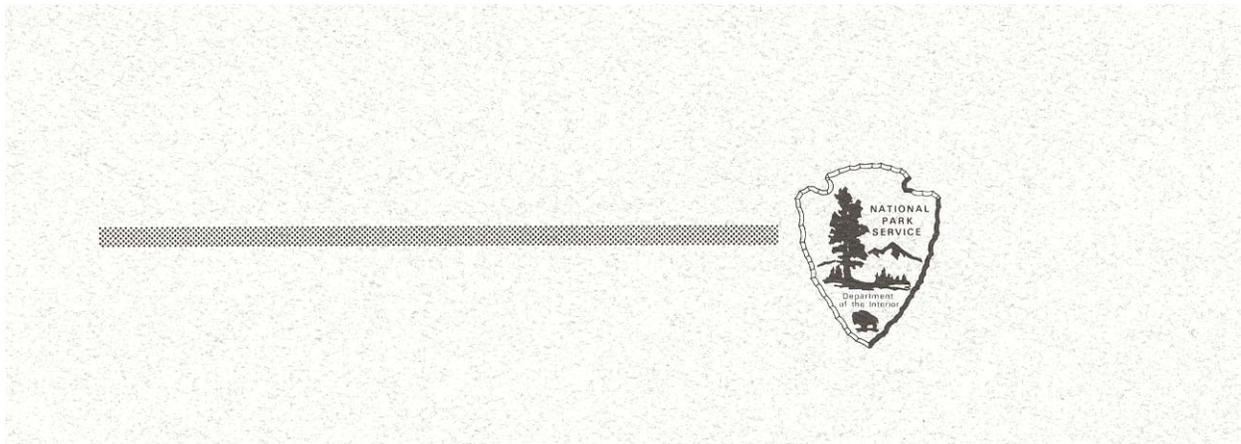


**Vegetation Inventory, Classification,
and Monitoring for
Tonto National Monument, Arizona**

**Philip D. Jenkins
Frank W. Reichenbacher
Kristen Johnson
Ann E. Gondor**

Technical Report No. 50

United States Department of the Interior
National Biological Service ♦ Mid-Continent Region
Cooperative Park Studies Unit
The University of Arizona ♦ Tucson, Arizona



COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT

The University of Arizona, Tucson

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National Biological Service
Cooperative Park Studies Unit
School of Renewable Natural Resources
125 Biological Sciences East
The University of Arizona
Tucson, Arizona 85721

Authors

Philip D. Jenkins
Kristen Johnson
Herbarium
113 Shantz Building
The University of Arizona
Tucson, AZ 85721

Frank W. Reichenbacher
Southwestern Field Biologists
8230 E Broadway Blvd., Suite W8
Tucson, AZ 85710-4002

Ann E. Gondor
1141 West Smoot Pl.
Tucson, AZ 85705

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Unit Personnel

William L. Halvorson, unit leader
Peter S. Bennett, research ecologist
Cecil R. Schwalbe, research ecologist
Michael R. Kunzmann, ecologist
Katherine L. Hiatt, biological technician
Joan M. Ford, research unit assistant
Gloria J. Maender, editorial assistant
Mary N. Greene, secretary

(520) 670-6885
(520) 621-1174
FTS (520) 670-6885

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Abstract

A survey and description of the vegetation and flora of Tonto National Monument are given with a review of recent influences on the vegetation and evidence of changes shown by historic photograph rematching. The plant communities are classified and mapped. Lists of native and nonnative flora are compiled with notes about vegetation types, subassociations, and habitats where each plant is found. Permanent, marked, vegetation monitoring plots are established at 10 sites to document occurrence, abundance, cover, and density of perennial herbs, shrubs, and trees.

Introduction

Tonto National Monument (TONT) was established in 1907 for the preservation and protection of cliff dwellings and surface sites once occupied by an ancient culture known as the Salado. Implicit in that proclamation is protection of the natural setting that the monument provides. Examination of vegetation of TONT includes a checklist of the vascular flora of TONT (Burgess 1965), a survey of nonnative plant species (Phillips 1992a), and a study of fire impacts on vegetation (Phillips 1992b). To better understand and manage the natural resources at the monument, the National Park Service (NPS) identified the need to inventory and classify the vegetation, as well as establish a monitoring system to identify changes in vegetation that may occur.

Southwestern Field Biologists entered into a contractual agreement to survey and describe the existing vegetation and flora of TONT, review existing literature on geology and recent history that may have influenced botanical resources, and, with historic photograph rematching, investigate changes in the vegetation of the monument. The objectives of the study include the following:

1. Classify the plant communities using the Brown system as published in "Biotic Communities of the American Southwest" in *Desert Plants* (Brown 1982) to the fourth decimal place or subassociation level.
2. Produce a map of the biotic communities of the monument according to the classification above at scale of 2.54 cm = 10.7 m (1 in. = 35.1 ft).
3. List the native flora of TONT including scientific name; common name (if one is available); and notes about vegetation types, subassociations, and habitats where the plant is found.
4. List the nonnative flora with information as described above for the native flora.
5. Establish 10 permanent, marked, vegetation monitoring plots in representative areas to document occurrence, abundance, cover, and density of perennial herbs, shrubs, and trees.
6. Report on the geology and soils of the monument using information from existing literature.
7. Report on the human history of the monument as it may have affected vegetation, using information from existing sources on livestock grazing, developments, and fire occurrences.
8. Obtain historic photographs and rephotograph sites to illustrate any changes in structure and composition of vegetation.

Study Area

Location and Topography

Tonto National Monument includes about 461 ha (1,139 a.) in the Salt River drainage near the Roosevelt Reservoir in the southern Tonto Basin, Gila County, Arizona. The area around the monument is national forest land. The entrance road on Arizona State Route 88 is about 190 km (120 mi) east of Phoenix, 3 km (1.9 mi) southeast of Roosevelt, and about 51 km (32 mi) northwest of Globe. The elevation ranges from 695 m (2,280 ft) on the northern boundary to 1,230 m (4,035 ft) near the southwestern corner.

The monument protects 2 main cliff-dwelling ruins, one called Upper Ruin in Cave Canyon and the second called Lower Ruin in a side drainage named Cholla Canyon. There are also numerous other archeological surface sites, especially in the northeastern part of the monument where the mountains fall away to the valley plain of the Salt River.

Climate

The climate is subtropical at the lower elevations and warm temperate at higher elevations. Temperatures average from around 5° C (41° F) in the winter to 36.7° C (98° F) in the summer. The station at Roosevelt, with 75 years of records until 1985, experienced temperature extremes of -7.8° C (18° F) and 46.7° C (116° F). An average January day has low and high temperatures of 2.5° C (36.5° F) and 14.8° C (58.6° F), while average July day temperatures range from 23.9° C (75° F) to 38.8° C (101.9° F). The annual rainfall average is 40.39 cm (15.9 in.), based on records from 1920 to 1952 for Roosevelt and 1953 to 1991 for the monument. (Sellers et al. 1985; monument records). Approximately 38% of precipitation falls from April to October, although April, May, and June are very dry. Summer moisture from the south and east causes convectional thunderstorms in July, August, and September. Precipitation during January through March derives from cyclonic storms generated in the Pacific Ocean. Rainfall can be variable, and annual rainfall ranges from 1.7 cm (0.67 in.) to 93.6 cm (36.85 in.). Snow is usually light, but not rare.

Geology and Soils

The monument is located in the Central Highlands geological subdivision of the Basin and Range Physiographic Province. Tonto National Monument is dominated by the characteristic Central Highlands fault-block mountain ranges adjacent to a deep valley bottom that is filling with material eroded from the mountains (Chronic 1983).

While there is much general literature about central Arizona, little formal work has been conducted on geology of the monument. In 1959, Robert B. Raup Jr. visited Cave and Cholla Canyons and the valley floor. He provided the monument with a report that remains on file at the TONT visitor center (Raup 1959). Some of the following discussion was derived from that report.

The exposed mountains are sedimentary rocks of the Apache group and Gila conglomerate along with some diabase intrusions. The slopes are covered with a thin veneer of decomposed

rocks from these formations, and the canyon bottoms and valley floor consist of largely uncemented angular material ranging in size from fine sand to large boulders. There is evidence of a thin basalt flow on the higher ridges outside the monument, which may locally extend within the monument.

The Apache group consists of ocean floor sediments that were deposited beginning more than a billion years before present during the Precambrian time (McConnell 1972; Burt and Pewe 1978). The oldest layer is called the Pioneer formation, a dark red siltstone seen in Cholla Canyon. It breaks into thin layers and was fashioned by Native Americans into weapons and tools. Overlying it is 1.5-6 m (5-20 ft) of Barnes conglomerate, and above this is approximately 183 m (600 ft) of siltstone and sandstone called the Dripping Springs Quartzite. Raup noted that the name of the formation did not reflect its composition as it occurs on the monument, and that at TONT it consists of mostly quartz and feldspar. Near the middle of this is a layer of rock less resistant to weathering than the layers above and below. Its more rapid erosion, called spalling, led to the formation of the caves that house the ruins. On top of the Dripping Springs rock is the Mescal Limestone. This name is also misleading, since Mescal Limestone is composed mostly of dolomite on the monument. This forms the ridgetops of the monument, with the possible occurrence of parts of a Precambrian basalt cap that can be seen near Roosevelt Dam.

After the Apache Group was deposited, it was intruded by diabase, which is similar to basalt but has a higher iron and magnesium content. At the monument it weathers into a gray-green soil, and can be observed just east of the visitor center (Raup 1959).

Events that occurred over the next 100 million years are sketchy, because the rocks that may have been deposited in the area have been removed by erosion. The Gila conglomerate is much younger than the previous formations, which were laid down from about 500,000 to 15 million years ago. It is valley fill material that has been cemented into a distinctive rock unit. Less than a million years ago, the area was uplifted as much as 900 m (2,955 ft) to 1,200 m (3,940 ft), and the subsequent erosion cycle left parts of the Gila conglomerate high on the slopes, as can be seen on the cliff face at the lower ruin.

The Salt River valley floor that comprises the northeastern third of the monument is made of debris, or talus, that has eroded from the higher formations and sloped towards the valley bottom. The particle size ranges from silt to large boulders. These are poorly sorted, but much of the larger material is found at the base of the slopes and at the mouths of the canyons. This deposition began after the most recent uplifting and is therefore the youngest formation on the monument. These formations have been variously called pediments, bajadas, and alluvial fans and are cut by intermittent and ephemeral stream channels. Since there is a present controversy between geologists and ecologists about the proper nomenclature of these formations in Arizona, the term "valley floor" has been chosen for this study. Most of the material is not yet cemented together but that process is occurring as carbonates and silicas come out of solution as runoff water evaporates in the ground (Raup 1959).

