flicker  
Gilded flicker

*Colaptes auratus*  
*Colaptes chrysoides*

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**TRUE FALCONS**

American kestrel  
Peregrine falcon  
Prairie falcon

**FALCONIDAE**

*Falco sparverius*  
*Falco peregrinus*  
*Falco mexicanus*

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**PARROTS AND THEIR ALLIES**

Rosy-faced lovebird (I)

**PSITTACIDAE**

*Agapornis roseicollis*

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**TYRANT FLYCATCHERS**

Olive-sided flycatcher  
Greater pewee (I)  
Western wood-pewee  
Gray flycatcher  
Dusky flycatcher  
'Western' flycatcher  
Say's phoebe  
Ash-throated flycatcher  
Brown-crested flycatcher  
Western kingbird

**TYRANNIDAE**

*Contopus cooperi*  
*Contopus pertinax*  
*Contopus sordidulus*  
*Empidonax wrightii*  
*Empidonax oberholseri*  
*Empidonax difficilis*  
*Sayornis saya*  
*Myiarchus cinerascens*  
*Myiarchus tyrannulus*  
*Tyrannus verticalis*

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**SHRIKES**

Loggerhead shrike

**LANIIDAE**

*Lanius ludovicianus*

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**VIREOS**

Bell's vireo  
Gray vireo  
Cassin's vireo  
Warbling vireo

**VIREONIDAE**

*Vireo bellii*  
*Vireo vicinior*  
*Vireo cassinii*  
*Vireo gilvus*

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**JAYS, CROWS, AND THEIR ALLIES**

Common raven

**CORVIDAE**

*Corvus corax*

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**LARKS**

Horned lark (I)

**ALAUDIDAE**

*Eremophila alpestris*



Acorn woodpecker (*Melanerpes formicivorus*).  
Photo by: M. Jensen



Say's phoebe (*Sayornis saya*).  
Photo by: P. Hartley



Ash-throated flycatcher (*Myiarchus cinerascens*).  
Photo by: P. Hartley



Loggerhead shrike (*Lanius ludovicianus*).  
Photo by: M. Jensen

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**SWALLOWS**

Violet-green swallow  
Northern rough-winged swallow  
Barn swallow

**HIRUNDINIDAE**

*Tachycineta thalassina*  
*Stelgidopteryx serripennis*  
*Hirundo rustica*

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**VERDINS**

Verdin

**REMIZIDAE**

*Auriparus flaviceps*



Verdin (*Auriparus flaviceps*).  
Photo by: M. Jensen

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**WRENS**

Rock wren  
Canyon wren  
House wren  
Bewick's wren  
Cactus wren

**TROGLODYTIDAE**

*Salpinctes obsoletus*  
*Catherpes mexicanus*  
*Troglodytes aedon*  
*Thryomanes bewickii*  
*Campylorhynchus brunneicapillus*



Cactus wren (*Campylorhynchus brunneicapillus*).  
Photo by: R. Babb

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**GNATCATCHERS**

Blue-gray gnatcatcher  
Black-tailed gnatcatcher

**POLIOPTILIDAE**

*Polioptila caerulea*  
*Polioptila melanura*

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**KINGLETS**

Ruby-crowned kinglet

**REGULIDAE**

*Regulus calendula*

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**THRUSHES**

Western bluebird  
Mountain bluebird (1)  
Hermit thrush  
American robin

**TURDIDAE**

*Sialia mexicana*  
*Sialia currucoides*  
*Catharus guttatus*  
*Turdus migratorius*



Black-tailed gnatcatcher (*Polioptila melanura*).  
Photo by: M. Jensen

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**MIMIDS**

Curve-billed thrasher  
Bendire's thrasher  
Crissal thrasher  
Sage thrasher  
Northern mockingbird

**MIMIDAE**

*Toxostoma curvirostre*  
*Toxostoma bendirei*  
*Toxostoma crissale*  
*Oreoscoptes montanus*  
*Mimus polyglottos*



Northern mockingbird (*Mimus polyglottos*). Photo by: M. Jensen

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**STARLINGS**

European starling

**STURNIDAE**

*Sturnus vulgaris*

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**SILKY-FLYCATCHERS**

Phainopepla

**PTILOGONATIDAE**

*Phainopepla nitens*



Phainopepla (*Phainopepla nitens*).