The present soil-forming process began about 10,000 years ago at the end of the Pleistocene following a climate change to increased aridity. Tonto National Monument soils are products of arid to semiarid desert and semidesert climates (Buol et al. 1973).

Lack of water impedes the decomposition of parent rock into soil-building material. Biomass is generally lower in arid climates than in more humid ones with reduced amount of organic matter and slow conversion of organic matter into humus. High temperatures oxidize some organic matter. Intermittent rainfall occurrence often causes sheet flooding and flashflooding that carry large volumes of soil and rock. The result of these factors is that soil formation is slower in arid climates and horizon development is minimal (Buol et al. 1973).

In desert and semidesert regions, water evaporation can greatly exceed rainfall and favors the formation of carbonate layers called "caliche," when runoff water evaporates in the upper parts of the soil. Caliche layers are sometimes thin but may be many meters thick, forming an impenetrable barrier to water and plants. It occurs wherever water can penetrate the surface, as on the valley floor. It usually forms just under the surface and is a factor in inhibiting soil horizon formation. Such layers are especially common on the valley floor.

A map compiled for the Roosevelt Terrestrial Ecosystem Survey is the only available source on soils of the monument (Anonymous 1991). It covers a large area (1:24,000), is not accompanied by descriptive text, and is not intended to provide specific soils data for the monument. Soils of the mountainous portion are listed together as Torriorthents and Ustortherents, which are mixed, calcareous, finely silty, light-colored soils; and Ustochreps, which are similar but sandier. All these are with rock outcrops. A portion of the highest southwestern ridge is classed as Typic Haplustalfs, which are clayey-skeletal, mixed and thermic. Most of the valley floor soils are Ustalfic Haplargids that are fine or clayey-skeletal, mixed and thermic. Fluvenic Ustochreps are mapped in the lower portion of the large wash, where it exits the monument. The term "Fluvenic" indicates the deposits are of streambed origin.

Human Influences on Vegetation

Significant effects of human presence on the vegetation of the monument began about 1875 when cattle were first imported to Arizona in large numbers (Croxen 1926). No accounts of the vegetation on the land that is now TONT were found for the time prior to the coming of cattle, but marked degradation of species palatable to cattle has been noted elsewhere in desert and semidesert communities of Arizona, especially in the vicinity of water sources (Hastings and Turner 1965; Steenbergh and Warren 1977).

President Roosevelt established 267 ha (659.7 a.) as Tonto National Monument on 19 December 1907, under the administration of the U.S. Forest Service. The land continued to be grazed, and its water resources were developed for cattle. In April 1937, 194 ha (479.4 a.) were added to the monument. Grazing continued over the entire monument until 1942, when 341 ha (843 a.) were fenced, leaving 120 ha (297 a.) unfenced. Deadman Canyon, Honey Butte, parts of the northern sections, and upper Cave Canyon down to the spring were still used by cattle. The monument was required to supply water for the cattle, and a pipeline led from the spring down to a trough southwest of the entrance road junction with Arizona Route 88 (Various authors, undated).

In 1974, the monument was closed to all grazing, and construction of a fence around the boundary was initiated. The east boundary fence was completed in May 1979, and the entire monument was enclosed on 6 November 1981. Cattle have been excluded since that time.

Abandoned road beds and development sites on the valley floor in and outside the monument can still be seen. They are characterized by different vegetation or, in a few locations, remain bare. Recent road construction, houses and other improvements have impacted the monument by creating disturbed patches and corridors that encourage the introduction and spread of nonnative plants.

Fire Influences

The question of the role of naturally caused (lightning) fires on the landscape and habitats of the monument is complicated by the diversity of vegetation types and the varied terrain. Semidesert Grassland and Sonoran Desertscrub habitats experience different fire frequencies, and each exhibits different responses to fire. Semidesert Grassland in this region can be expected to burn every few years (Humphrey 1958; Wright 1980), while Sonoran Desertscrub vegetation should burn much less often, perhaps on the order of once every 300 years (Rogers 1986). Both of these major habitat categories are near the limits of their ranges, and the climate is naturally dry and cyclic; it would not be surprising to find that populations of characteristic plants fluctuate, sometimes very drastically, over periods of time (Daubenmire 1968). Given the frequency of lightning in the area, it should also not be surprising to find that fire plays a major role in molding the plant communities of many parts of the monument. Human activities, cattle grazing, and the invasion of plants from Eurasia and Africa have changed the vegetative composition of the landscape and hence the behavior and frequency of the fires that it experiences. If grasses were once as prevalent in the Semidesert Grassland of the monument as historic accounts indicate for nearby Tonto Basin, widespread low intensity fires probably occurred regularly. Continuous stands of grass are easily ignited and will carry fire long distances, yet the grass sustains little damage from the fire. When fires are artificially suppressed, woody plants may become established and gradually come to dominate the vegetation. Some believe that grazing by cattle has the same effect (Humphrey 1958). Less frequent fires of greater intensity can be expected as fuel loading increases.

In Sonoran Desertscrub vegetation, introduced nonnative grasses, especially annual species such as red brome (*Bromus rubens*), may quickly invade areas where grasses are not sufficiently dense to carry fire. This may introduce more frequent fire to areas that rarely burned under natural conditions (Schmid and Rogers 1988). This occurs especially after wet cycles and may actually have increased with the exclusion of livestock grazing. Although some of these introduced grasses may encourage fires, Cave and Patten (1984) documented a decline in the abundance of red brome at a Sonoran Desertscrub site in the Tonto National Forest following a controlled burn. Keeley et al. (1981), commenting on the results of several studies of low chaparral vegetation in southern California (e.g., Horton and Kraebel 1955), postulated that red brome seeds may be sensitive to fires, or that red brome seed reserves were low at the time of the burn. Red brome is an abundant, introduced annual grass at TONT. In light of these studies, it appears possible that NPS may be able to control or limit populations of red brome on the monument with a controlled burning program.

McLaughlin and Bowers (1982) found that young saguaros (*Carnegiea gigantea*) and paloverdes (*Cercidium* spp.) were easily killed by fire at a site south of Florence, Arizona. At TONT, populations of these species seem to have been greatly reduced by the 1964 Schultz Fire on the slopes below Upper Ruin. They have been replaced largely by grasses (see Figs. 12 and 13). Examination of the photos shows many of the saguaros killed by the Schultz Fire were relatively young (few had arms) indicating these plants may have colonized the site in this century. It is possible that this may have been encouraged by the effect of heavy livestock grazing in the 1880s and 1890s on the perennial grasscover. The slope below Upper Ruin has not been grazed since 1942. The photos also show a general reduction of cover and density of shrubs and trees. The site was reinvaded by perennial grasses after the fire, but some of the grasses are now nonnative species, such as Lehmann lovegrass (*Eragrostis lehmanniana*).

Another explanation posed for the same site is that saguaros and paloverdes had been long established, and the area was not recently a grassland. The introduction of nonnative grasses encouraged artificially high fire frequencies in this century. Fire removed the older plant community and replaced it with Semidesert Grassland.

The slope below Lower Ruin is very different in character from that of the Upper Ruin and is dominated by Sonoran Desertscrub. There is no record of it having burned in this century, and saguaros and shrub cover have increased (see Figs. 6-7). A large fire has not occurred on the valley floor in the 30 years since the 1960 record began.

The interpretation of the changes in vegetation structure and composition shown in the historic photographs is greatly complicated by the continuously changing climate. Shifts in the seasonality of precipitation from predominately winter to predominantly summer have been observed elsewhere (Hastings and Turner 1965). If such shifts are occurring at the monument, one might expect an accompanying shift in the composition, and hence the structure, of the vegetation.

These examples demonstrate the need for more study of changes in the distribution, structure, and composition of the vegetation of the monument in the last 100 years. In addition, it is also important for managers and planners to recognize that the monument cannot be considered as a whole in its fire regime. Each of the vegetation types in the monument has its own fire frequency and response, and studies to improve management should take this into account.

Phillips (1992b) recently compiled a fire history of TONT. Available records begin only with the 1947 fire, and no fires have occurred in the monument since 1984. All of the recorded fires were caused by lightning. The following is a list of fires burning 40 ha (100 a.) or more from 1947 to 1980:

1. An unnamed fire burned roughly 40 ha (100 a.) in upper Cave Canyon and the Honey Butte area in 1947.
2. The Schultz Fire burned onto the monument from the south on 1 July 1964, consuming 219 ha (541 a.) on the monument including the Upper Ruin area and most of Cholla and Deadman canyons. It did not burn Honey Butte or the valley floor. Fire lines were

constructed to protect buildings, and a large bulldozer plowed a fire line (that can still be seen) up the ridge east of the visitor center.

3. The Cottonwood Fire consumed 81 ha (200 a.), starting on 3 July 1970, and included much of the same area burned in 1947 in upper Cave Canyon and Honey Butte. To protect the visitor center, a fire line was bulldozed from near Honey Butte to the bottom of Cave Canyon, following the same route used in 1976.
4. The Monument Fire burned about 100 ha (250 a.) from upper Deadman Canyon to Honey Butte and north to the residential area on 18 May 1976.
5. A second fire named "Monument" burned about 40 ha (100 a.) in July 1980, again, mainly in the upper Cave Canyon and Honey Butte areas. Both "Monument" fires required rebulldozing the Cave Canyon fire line, which was first opened in 1964. In the same season after this fire, illegal jojoba (*Simmondsia chinensis*) nut gatherers were apprehended on the monument. The 90 kg (200 lb) of confiscated nuts were used to seed the burn. The results of that seeding area unknown.

A more complete fire history is presently being compiled for TONT. It is expected to show an increase in fire occurrence during the past century because of an increase in the incidence of man-caused fires and, in some areas, due to invasions of introduced grasses and herbs.

Methods

Work on this study began in late 1988 and continued through 1990. We established permanent plots and sampled in the spring of 1989 and revisited and sampled in the summer to establish annual seasonal changes. We obtained voucher collections of the plant species in 1989, while classifying plant communities and during the establishment and sampling of the permanent vegetation monitoring plots.

Vegetation Classification and Mapping

A vegetation map was produced from on-site field observations, studies of aerial photography at approximately 2.5 cm = 1,524 m (1 in. = 5,002.2 ft) scale, and from qualitative compositional and structural data obtained from 60 temporary relevé plots. The base map was a topographic map of the monument supplied by the staff. Field study objectives included a comprehensive list of all plant species. Ten plots were permanently established to measure density and cover.