Photo by: P. Hartley

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**WOOD-WARBLERS**

Orange-crowned warbler

Lucy's warbler

Nashville warbler

Virginia's warbler

MacGillivray's warbler

Yellow warbler

Yellow-rumped warbler

Black-throated gray warbler

Townsend's warbler

Hermit warbler

Wilson's warbler

Yellow-breasted chat

**PARULIDAE**

*Oreothlypis celata*

*Oreothlypis luciae*

*Oreothlypis ruficapilla*

*Oreothlypis virginiae*

*Geothlypis tolmiei*

*Setophaga petechia*

*Setophaga coronata*

*Setophaga nigrescens*

*Setophaga townsendi*

*Setophaga occidentalis*

*Cardellina pusilla*

*Icteria virens*



Townsend's warbler (*Setophaga townsendi*).

Photo by: M. Jensen

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**EMBERIZINE SPARROWS AND THEIR ALLIES**

Green-tailed towhee

Spotted towhee

Rufous-crowned sparrow

Canyon towhee

Abert's towhee

Chipping sparrow

Clay-colored sparrow (S)

Brewer's sparrow

Black-chinned sparrow

Vesper sparrow

Lark sparrow

Black-throated sparrow

Lark bunting

Lincoln's sparrow

White-crowned sparrow

Dark-eyed junco

**EMBERIZIDAE**

*Pipilo chlorurus*

*Pipilo maculatus*

*Aimophila ruficeps*

*Melospiza fusca*

*Melospiza aberti*

*Spizella passerina*

*Spizella pallida*

*Spizella breweri*

*Spizella atrogularis*

*Poocetes gramineus*

*Chondestes grammacus*

*Amphispiza bilineata*

*Calamospiza melanocorys*

*Melospiza lincolni*

*Zonotrichia leucophrys*

*Junco hyemalis*



Wilson's warbler (*Cardellina pusilla*).

Photo by: P. Hartley.



White-crowned sparrow (*Zonotrichia leucophrys*).

Photo by: M. Jensen.

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**CARDINALS, GROSBEAKS, AND BUNTINGS**

Western tanager  
Northern cardinal  
Black-headed grosbeak  
Lazuli bunting (S)

**CARDINALIDAE**

*Piranga ludoviciana*  
*Cardinalis cardinalis*  
*Pheucticus melanocephalus*  
*Passerina amoena*



Northern cardinal (*Cardinalis cardinalis*). Photo by: M. Jensen

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**ICTERIDS**

Western meadowlark  
Great-tailed grackle  
Bronzed cowbird  
Brown-headed cowbird  
Hooded oriole  
Bullock's oriole  
Scott's oriole

**ICTERIDAE**

*Sturnella neglecta*  
*Quiscalus mexicanus*  
*Molothrus aeneus*  
*Molothrus ater*  
*Icterus cucullatus*  
*Icterus bullockii*  
*Icterus parisorum*



Lawrence's goldfinch (*Spinus lawrencei*). Photo by: J. Weser

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**FINCHES AND OLD WORLD SPARROWS**

House finch  
Lesser goldfinch  
Lawrence's goldfinch (l)  
House sparrow

**FRINGILLIDAE**

*Haemorhous mexicanus*  
*Spinus psaltria*  
*Spinus lawrencei*  
*Passer domesticus*

**Small Mammal Survey**

The small mammal survey team documented 25 mammal species on the MSP. Thirteen of the 25 species were documented using motion-detecting trail cameras, eight species were documented by live-trapping, and two bat species were documented by mist netting. A single black-bear paw print was photographed on the MSP during an AZGFD study that ran concurrently with the flora and fauna inventory (Grandmaison 2012).