Relevé plots were scattered throughout the monument. We recorded plot data on a standardized form (Fig. 1) and developed a list of perennial species for each relevé plot, using a 4-letter acronym derived from the scientific name (e.g., saguaro cactus, *Carnegiea gigantea* = CAGI). The prominence, height range, and cover of each species was estimated and given a code (Table 1).

After the relevé plot data were obtained, the forms were divided into groups with similar composition and structure of dominant and co-dominant species. Frequency for each species was determined by dividing the number of plots where the plant was observed by the total number of plots. If a species occurred in all plots, the frequency was 1.00; if it was found in half of the plots, the frequency was 0.50. Prominence rank ranges are the low to high rankings assigned to the species on the set of plots where the plant occurred (nonoccurrence is not counted). The prominence mean is the sum of the prominence rankings assigned to the plant divided by the number of plots where it was recorded. We listed the species in order of (1) frequency and (2) prominence, using cover-class codes as "tie-breakers." The most frequent and prominent species were called characteristic species, and those commonly encountered were called associated species. Occasional species were encountered only on 1 or 2 plots and usually had a prominence code of 1.

The most frequent and prominent 3 to 5 species encountered on the relevé plots were matched to categories outlined in the Digitized Classification System for Biotic Communities of North America as published by Brown (1982). An 8-digit code was assigned to each subassociation mapped. The number 1, 4 digits to the left of the decimal, was omitted since it designates the Nearctic Realm, or North America approximately north of the Tropic. of Cancer. A coding system was used in the relevé plot vegetation sampling at TONT to describe vegetation composition and structure (Table 1). Although the cover scoring system provides for classes up to 100%, no scores greater than 5 were recorded on the monument.

F.W. REICHENBACHER & ASSOCIATES - U.S. NATIONAL PARK SERVICE VEGETATION SURVEY FORM

LOCATION _____ DATE _____

PHOTO NO. _____ JOB _____ CODE _____ NAME _____

SPECIES	PROM	HT	COVER	LAND FORM	Drn Chnl fldpl	Val fl intfl sdsl	lowsl midsl	Up ridge	Plat Intfl sdsl	Rock terrc cliff	Cind Talus		
				SLOPE			DISSECT				ELEV.		
				ASPECT	SW	S	W	SE	LEV	NW	E	N	NE
				LITHOL									
				SOIL	FORMATION TEXTURE							% GRAVEL % ROCK	
				NOTES									
FIELD CLASS.						FINAL CLASS.							

Figure 1. Relevé plot scorecard for vegetation classification of Tonto National Monument, adapted from Warren et al. (1981).

Table 1. Coding system used in the relevé plot vegetation sampling at Tonto National Monument, Arizona, to describe vegetation composition and structure.

Coding System					
	Prominence		Height	Percent-cover ¹	
Code	Definition	Code	Definition	Code	Definition
1	1 or 2 plants	A	< 15 cm (5.9 in.)	0	0%
2	Scattered	B	15 cm-40 cm (5.9 in.-15.7 in.)	1	1-5%
3	Characteristic	C	40 cm-1.5 m (15.7 in.-4.9 ft)	2	6-20%
4	Co-dominant	D	1.5 m-3.0 m (4.9 ft-9.8 ft)	3	21-40%
5	Dominant	E	> 3.0 m (9.8 ft)	4	41-60%
				5	61-80%
				6	81-95%
				7	96-100%

¹ Although the cover-scoring system provides for classes up to 100%, no scores greater than 5 were recorded on the monument.

Permanent Vegetation Monitoring Plots

Ten vegetation study quadrats were established at representative sites at TONT. The sites were selected on the basis of the results of the relevé plot sampling discussed above and for accessibility, to minimize impact during sampling. The locations of the permanent monitoring plots are shown on Figure 2.

One permanent monitoring plot was located in each vegetation subassociation mapped in Figure 2 (e.g., plot number TMP8 for TONT Monitoring Plot 8) as follows:

Desert Riparian Scrub

Plot TMP8 Jojoba—Velvet mesquite—Catclaw [*Simmondsia chinensis*—*Prosopis velutina*—*Acacia greggii*]

Interior Chaparral

Plot TMP10 Mountain-mahogany—Shrub-live oak—Desert needlegrass [*Cercocarpus montanus*—*Quercus turbinella*—*Stipa speciosa*]

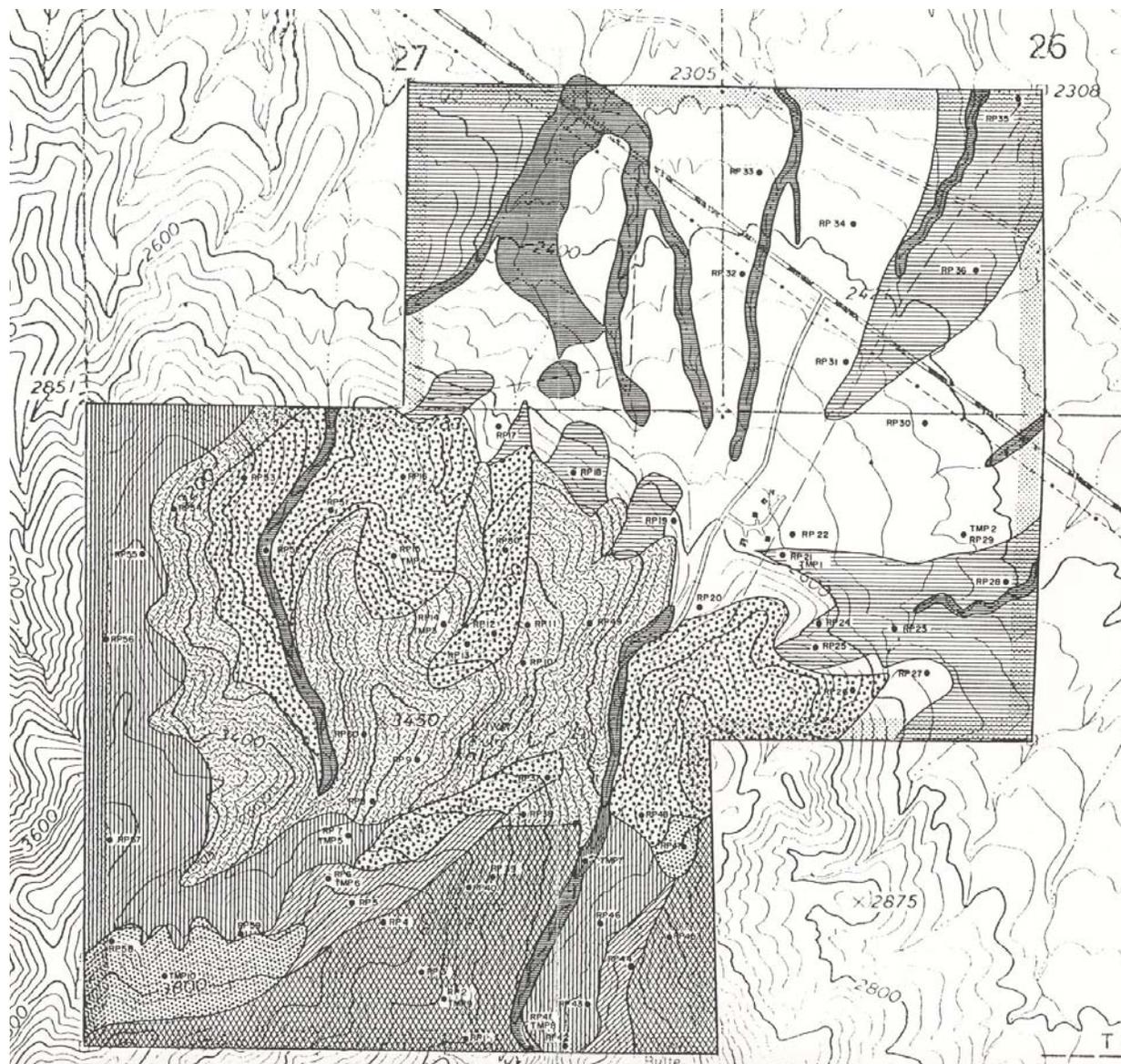
Semidesert Grassland

Plot TMP9 Globe-mallow—Desert-straw-Desert needlegrass—Jojoba [*Sphaeralcea emoryi*—*Stephanomeria pauciflora*—*Stipa speciosa*—*Simmondsia chinensis*]



SOUTHWESTERN FIE
BIOLOGICAL CONSULTANTS
8230 East Broadway Boulevard, Suite
Tucson, Arizona 85710-6002
(602) 886-4303 FAX: (602) 886-4391

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KEY TO THE VEGETATION MAP*

SONORAN WOODLAND

124.7121 Sich-Prve-Acgr

INTERIOR CHAPARRAL

133.3421 Cemo-Qulu-Stsp

GRASSLAND - SCRUB

143.1551 Spem-Stsp-Stpa-Sich

143.1552 Dowh-Gusa-Bocu-Spem

ARIZONA UPLANDS

154.1231 Sich-Lyfe-Gusa

154.1232 Cemi-Lyfe-Sich

154.1234 Sich-Enfa-Gusa

154.1235 Sich-Cemi-Arpa-Sear

154.1236 Stpa-Sich-Bocu

INTERIOR RIPARIAN DECIDUOUS WOODLAND

223.2221 Ptwr-Juma-Elgl-Cere

● RP9 Relevé Plots

● TMP1 Permanent Monitoring Plots

*Refer to text for species code list.

(Classification follows Warren et al., 1981
and Brown 1982.)



LEGEND

- NPS Boundary
- - - Power Line
- Well & Pump House
- Water Tower
- Water Trough
- ▬ Cattle Guard
- ▬ Cave
- Structure
- Spring
- Trail
- Fenceline
- ▬ Paved Road
- ▬ Improved Dirt Road
- ▬▬▬ Dirt Road

Plot TMP6 Sotol—Broom snakeweed—Side-oats grama—Globe-mallow [*Dasyilirion wheeleri*—*Gutierrezia sarothrae*—*Bouteloua curtipendula*—*Sphaeralcea emoryi*]

Sonoran Desertscrub

Plot TMP1 Jojoba—Broom snakeweed—Wolfberry [*Simmondsia chinensis*—*Gutierrezia sarothrae*—*Lycium fremontii*]

Plot TMP2 Foothill paloverde—Wolfberry Jojoba [*Cercidium microphyllum*—*Lycium fremontii*—*Simmondsia chinensis*]

Plot TMP3 Jojoba—Foothill paloverde—Spike-moss [*Simmondsia chinensis*—*Cercidium microphyllum*—*Selaginella arizonica*]

Plot TMP4 Jojoba—Brittle-bush—Broom snakeweed [*Simmondsia chinensis*—*Encelia farinosa*—*Gutierrezia sarothrae*]

Plot TMP5 Desert-straw—Jojoba—Side-oats grama [*Stephanomeria pauciflora*—*Simmondsia chinensis*—*Bouteloua curtipendula*]

Interior Riparian Deciduous Woodland

Plot TMP7 Arizona sycamore—Arizona walnut—Blue wild-rye—Net-leaf hackberry [*Platanus wrightii*—*Juglans major*—*Elymus glaucus*—*Celtis reticulata*]

No attempt was made to randomly locate the plots. Instead, each plot was carefully located to represent one of each of the subassociations mapped in Figure 2. This was considered to be the minimum sampling requirement at TONT.