The most commonly encountered species on the motion-triggered cameras were mule deer, collared peccaries, and coyote. The species most



Raccoons (*Procyon lotor*) at Fraiser Springs. Photo by: McDowell Sonoran Field Institute trail camera

often captured in live-traps were Bailey’s pocket mouse, rock pocket mouse, and white-throated wood rat. The striped skunk and raccoon were photographed only at the few permanent waters sources, and the badger was documented only once in the semi-desert grassland area near Brown’s Ranch. The Townsend’s big-eared bat is considered a species of concern by the US Fish and Wildlife Service, and was the only protected mammal found in the MSP.

The survey teams documented members from various trophic levels, including prey species, medium sized carnivores, omnivores, and large predators. This complexity in food-web structure

indicates a healthy mammal community, and suggests a well-functioning ecosystem.



Townsend's big-eared bat (*Corynorhinus townsendii*). Photo by: M. Jensen

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## Mammals of Scottsdale’s McDowell Sonoran Preserve

This list conforms to the nomenclature presented in Wilson and Smith (2005).

<b>VESPER BATS</b>	<b>VESPERTILIONIDAE</b>
Townsend’s big eared bat	<i>Corynorhinus townsendii</i>
Western pipistrelle	<i>Pipistrellus hesperus</i>
<b>RABBITS AND HARES</b>	<b>LEPORIDAE</b>
Desert cottontail	<i>Sylvilagus audubonii</i>
Black-tailed jackrabbit	<i>Lepus californicus</i>
<b>SQUIRRELS</b>	<b>SCIURIDAE</b>
Round-tailed ground squirrel	<i>Spermophilus tereticaudus</i>
Rock squirrel	<i>Spermophilus variegatus</i>
Harris’ antelope squirrel	<i>Ammospermophilus harrisi</i>
<b>POCKET MICE AND KANGAROO RATS</b>	<b>HETEROMYIDAE</b>
Desert pocket mouse	<i>Chaetodipus penicillatus</i>
Bailey’s pocket mouse	<i>Chaetodipus baileyi</i>
Rock pocket mouse	<i>Chaetodipus intermedius</i>
Merriam’s kangaroo rat	<i>Dipodomys merriami</i>



Black-tailed jackrabbit (*Lepus californicus*).  
Photo by: M. Jensen



Cactus mouse (*Peromyscus eremicus*).  
Photo by: E. Weigand

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**MICE AND RATS**

White-throated woodrat  
Brush deermouse  
Cactus mouse

**CRICETIDAE**

*Neotoma albigula*  
*Peromyscus boylii*  
*Peromyscus eremicus*

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**CANINES**

Coyote  
Gray fox

**CANIDAE**

*Canis latrans*  
*Urocyon cinereoargenteus*

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**FELINES**

Cougar  
Bobcat

**FELIDAE**

*Puma concolor*  
*Lynx rufus*

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**SKUNKS**

Striped skunk

**MEPHITIDAE**

*Mephitis mephitis*

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**BADGERS AND RELATIVES**

American badger

**MUSTELIDAE**

*Taxidea taxus*

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**RACCOONS AND RELATIVES**

Raccoon

**PROCYONIDAE**

*Procyon lotor*

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**BURROWING RODENTS**

Botta's pocket gopher

**GEOMYIDAE**

*Thomomys bottae*

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**DEER**

Mule deer

**CERVIDAE**

*Odocoileus hemionus*

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**PECCARIES**

Collard peccary

**TAYASSUIDAE**

*Pecari tajacu*

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**BEARS**

American black bear

**URSIDAE**

*Ursus americanus*

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Gray fox (*Urocyon cinereoargenteus*).  
Photo by: M. Jensen



Cougar (*Puma concolor*).  
Photo by: McDowell  
Sonoran Field Institute trail camera



Bobcat (*Lynx rufus*).  
Photo by: M. Jensen



Collard peccary (*Pecari tajacu*).  
Photo by: M. Jensen

### ***Large Mammal Population Survey***

The helicopter survey flown in January, 2013 was the first since 2006. The survey team counted a total of 65 mule deer and 70 collared peccaries. Although white-tailed deer have been reported in the area, the team did not note any during the flight. Neither did they note any cougars or bobcats.