The plots were rectangular, 10 x 20 m (200 sq m, 0.02 ha)—32.8 x 65.6 ft (2,150.5 sq ft, 0.05 a.)—with the long axis situated parallel to the slope contour (Fig. 3). Each corner was marked with a length of rebar hammered into the ground, leaving 20-30 an (8-12 in.) above the surface. A circular aluminum tag stamped with the plot number given above was wired to the rebar at each corner.

Sampling included all trees, shrubs, perennial herbs (including ferns and fern-like plants), and grasses. The data taken at each plot included (1) species counts (the numbers of individuals of each species in a plot), and (2) cover (the area covered by each species). Using the area of the plots (200 sq m, or one-fiftieth of a hectare [2,150 sq ft, one-twentieth of an acre]), it was possible to extrapolate an estimated density (the number of plants of each species, per hectare of habitat) from the species count.

The plots were delineated on the ground with a 100-m (330-ft) rope chain stretched around the plot perimeter. Extra lengths of rope chain and meter rulers were then used to mark off 50 subplots, each 4 m² (13 ft²). The species counts were made subplot-by-subplot, then summed over the whole plot. Cover for each plant was defined as the largest diameter circle connecting to outermost points of the plant canopy projected down to the ground surface (Grieg-Smith 1964). Cover was visually estimated for each species, also subplot-by-subplot, by scoring each species on the scale shown in Table 1.

The cover-class estimate for each species was averaged over the whole plot. Defining individual plants was impossible for spike-moss (*Selaginella arizonica*), a prostrate, mat-forming plant, composed of creeping slender stems; but cover was estimated as with other species. Counts were very difficult also for blue wild-rye (*Elymus glaucus*), the dominant perennial grass at the Interior Riparian Deciduous Woodland plot (TMP7). The plants were very dense, and there was often no apparent separation between the plants. Cover was estimated for this species as usual.

It was necessary to subdivide the plots because of the difficulty of keeping an accurate count of some of the more numerous species within larger areas and because it would be impossible to accurately estimate cover of each species in a large area. The subplots could be arranged in any convenient manner, so long as roughly the same size of subplot is used during each monitoring period.

Each of the 10 plots was sampled during 17-25 April 1989 to represent the spring growing season, and during 20-23 September 1989 to represent the summer growing season. All trees, shrubs, perennial herbs (including ferns and fern-like plants), and grasses were sampled during the spring period, but only the herbaceous species were sampled during summer.

1	6	11	16	21	26	31	36	41	46
2	7	12	17	22	27	32	37	42	47
3	8	13	18	23	28	33	38	43	48
4	9	14	19	24	29	34	39	44	49
5	10	15	20	25	30	35	40	45	50

Figure 3. Design of permanent vegetation monitoring plots (of 10 total) used at Tonto National Monument. Each plot is 10 x 20 m (200 sq m, 0.02 ha)—32.8 x 65.6 ft (2,150.5 sq ft, 0.05 a.). Thick lines indicate plot boundaries, and include rebar stakes at each corner. Thin lines represent 2 x 2 m (6.6 x 6.6 ft), temporary subplots.

Native Flora and Nonnative Flora Lists

The species lists were compiled from existing publications (Strong undated; Burgess 1963, 1965; Phillips 1992a) and lists (an undated herbarium inventory at Tonto National Monument),

a survey of the collections at that herbarium, and observation in the field. Collections were made of plants for documentation and identification when they could not be identified in the field. These were taken to the herbarium at The University of Arizona in Tucson (ARIZ) for positive identification. The list includes all of the plants known to grow on the monument without cultivation. A separate list was made of nonnative species. *Arizona Flora and Supplement* (Kearney and Peebles 1960) was used as a reference for this list. *A Catalogue of Arizona Flora* (Lehr 1978), with *Supplement I* (Lehr and Pinkava 1980) and *Supplement II* (Lehr and Pinkava 1982) were used for most nomenclature of the taxa. In addition, an effort was made to bring the list into line with publications and manuscripts provided us by contributors to the upcoming revised *Arizona Flora*. In every case the synonym in the *Catalogue* is given.

Historic Photograph Rematching

On 17 January 1991, TONT files were searched for the oldest available photographs that might be rephotographed and used to illustrate any changes that have occurred in the structure or composition of the vegetation of the monument. Five photographs were chosen ranging in date from 1929 to 1964. We then rephotographed the scene of each photograph on 18 January 1991, matching, as closely as possible, the scale and framing.

Results

Vegetation Classification and Mapping

Tonto National Monument lies near the northeastern edge of the Sonoran Desert; much of the monument is dominated by subassociations classified in the Arizona Upland subdivision of the Sonoran Desertscrub biome. Jojoba, which is dominant or co-dominant in all 5 subassociations identified, is the most prominent species on the monument. Many areas of mid and lower slopes and fine-grained soils of the valley floor are dominated by jojoba. Foothill paloverde (*Cercidium microphyllum*) dominates the rest of the valley floor other than the larger arroyos. On the higher ridges a subassociation occurs that is transitional between Sonoran Desertscrub and Semidesert Grassland. The stem succulent cacti such as saguaro, Engelmann prickly-pear (*Opuntia engelmannii*) and chollas (*Opuntia* spp.) are obvious and notable plants, but do not occupy dominant roles in the subassociations.

Semidesert Grassland vegetation covers the ridge tops in the south part of the monument. It may be present in part because of recent fires, especially at lower elevations of its range. The character of this association changes markedly from the northwest to southeast slopes, which divide the 2 subassociations.

The north-facing slopes of the higher elevations support many species typical of Interior Chaparral communities. The characteristic species is mountain-mahogany (*Cercocarpus montanus*).

The larger canyon bottoms and washes of the Salt River valley floor receive more frequent deep watering than other areas. The vegetation becomes dense and tall enough to be called a riparian scrub. There is a permanent spring in Cave Canyon that supports such broadleaf riparian trees as Arizona sycamore (*Platanus wrightii*) and Arizona walnut (*Juglans major*).

Table 2 summarizes the biotic communities of TONT and names the subassociations by their dominant species. These species are listed in descending order of dominance. The subassociations are mapped in Figure 2, and Appendix 5 lists the full scientific names of the acronyms used in the figure.

Appendix 1 lists all the species located in each subassociation, with mean prominence, height range, and mean frequency for all species except those found only occasionally. The appendix also describes the locations of the subassociations on the monument, and outlines the distribution and physiognomy of the vegetation.

Table 2. Checklist for the biotic communities of Tonto National Monument, Arizona. Classification follows Warren et al. (1981) and Brown (1982).

<u>Classification</u>	<u>Community</u>
224	Tropical-Subtropical Woodlands
	224.7 Sonoran Riparian Woodland
	224.71 Mesquite Series
	224.712 Desert Riparian Scrub Association
	224.7121 Jojoba—Velvet mesquite—Catclaw [<i>Simmondsia chinensis</i> — <i>Prosopis velutina</i> — <i>Acacia greggii</i>]
133	Warm-Temperate Scrublands
	133.3 Interior Chaparral
	133.34 Mountain Mahogany Series
	133.342 <i>Cercocarpus montanus</i> Association
	133.3421 Mountain-mahogany—Shrub-live oak—Desert needlegrass—Canotia [<i>Cercocarpus montanus</i> — <i>Quercus turbinella</i> — <i>Stipa speciosa</i> — <i>Canotia holacantha</i>]
143	Warm-Temperate Grasslands
	143.1 Semidesert Grassland
	143.15 Mixed Grass-Scrub Series
	143.155 Mixed Grass-Mixed Scrub Association
	143.1551 Globe-mallow—Desert-straw—Desert needlegrass—Lehmann lovegrass—Jojoba [<i>Sphaeralcea emoryi</i> — <i>Stephanomeria pauciflora</i> — <i>Stipa speciosa</i> — <i>Eragrostis lehmanniana</i> — <i>Simmondsia chinensis</i>]
	143.1552 Sotol—Broom snakeweed—Side-oats grama—Globe-mallow [<i>Dasyilirion wheeleri</i> — <i>Gutierrezia sarothrae</i> — <i>Bouteloua curtipendula</i> — <i>Sphaeralcea emoryi</i>]
154	Tropical-Subtropical Desertlands
	154.1 Sonoran Desertscrub
	154.12 Paloverde-Mixed Cacti ("Arizona Upland") Series
	154.123 <i>Simmondsia chinensis</i> —Mixed Scrub Association
	154.1231 Jojoba—Broom snakeweed—Wolfberry [<i>Simmondsia chinensis</i> — <i>Gutierrezia sarothrae</i> — <i>Lycium fremontii</i>]
	154.1232 Foothill paloverde—Wolfberry Jojoba [<i>Cercidium microphyllum</i> — <i>Lycium fremontii</i> — <i>Simmondsia chinensis</i>]
	154.1234 Jojoba—Brittle-bush—Broom snakeweed—Wild-buckwheat—Three-awn [<i>Simmondsia chinensis</i> — <i>Encelia farinosa</i> — <i>Gutierrezia sarothrae</i> — <i>Eriogonum fasciculatum</i> — <i>Arstida parishii</i>]
	154.1235 Jojoba—Foothill paloverde—Three-awn—Spike-moss [<i>Simmondsia chinensis</i> — <i>Cercidium microphyllum</i> — <i>Aristida parishii</i> — <i>Selaginella arizonica</i>]
	154.1236 Desert needlegrass—Jojoba—Side-oats grama [<i>Stipa speciosa</i> — <i>Simmondsia chinensis</i> — <i>Bouteloua curtipendula</i>]
223	Warm Temperate Swamp and Riparian Forests
	223.2 Interior Southwestern Riparian Deciduous Forest and Woodland
	223.22 Mixed Broadleaf Series
	223.222 <i>Platanus wrightii</i> Association
	223.2221 Arizona sycamore—Arizona walnut—Blue wild-rye—Net-leaf hackberry [<i>Platanus wrightii</i> — <i>Juglans major</i> — <i>Elymus glaucus</i> — <i>Celtis reticulata</i>]

Permanent Vegetation Monitoring Plots

The monitoring plot data are summarized in Table 3 and the plot data are given in detail in Appendix 2. In the appendix, cover data should be interpreted using the cover-class scale given in Table 1 because the "frequency" figures listed in the tables are really averaged cover-class scores. These means will be useful in comparing cover estimates between plots and from year-to-year and from season-to-season, but should not be used in deriving statistical inferences and predictions, since cover estimates from the subplots are not independent samples. Use of the plot data in comparing statistical properties is also inappropriate because the plots were not randomly located. Each plot represents a single sample from a single statistical population. At least two and preferably more plots should be established in each subassociation to allow for statistical comparisons.

The most important plants (i.e., those most frequently encountered and those providing the most cover) included foothill paloverde (the only common tree), jojoba, wolfberry (*Lycium fremontii*), broom snakeweed (*Gutierrezia sarothrae*), three-awn (*Aristida* spp.), globe-mallow (*Sphaeralcea emoryi*), and rock-cress (*Arabis perennans*). Saguaro, which is common on south-facing slopes throughout the monument, did not occur in any of the plots. Many of the plots represented very similar floras, and many species are shared by most of the plots. The 3 plots representing habitats very different from most of the rest included TMP7 (Interior Riparian Deciduous Woodland), TMP8 (Desert Riparian Scrub), and TMP10 (Interior Chaparral).

The 2 vegetation sampling periods did not produce markedly differing results. This was, in part, due to below-average precipitation in the spring of 1989. A few species were clearly representative of a winter flora, such as pointy-leaf phlox (*Phlox tenuifolia*), bluedicks (*Dichelostemma pulchellum*), and wild-cucumber (*Marah gilensis*).

All but 1 monitoring plot (TMP4) located west of Cave Canyon (TMP5, TMP6, TMP9, TMP10) represent sites burned in the 1964 wildfire, discussed previously. Generally speaking, the vegetation at these sites is dominated by perennial bunchgrasses, including desert needlegrass (*Stipa speciosa*), side-oats grama (*Bouteloua curtipendula*), three-awn, Lehmann lovegrass (*Eragrostis lehmanniana*), and low shrubs. Jojoba is common throughout most of this area, at least on north-facing slopes; it is conspicuously absent from some south-facing burned slopes. Monitoring Plot #3 (TMP3) is the only plot in this area representing unburned vegetation. Very few grasses are present; most cover is provided by foothill paloverde, brittle-bush (*Encelia farinosa*), spike-moss, and jojoba. Monitoring plots #1 and #2 (TMP1 and TMP2), representing the lowlands and low foothills, are the least diverse (16 and 10 species, respectively) and both supported very few herbs and no perennial grasses at all. Monitoring Plot #8 (TMP8), representing desert riparian scrub vegetation, supported the most diverse flora (44 species).

The Interior Riparian Deciduous Woodland plot (TMP8) was located about 60 m (195 ft) below Cave Canyon Spring and did not represent the wettest habitat on the monument. The immediate vicinity of the spring, which is extremely wet, is an impenetrable tangle of Arizona dewberry (*Rubus arizonensis*) vines and shrubs. The site chosen for the plot represents the riparian woodland environment rather than the spring environment.

Table 3. Summary of results of permanent vegetation monitoring plot sampling at Tonto National Monument, AZ, in April and September 1989. Importance values¹ for the 27 most important species at each of the 10 plots (using the spring 1989 data only). The + indicates the presence of a species for which an exact count was not taken.

Species	Plot									
	TMP1	TMP2	TMP3	TMP4	TMP5	TMP6	TMP7	TMP8	TMP9	TMP10
Aster ²								6400		
Blue wild-rye							+			
Brittle-bush		510	5874							
Broom snakeweed		1	6	46866	58491	39368				2550
Desert needlegrass				110	5133	380	380			128
Foothill paloverde		10	280							
Globe-mallow	1		6	988	760	782	4	5775	3528	352
Goldeneye	104			780					1	
Horehound							3024			
Indian paintbrush				1900	4	66		4		
Jojoba	2760	1800	2013	48	882			60	162	
Lehmann lovegrass								612	154880	
Menodora	255									
Mutton-grass					12744	50912				21097
Net-leaf hackberry							4340			
Odora	9	48	1					510	30	
Rock-cress	30		4	3300	3300	13640		1	6	9
Rock echevaria				2263	583	392				
San-Felipe dyssodia					42	4		1	725	
Side-oats grama	1	2		286	1820	5376		24	2	6844
Spike-moss			+	+	+	+			+	
Spurge ⁴	56							20	1008	
Western ragweed							380		11	
Wolfberry	162	50	1					4	10	
Wormwood ⁵							112	3432		
Wormwood ⁶				8	4	16	16	1120		3456
Wright buckwheat				1	99			3		6

1 Estimated density (plants per hectare) multiplied by the estimated cover (scored by cover class [see Table 1]).

2 *Machaeranthera asteroides* var. *glandulosa*

3 *Sphaeralcea emoryi*

4 *Euphorbia melandenia*

5 *Artemisia dracunculus*

6 *Artemisia ludoviciana*

Native Flora

The list of native flora given in Appendix 3 includes 298 species. This number may be expected to vary with preferences of taxonomy, new research in systematics, and new discoveries. Also, this study did not allow for the confirmation of identifications of historical collections. The largest families are Compositae (Sunflower Family) with 48 species and Gramineae (Grass Family) with 35 species. Leguminosae (Pea Family) with 15 species is not as well represented here as in most of the Sonoran Desert, probably because the monument is near the northern limit of that desert. Cruciferae (Mustard Family), Boraginaceae (Forget-me-not Family), and Hydrophyllaceae (Waterleaf Family) add significantly to the spring annual species diversity, which is much greater than the small group of annuals that bloom in summer. The species are listed in Appendix 3, with notes about their abundance and distribution.

Nonnative Flora

A total of 28 species of nonnative plants are reported in Appendix 4. Two species of Gramineae of the genus *Eragrostis* (lovegrass) are so well established that they are co-dominant constituents of the vegetation in significant areas of the monument. Lehmann lovegrass is dominant in Semidesert Grassland on southeast-facing slopes. Weeping lovegrass (*Eragrostis curvula*) is abundant in Cave Canyon as well. Horehound (*Marrubium vulgare*) is a perennial European mint that is strongly established in the riparian area, and efforts to eradicate it have failed. Most of the nonnative species are uncommon or occupy limited disturbed areas beside roads and around construction sites. The species are listed in Appendix 4 with notes about abundance and distribution, and the land to which the plant is native.

Historic Photograph Rematching

The rematched historic photographs (Figs. 4-13) suggest 2 important observations: (1) the density and sizes of shrubs have increased dramatically in the past 4-6 decades throughout much of the monument; (2) it also appears that saguaro has become much more numerous on favorable south-facing slopes. Unfortunately, we could not locate any old photographs taken of areas before they were burned in 1964. Figures 10-13 show comparable views immediately after the fire was put out, but Figures 4-9, which include views of the southeast-facing slope below Lower Ruin, illustrate habitats that to our knowledge have not burned at all in historic times.

Figures 4-7 illustrate the first observation made above. The density of shrubs along Cave Canyon and in the vicinity of the visitor center has increased dramatically. The shrubs that have increased probably include catclaw (*Acacia greggii*), velvet mesquite (*Prosopis velutina*), and jojoba. The south-facing slope of Cave Canyon seems to support more saguaros now than previously, although a precise count could not be accurately made. It is difficult to account for the increase in the number of saguaros, but the most important climatic attributes to the plants are the amount of summer precipitation and the frequency and intensity of winter freezes (Steenbergh and Lowe 1983). Changes in these factors could result in declines or increases in saguaro populations over time. Less easily observed are influences of pollinator availability and seed predation, which could also affect population levels over time.

Figure 4 depicts the view in 1929 across Cave Canyon from opposite the visitor center site, looking up Cholla Canyon at Lower Ruin. It shows virtually no riparian vegetation in Cave Canyon and the opposite lower slope nearly devoid of shrubs and trees compared to the 1991 photo (Fig 5). The upper south-facing slope of Cholla Canyon now supports many more foothill paloverdes and saguaros than in 1929. In our opinion, the most likely explanation for the lack of shrubs in 1929 is that cattle grazing, and fuelwood collection by monument residents and monument visitors, combined with trampling of the groundcover needed to support germination and establishment of new shrubs and trees, reduced or suppressed shrubs and trees. Subsequent active fire suppression, especially in the high visitor-use area of the visitor center, perhaps in combination with lack of fuelwood collection, cattle grazing, and climatic change, has caused shrubs to increase in density and cover.

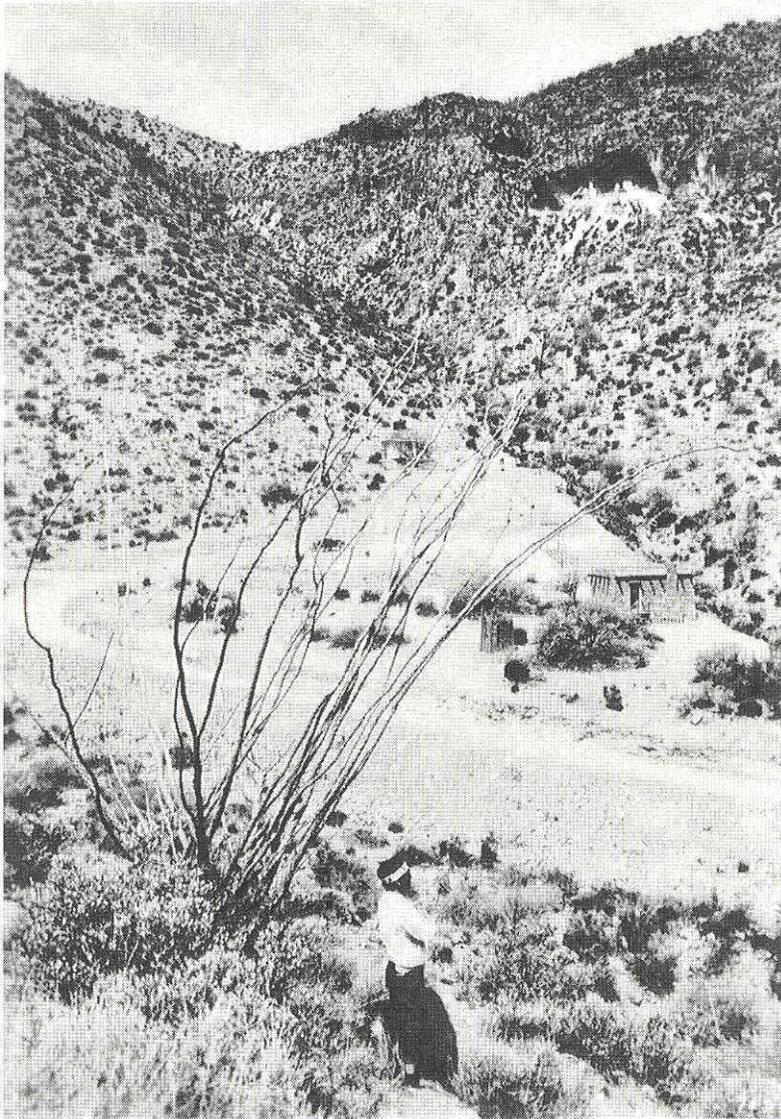


Figure 4. View in 1929 across Cave Canyon from opposite the visitor center site, looking up Cholla Canyon at Lower Ruin. Photo by Southern Pacific Railroad.