Mule deer (*Odocoileus hemionus*) fawns visiting Fraiser spring. Photo: McDowell Sonoran Field Institute trail camera

The AZGFD uses a standard model to estimate animal population size based on the survey count and habitat. The 2012 population model indicated an approximate population of 184 deer and 114 collared peccaries in GMU 25M, which includes the MSP, the McDowell Mountain Regional Park, adjacent State Trust land, and adjacent private lands.

It is important to note that this is baseline data and that surveys must be completed for a period of at least three years to establish population trends and fawn recruitment (fawn survival). Adding two more consecutive years of survey data to the 2012 baseline data will allow the AZGFD to establish deer and collared peccary population trends for GMU 25M (Arizona Game and Fish Department 2013).



## LOOKING FORWARD

Although the flora and fauna surveys have ended in a formal sense, the volunteers and principal investigators will continue building the species lists through individual efforts and through the relationships they have built over the past three years. Each principal investigator has compiled a “lookout list” of plants or animals which they did not document on the surveys but would expect to find on the MSP given the right timing and conditions. These lists are made available to the public through the MSC website. The ongoing work of the MSFI has been, and will continue to be, carried out largely by volunteer citizen-scientists who not only give of their time but enrich the work with their unique perspectives.

The McDowell Sonoran Field Institute, as the research center of the MSC will continue contributing to the broader community through public involvement in the citizen science program, dissemination of educational materials, and involving youth as volunteers and interns. The results will be used to produce educational materials designed to enhance the appreciation and conservation of the MSP and the Sonoran Desert. The MSFI will work closely with the City of Scottsdale, scientific partners, and community stakeholders to use the flora and fauna survey results for long-term ecological resource planning. The MSFI will also continue the work with scientific partners to investigate the impacts of human use of the MSP, monitor animal populations, and conduct original research into the geology, ecology, and human history of the MSP. This knowledge will be used to ensure the sustainability of the MSP for this and future generations.



Mule deer (*Odocoileus hemionus*) at the interface of the MSP and surrounding neighborhoods.  
Photo by: M. Jensen

## LITERATURE CITED

ARIZONA GAME AND FISH DEPARTMENT. 2013. 2013 Deer and javelina survey results for Scottsdale's McDowell Sonoran Preserve/Game Management Unit 25M. Arizona Game and Fish Department, Phoenix, Arizona.

BOWERS, J. E., and S. P. MCLAUGHLIN. 1982. Plant species diversity in Arizona. *Madrone*. 29:227-233.

BROWN, D. E., C. H. LOWE, and C. P. PASE. 1979. A digitized classification system for the biotic communities of North America, with community (series) and association examples for the southwest. *Journal of the Arizona-Nevada Academy of Sciences* 14:1-16.

BUGGUIDE.NET. 2013. An online resource devoted to insects, spiders and their kin, with identification help, images, and information. (<http://bugguide.net/node/view/15740>, 28 November 2013). Iowa State University Department of Entomology, Ames, Iowa.

CAMP, P. D. 1986. Soil survey of Aguila-Carefree area, parts of Maricopa and Pinal Counties, Arizona. United States Department of Agriculture, Soil Conservation Service. Washington, D. C.

CHESSER, T. R., R. C. BANKS, F. K. BARKER, C. CICERO, J. L. DUNN, A. W. KRATTER, I. J. LOVETTE, P. C. RASMUSSEN, J. V. REMSEN JR., J. D. RISING, D. F. STOTZ, and K. WINKER. Fifty-fourth supplement to the American Ornithologists' Union check-list of North American birds. *The Auk* 130:558-571.

MORARITY, J. J. (editor). 2012. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. edition 6.1. Society for the study of amphibians and reptiles herpetological circular 39.