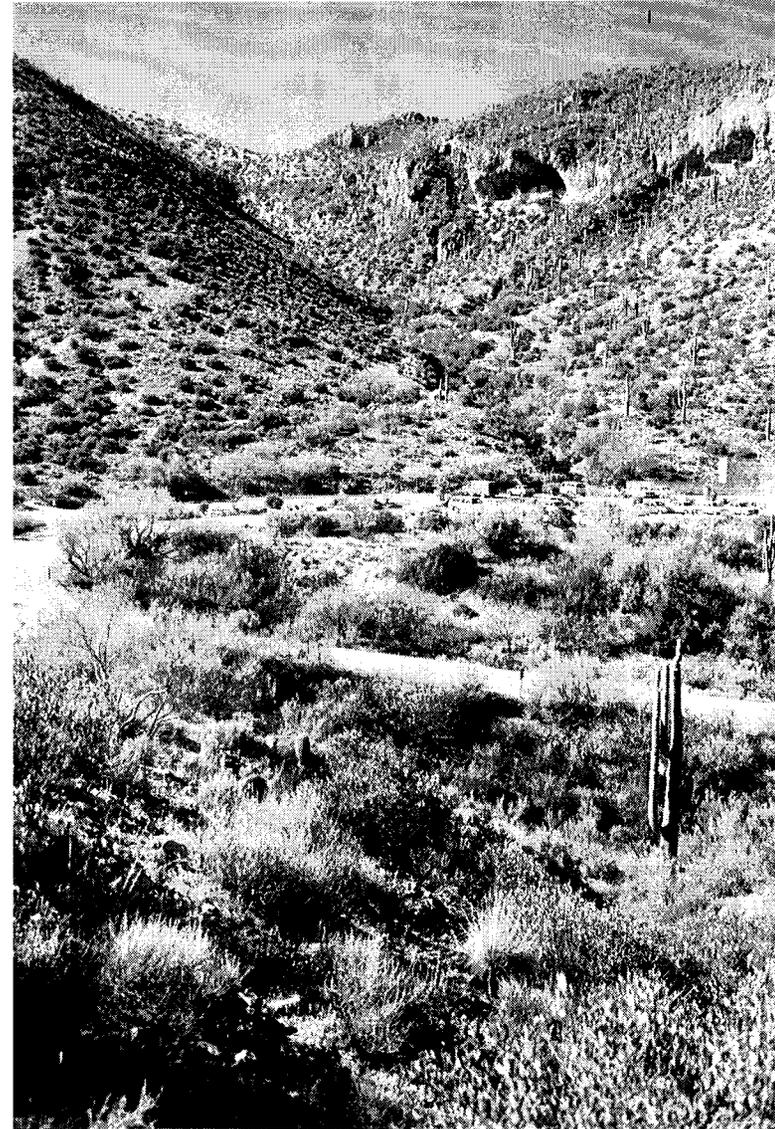


Figure 5. Same view as Figure 4, taken 18 January 1991. Photo by F. Reichenbacher.

Figure 6 depicts the view in August 1941 from the south side of Cave Canyon, looking towards the visitor center site. Comparatively, the view on 18 January 1991 (Fig. 7) shows that vegetation has grown dramatically denser, especially along the Cave Canyon bottom. In our opinion, the increased cover and density of shrubs is primarily due to active fire suppression, in concert with a lack of cattle grazing, fuelwood collection, and climatic changes. The number of saguaros appears to have increased, although the views do not exactly match and a precise count is not possible.



Figure 6. View in August 1941 from the south side of Cave Canyon, looking toward the visitor center site. Photo by N. Dodge and J. Peavy.



Figure 7. Same view as Figure 6, taken 189 January 1991. Photo by F. Reichenbacher.

Figure 8 depicts the view in November 1950 from above Lower Ruin Trail immediately north of Lower Ruin, looking down Cholla Canyon to the visitor center site. Differences in lighting inhibit comparison to Figure 9 (same view, 18 January 1991). The saguaro in the right foreground of Figure 9 must have been very small in 1950. The saguaro in the left foreground has grown considerably and has lost 3 arms. It is difficult to tell whether the density or only the cover of shrubs on the south-facing slope of Cholla Canyon in the foreground has increased. The plants do seem taller and bushier in 1991 than in 1950.

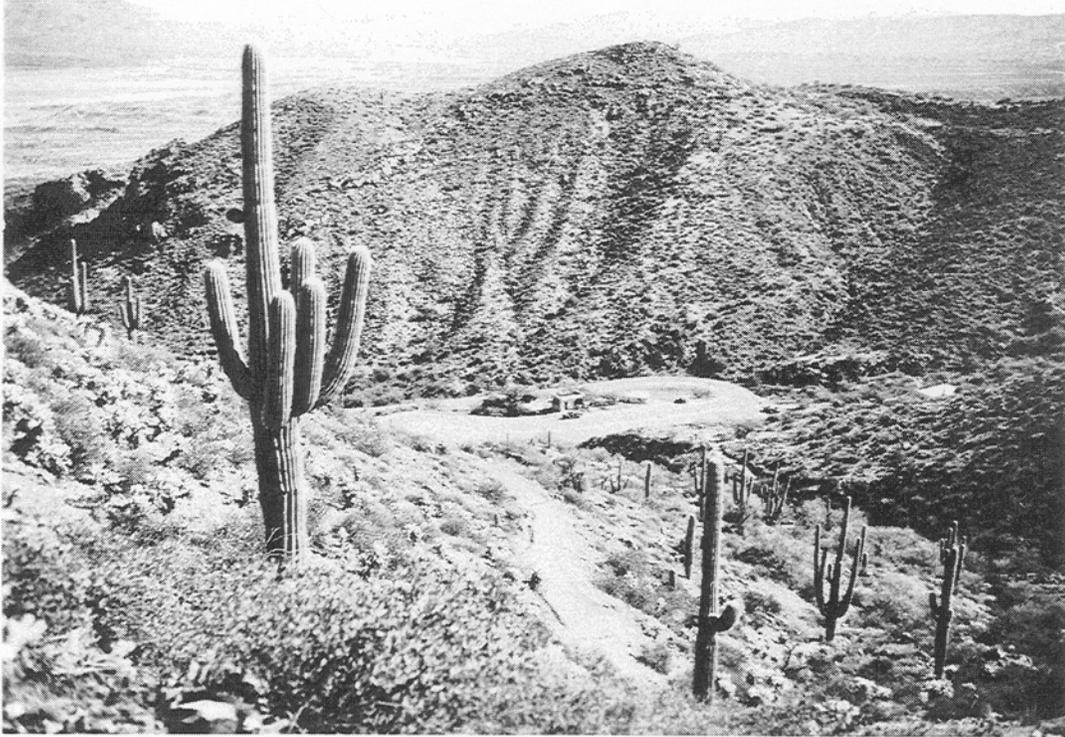


Figure 8. View in November 1950 from Lower Ruin Trail immediately north of Lower Ruin, looking down Cholla Canyon to the visitor center site. Photo by ?. Steen.



Figure 9. View slightly higher on slope than in Figure 8, taken 18 January 1991 (note large saguaro at right is not seen in Fig. 8). Photo by F. Reichenbacher.

Figure 10 depicts the view photographed 2 July 1964 from what is now the monument road, immediately south of the residential area access road, north of the gate. The photograph shows 2 north-facing hill slopes that were burned a few days before the picture was taken. In Figure 11 (same view, 18 January 1991) the southeast-facing hill slopes that support paloverde associations do not support sufficient grasses to carry a fire and probably rarely experience wildfires. The north-facing slopes would probably burn frequently without fire suppression efforts. Recurrent fires on the north-facing slopes discourage shrub growth and may partly account for the lack of saguaros in these sites.



Figure 10. View on 2 July 1964 from what is now the monument road, immediately south of the residential area access road, north of the gate. Photo by T. Swan

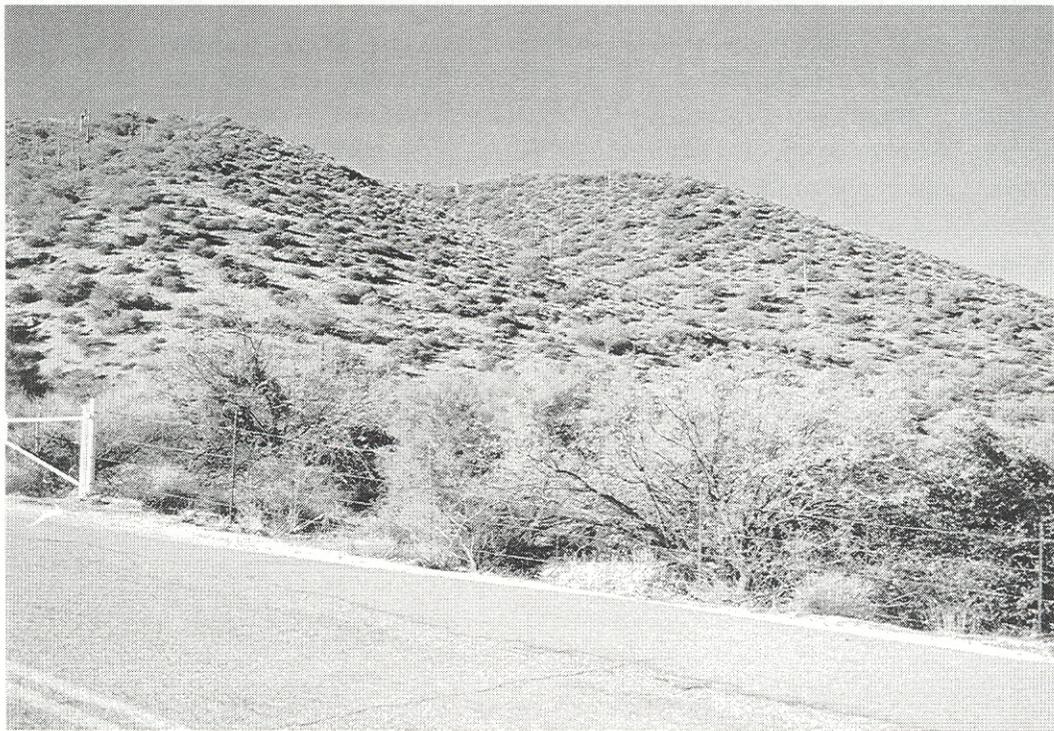


Figure 11. Same view as Figure 10, taken 18 January 1991. Photo by F. Reichenbacher.

Figure 12 depicts the 3 July 1964 view from what is now Upper Ruin Trail, near the bottom of Cave Canyon. It shows the vegetation of the east-facing slopes of Cave Canyon below Upper Ruin. Many of the areas to the far lower right and far left were not burned, unlike the area shown in the center. Figure 13 (same view, 18 January 1991) shows that the prickly pear cactus on the trail survived, as did the juniper in the lower right. Many saguaros were apparently killed. This is the only view of an area demonstrating a decline in shrub and saguaro density and cover. In our opinion, it is likely that active fire suppression in the past created an excess fuel load that created an abnormally hot fire. The current condition, with reduced densities of shrubs and fewer saguaros, is likely to more closely approach that of the pre-settlement condition. Livestock grazing reduced the fuel load below the limits that could carry an intense fire, and for a time shrubs and saguaros colonized areas previously dominated by perennial grasses. Fuel loads were allowed to accumulate until a truly devastating fire of high intensity was inevitable. The validity of this opinion is greatly complicated by the role of a continuously changing climate that may, in some periods, favor some species over others. Whether the current lack of saguaros on the slopes below Upper Ruin is due to the effects of fire suppression or is the manifestation of a completely natural fluctuation in the margin of the range of a species cannot be determined solely from photographs.



Figure 12. View on 3 July 1964 from what is now Upper Ruin Trail, near the bottom of Cave Canyon. Photo by H.Jones.



Figure 13. Same view as Figure 12, taken 18 January 1991. Phot by F. Reichenbacher.

Management Recommendations

The vegetation changes documented by the rematched historic photographs suggest that TONT is in a period of change. Some areas have apparently become increasingly dominated by woody plants, while others have become grasslands. Both situations may derive from too frequent fires and livestock grazing, and attempts to determine successional patterns would be helpful. Although we believe livestock grazing should still be excluded from the monument, the effects of the release of grazing pressure on the fire ecology of the area must be considered.

The frequency, extent, and effects of fires must be carefully studied prior to the adoption of any permanent active management policy. The scopes of such studies should include fire history and the role of fire in the different vegetative communities so that fire occurrence can be integrated into the management of the monument. It may be possible to achieve some degree of control of red brome with an active fire management program.

If recovery measures are contemplated after fire or disturbances, only native plant seed of very local origin should be used. No action is recommended on nonnative species that have become well established. The monument should consider the feasibility of eradication programs for some of the nonnative plant species, especially horehound. Most of the nonnative species are annuals and many are very abundant; eradication programs for these species would be unlikely to succeed. Although eradication of the abundant perennial Lehmann lovegrass is probably not possible, the monument should look into the possibility of some form of biological control.

It is recommended that the monitoring plots not be revisited for 5-10 years because of potential disturbances by the samplers. If sampled too frequently, some plots, especially those on steep slopes, could be trampled by the samplers to the point that they may no longer represent the subassociation surrounding them. Future samplers may alter sampling techniques such that only certain subplots be sampled for herbaceous plant cover. We recommend reading the plots for woody and herbaceous perennial plants only, and only once during the month of April.

At the time of this study, pressed plant collections were kept at the monument. They have since been moved to the NPS Western Archeological and Conservation Center (WACC). Establishing central, regional herbarium holdings such as at WACC will allow researchers easier access to specimens and related literature and could better aid in administration and management of national park lands. It should be pointed out that instructive and "show and tell" collections are of a different nature than herbarium specimens and are invaluable at park and monument headquarters.

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Appendix 1
**Data for Vegetation Subassociations on
Tonto National Monument**

Subassociation

224.7121 Jojoba—Velvet mesquite—Catclaw [*Simmondsia chinensis*—*Prosopis velutina*—*Acacia greggii*]

Distribution

This type is found adjacent to the stream channels in Cave Canyon and Deadman Canyon, as well as portions of the arroyos on the valley floor. Also characteristic of this type is an area extending out from the arroyos on the northwestern part of the valley floor. Elevational range is from about 700 m to 1,005 m (2,300-3,300 ft).

Floristics

Individual species are arranged principally by descending frequency value, and thereafter by descending prominence mean value, descending prominence range value, and alphabetized species common name.

Characteristic species	Range	Prominence	
		Mean	Frequency
Globe-mallow	3-4	3.50	1.00
Catclaw	2-4	3.00	1.00
Goldeneye	2-4	3.00	1.00
Jojoba	2-4	3.00	1.00
Velvet mesquite	2-4	3.00	1.00
Blue paloverde	2-3	2.50	1.00
Buckhorn-cholla	2	2.00	1.00
Broom snakeweed	1-3	1.50	1.00
Graythorn			

Associated species	Range	Prominence	
		Mean	Frequency
Sotol	2	2.00	1.00
Desert-broom	1-2	1.50	1.00
Bush-penstemon	0-4	2.00	0.50
Lehmann lovegrass	0-4	2.00	0.50

Associated species	Prominence		
	Range	Mean	Frequency
Wright lippia	0-4	2.00	0.50
Wormwood (<i>Artemisia ludoviciana</i>)	0-4	1.50	0.50
Brittle-bush	0-3	1.50	0.50
Bush muhly	0-3	1.50	0.50
Spiderwort	0-3	1.50	0.50
Three-awn (<i>Aristida parishii</i>)	0-3	1.50	0.50
Wolfberry	0-2	1.00	0.50

Occasional Species

Aster (*Machaeranthera asteroides*), spike dropseed, spurge (*Euphorbia melanadenia*), tatalencho, desert-straw, rock-cress, *Trixis californica*, thistle, Wright buckwheat, odora, hispid golden-aster, *Janusia gracilis*, cliff brake, canotia, red-berry juniper, Reverchon three-awn, wormwood (*Artemisia dracunculus*), sweet-bush, *Bothriochloa barbinodis*, side-oats grama, Indian paintbrush, bluedicks, San-Felipe dyssodia, squirrel-tail, weeping lovegrass, spreading fleabane, mock-pennyroyal (*Hedeoma nanum* ssp. *macrocalyx*), desert-rock pea, wild-cucumber, angle-pod (*Matelea producta*), blue snapdragon-vine, pointy-leaf phlox, groundsel (*Senecio lemmonii* and *S. neomexicanus*), and slim tridens.

Physiognomy

Small trees and shrubs to 8 m (26 ft) grow in stands along ephemeral streambeds in canyon bottoms and in and adjacent to shallow gullies on the valley floor. The density and cover is greater than in adjacent upland vegetation. The ground is generally very rocky, with small intermittent areas of silty and sandy soil deposits.

Notes

Graythorn did not fall within the sampled areas, yet there are places especially on the valley floor in the northwest part of the monument where it can grow to 3 or 4 m (10-13 ft) in dense thickets. Sotol and bush-penstemon are more common in the canyons, while wolfberry and graythorn are more common on the valley floor. This and the other types on the valley floor intergrade frequently at various locations, making it difficult to classify the vegetation of the area.

Subassociation

133.3421 Mountain-mahogany—Shrub-live oak—Desert needlegrass—Canotia [*Cercocarpus montanus-Quercus turbinella—Stipa speciosa—Canotia holacantha*]

Distribution

Lower elevation limits of Interior Chaparral occur on the highest northeast-facing slopes of the monument at the highest elevations of Deadman Canyon, and in a small pocket at the northeast corner of Honey Butte. Elevation range in Deadman Canyon is 1,085-1,213 m (3,560-3,980 ft), while the pocket on Honey Butte is 877-1,000 m (2,880-3,280 ft).

Floristics

Individual species are arranged principally by descending frequency value, and thereafter by descending prominence mean value, descending prominence range value, and alphabetized species common name.

Prominence			
Characteristic species	Range	Mean	Frequency
Mountain-mahogany	4	4.00	1.00
Desert needlegrass	3-4	3.50	1.00
Shrub-live oak	3-4	3.50	1.00
Canotia	2-4	3.00	1.00
Globe-mallow	3	3.00	1.00
Jojoba	3	2.50	1.00
Banana yucca	2-3	2.50	1.00

Prominence			
Associated species	Range	Mean	Frequency
Buckhorn-cholla	2	2.00	1.00
Engelmann prickly-pear	2	2.00	1.00
Broom snakeweed	0--4	4.00	0.50
Side-oats grama	0-4	4.00	0.50
Bush-penstemon	0-3	3.00	0.50
Fendler lip-fern	0-3	3.00	0.50
Rayless encelia	0-3	3.00	0.50
Rock-cress	0-3	3.00	0.50
Three-awn (<i>Aristida parishii</i>)	0-3	3.00	0.50
Velvet mesquite	0-3	3.00	0.50

Associated species	Range	Prominence	
		Mean	Frequency
Wild-buckwheat	0-3	3.00	0.50
Wormwood (<i>Artemisia ludoviciana</i>)	0-3	3.00	0.50
Wright buckwheat	0-3	3.00	0.50

Occasional Species

Sweet-bush, sugar sumac, desert bedstraw, *Trixis californica*, desert-marigold, desert-rock pea, rock echeveria, squaw-bush, mutton-grass, squirrel-tail, spreading fleabane, single-leaved ash, mountain parsley, straggling mariposa, groundsel (*Senecio neomexicanus*), sotol, broom snakeweed, cliff brake, and thick-leaved groundcherry.