DIMMITT, M. A. 1999. Biomes and communities of the Sonoran desert region. Pages 3-18 in *A natural history of the Sonoran Desert: Arizona-Sonora Desert Museum*. (S. J. Phillips and P. Wentworth Comus, editors). University of California Press, Berkeley.

DOBSON, S. L., T. F. H. ALLEN, S. R. CARPENTER, A. R. IVES, R. L. JEANNE, J. F. KITCHELL, N. E. LANGSTON and M. G. TURNER. 1998. *Ecology*. Oxford University Press, Inc., Oxford, New York.

FLOOD CONTROL DISTRICT of MARICOPA COUNTY. 2013. Thompson Peak station information. <http://alert.fcd.maricopa.gov/alert/Rain/Master/5945.pdf>. Accessed 23 August 2013.

GRANDMAISON, D. D. 2012. 2013. Identification of wildlife road mortality hotspots and wildlife activity patterns within Scottsdale's McDowell Sonoran Preserve wildlife linkage. Arizona Game and Fish Department, Phoenix, Arizona.

HADDER, D. 2013. Personal communications, 29 October, 2013.

HODGSON, W. C. 2001. *Food plants of the Sonoran Desert*. The University of Arizona Press, Tucson, Arizona.

JONES, T. 2012. Broken down cowboys: A summary of ranching in North Scottsdale and Scottsdale's McDowell Sonoran Preserve, Maricopa County, Arizona 1915-1970. Archaeological Consulting Services Project 12-106-HDOC: 1-36.

JONES, S. and C. L. HULL. 2013. Vegetation and Flora of Scottsdale's McDowell Sonoran Preserve. Canotia. In press.

LEVICK, L., J. FONSEA, D. GOODRICH, M. HERNANDEZ, D. SEMMENS, J. STROMBERG, R. LEIDY, M. SCIANNI, D. P. GUERTIIN, M. TLUCZEK, and W. KEPNER. 2008. The Ecological and hydrological significance of ephemeral and intermittent streams in the arid and semi-arid American southwest. U.S. Environmental Protection Agency and USDA/ARS Southwest Watershed Research Center, Tucson. EPA/600/R-08/134, ARS/233046:1-116.

NATIONS, D. and E. STUMP. 1981. Landforms. Pages 79-97 in *Geology of Arizona*. (D. Nations and E. Stump, editors). Kendall/Hunt Publishing Company, Dubuque.

SCOTNICKI, S. J. 1996. Geologic map of portions of the Fort McDowell and McDowell Peak quadrangles, Maricopa County, Arizona. Arizona Geological Survey Open File Report OFR-96-11.

USDA, NRCS. 2013. The PLANTS Database (<http://plants.usda.gov>, 24 November 2013). National Plant Data Team, Greensboro, NC 27401-4901 USA.

WILSON, D. E. and D. M. REEDER (editors). 2005. *Mammal species of the world. A taxonomic and geographic reference*. Third edition. Johns Hopkins University Press, Baltimore.

WRIGHT, T. E. 2002. Archaeological testing of AZ U:1:25 (ASM), the Brown's Ranch rock shelter site, in Northern Scottsdale, Maricopa County, Arizona. First edition. Arizona Archaeological Society, Phoenix.



People Preserving Nature

The McDowell Sonoran Conservancy champions the sustainability of Scottsdale's McDowell Sonoran Preserve for the benefit of this and future generations. As stewards, we connect the community to the Preserve through education, research, advocacy, partnerships and safe, respectful access.

16435 N. Scottsdale Road, Suite 110 • Scottsdale, AZ 85254 • 480-998-7971  
**[www.mcdowellsonoran.org](http://www.mcdowellsonoran.org) • [info@mcdowellsonoran.org](mailto:info@mcdowellsonoran.org)**



This project was completed in partnership with the City of Scottsdale. All data was collected from Scottsdale's McDowell Sonoran Preserve in compliance with their scientific research permit guidelines which encourage best practices in field research.