Physiognomy

Small trees and shrubs to 4 m (13 ft) tall, with several common perennial grasses and herbaceous species, grow on gentle to moderately steep rocky slopes. The larger trees and shrubs are scattered or in small thickets with grass, small shrubs, and herbs filling the areas between them.

Notes

These isolated patches of Interior Chaparral are at the lower elevational limit for the type. The small areas of chaparral, especially at the head of Deadman Canyon, are relatively open habitats with many species more characteristic of surrounding Semidesert Grassland vegetation.

Subassociation

143.1551 Globe-mallow—Desert-straw—Desert needlegrass—Lehmann lovegrass—Jojoba
 [*Sphaeralcea emoryi*—*Stephanomeria pauciflora*—*Stipa speciosa*—*Eragrostis lehmanniana*
Simmondsia chinensis]

Distribution

This type is found on the south and southeast-facing slopes of Cave Canyon and its side canyon, and on the east side of Honey Butte. Elevation range is 865—1,230 m (2,840-4,035 ft).

Floristics

Individual species are arranged principally by descending frequency value, and thereafter by descending prominence mean value, descending prominence range value, and alphabetized species common name.

Prominence			
Characteristic species	Range	Mean	Frequency
Globe-mallow	1-4	2.71	1.00
Desert needlegrass	1-3	1.67	0.86
Lehmann lovegrass	1-5	3.40	0.71
Desert-straw	1-3	2.40	0.71
Jojoba	2-4	2.17	0.71

Prominence			
Associated species	Range	Mean	Frequency
Three-awn (<i>Aristida parishii</i>)	1-5	3.50	0.57
Spike-moss	1-3	2.50	0.57
Goldeneye	1-4	2.00	0.57
Four o'clock (<i>Mirabilis bigelovii</i>)	1-3	1.75	0.57
Rock echevaria	2-3	2.66	0.43
Slim tridens	1-3	2.33	0.43
Wolfberry	1-3	2.00	0.43
Brittle-bush	2	2.00	0.43
Side-oats grama	1-2	1.67	0.43
<i>Bothriochloa barbinodis</i>	4	4.00	0.29
Sweet-bush	2-3	2.50	0.29
Odora	2	2.00	0.29
Desert senna	1-2	1.50	0.29

Occasional Species

Wright lippia, tanglehead, teddy-bear-cholla, buckhorn-cholla, blue paloverde, sand dropseed, Havard three-awn, foothill paloverde, pincushion-cactus, broom snakeweed, catclaw, spurge (*Euphorbia melanadenia*), trailing four-o'clock, blackfoot, century-plant, saguaro, desert rose-mallow, western ragweed, rock-cress, Fendler lip-fern, cotton-top, bluedicks, *Carlowrightia arizonica*, San-Felipe dyssodia, spreading fleabane, wild-buckwheat, desert bedstraw, *Janusia gracilis*, angle-pod (*Matelea producta*), Engelmann prickly-pear, cliff-brake, and spiderwort.

Physiognomy

Several species of perennial grasses and herbaceous species dominate steep, rocky slopes and ridgetops. Cacti and shrubs, mostly less than 3 m (10 ft), are interspersed.

Notes

This type on the monument may have been created and maintained by fire. Cacti were once common here (see photo discussion).

In some places the boundaries of this type are old fire trails. Pockets of Sonoran Desertscrub vegetation are found within this type.

Subassociation

143.1552 Sotol—Broom snakeweed—Side-oats grama—Globe-mallow [*Dasyilirion wheeleri-Gutierrezia sarothrae-Bouteloua curtipendula-Sphaeralcea emoryi*]

Distribution

This type occurs from the higher elevations to the ridgetop on north and northwest-facing slopes in Cholla Canyon into upper Deadman Canyon, where it is replaced by Interior Chaparral. It also occurs on the upper west and northwest-facing slopes of Honey Butte. Elevation range is from 940 m to 1,385 m (3,085—4,545 ft).

Floristics

Individual species are arranged principally by descending frequency value, and thereafter by descending prominence mean value, descending prominence range value, and alphabetized species common name.

Characteristic species	Range	Prominence	
		Mean	Frequency
Broom snakeweed	4	4.00	1.00
Side-oats grama	4	4.00	1.00
Sotol	4	4.00	1.00
Century-plant	1-3	1.67	1.00
Globe-mallow	1-2	1.67	1.00

Associated species	Range	Prominence	
		Mean	Frequency
Canotia	3	3.00	0.67
Rock echevaria	3	3.00	0.67
Fendler lip-fern	1-2	1.50	0.67
Eaton firecracker	1	1.00	0.67
Jojoba	1	1.00	0.67

Occasional Species

Feather-plume, Lehmann lovegrass, Wright buckwheat, slim tridens, rock-cress, three-awn (*Aristida hamulosa* and *A. parishii*), hop-bush, spurge (*Euphorbia melanadenia*), hispid goldenaster, brickellia (*Brickellia atrectyloides*), green violet, blackfoot, spike-moss, mountain-mahogany, San-Felipe dyssodia, Wright lippia, pointy-leaf phlox, desert bedstraw, plains lovegrass, desert-straw, brittle-bush, pincushion-cactus, mutton-grass, groundsel (*Senecio lemmoni*), small-leaved ratany, Indian paintbrush, mountain parsley, desert-broom, desert-rock pea, cliff-brake, bluedicks, spiderwort, red-berry juniper, wormwood (*Artemisia ludoviciana*), *Bothriochloa barbinodis*, hedgehog, spreading fleabane, and squirrel-tail.

Physiognomy

Sotol and several species of perennial grasses, subshrubs, and herbaceous species dominate ridgetops and steep, rocky slopes. Other deciduous and evergreen shrubs are frequent. The flowering stalks of sotol and agaves may be 4 m (13 ft) tall, but are usually less. Most plants and shrubs are less than 2 m (6.5 ft).

Notes

This type is the north and west aspect counterpart of 143.1551 and has also had much of the same fire history. Cacti were never as common here, but the sotol and agave were.

Subassociation

154.1231 Jojoba—Broom snakeweed—Wolfberry [*Simmondsia chinensis*—*Gutierrezia sarothrae*
Lycium fremontii]

Distribution

The most representative stands of this type are found on the northwest, northeast, and southeast parts of the valley floor on the monument and on the west and northwest aspects of the lowest mountain slopes. The boundaries are not clear, and examples of this type can be found in irregular patches from the lowest slopes down in elevation. Elevation range is from near 700 m (2,300 ft), the lowest on the monument, up to 790 m (2,595 ft).

Floristics

Individual species are arranged principally by descending frequency value, and thereafter by descending prominence mean value, descending prominence range value, and alphabetized species common name.

Characteristic species	Prominence		
	Range	Mean	Frequency
Jojoba	3-5	4.17	1.00
Broom snakeweed	2-5	3.43	1.00
Wolfberry	2-4	2.83	0.86
Buckhorn-cholla	1-3	2.20	0.71
Engelmann prickly-pear	1-4	2.75	0.57
Velvet mesquite	3-4	3.33	0.43

Associated species	Prominence		
	Range	Mean	Frequency
Foothill paloverde	2-3	4.14	0.43
Spurge (<i>Aristida parishii</i>)	1-4	2.33	0.43
Menodora	1-3	2.33	0.43
Brittle-bush	1-5	3.00	0.29
Globe-mallow	3	3.00	0.29
Blue paloverde	2-3	2.50	0.29
Goldeneye	2-3	2.50	0.29
Graythorn	2-3	2.50	0.29
Wild-buckwheat	1-3	2.00	0.29
Desert senna	1-2	1.50	0.29
Rock-cress	1	1.00	0.29

Occasional Species

Teddy-bear-cholla, spurge (*Euphorbia arizonica*), odora, slim tridens, creosote-bush, desert hackberry, catclaw, bush-penstemon, Wright lippia, sotol, ocotillo, joint-fir, brownfoot, desert bedstraw, desert-rock pea, saguaro, San-Felipe dyssodia, fluff-grass, turpentine-bush, Fendler lip-fern, hedgehog, barrel-cactus, *Janusia gracilis*, and angle-pod (*Matelea producta*).

Physiognomy

Shrubs and small trees, 1-4 m (3-13 ft) tall, and cacti of several species are in evidence. Saguaros may be more than 10 m (30 ft) tall. Jojoba is 2 m (6.5 ft) tall and is clearly the most abundant plant. Subshrubs are common and perennial grasses are restricted. Some areas are nearly void of vegetation. The soil is usually a rocky mix of sandstone and conglomerate deposits, and the slope is generally gradual.

Notes

This type seems to prefer the finer sediments on the valley floor. This and other types that grow on the valley floor are not always clearly defined and frequently mix with each other in transition areas or pockets.

Subassociation

154.1232 Foothill paloverde—Wolfberry—Jojoba [*Cercidium microphyllum*—*Lycium fremontii*—*Simmondsia chinensis*]

Distribution

This type occupies the greater part of the central area of the monument valley floor and the east and southwest aspects of the lowest mountain slopes. Much of the area along State Route 88 and the monument access road up to and including the resident area is included in this type.

Floristics

Individual species are arranged principally by descending frequency value, and thereafter by descending prominence mean value, descending prominence range value, and alphabetized species common name.

Characteristic species	Prominence		
	Range	Mean	Frequency
Foothill paloverde	3-5	3.92	1.00
Wolfberry	1-3	2.75	1.00
Jojoba	3-5	3.90	0.83
Velvet mesquite	2-4	3.43	0.58
Broom snakeweed	2-4	3.00	0.58
Blue paloverde	1-4	2.57	0.58

Associated species	Prominence		
	Range	Mean	Frequency
Brittle-bush	2-5	2.67	0.50
Buckhorn-cholla	1-4	2.33	0.50
Desert hackberry	1-3	2.33	0.50
Odora	2-3	2.17	0.50
Wild-buckwheat	1-3	2.20	0.42
Graythorn	1-2	1.60	0.42
Three-awn (<i>Aristida parishii</i>)	3-4	3.25	0.33
Globe-mallow	2-3	2.50	0.33
Teddy-bear-cholla	1-3	2.00	0.33
Saguaro	1-5	3.00	0.25
Catclaw	3	3.00	0.25
Goldeneye	2-3	2.33	0.25

Occasional Species

White-thorn, *Commicarpus scandens*, *Janusia gracilis*, Wright buckwheat, desert-broom, fluff grass, short-leaved baccharis, *Isocoma coronopifolia*, *Isocoma acradenia*, spike-moss, helechillo, barrel-cactus, desert senna, cheese-bush, turpentine-bush, angle-pod (*Matelea parvifolia*), and San-Felipe dyssodia.

Physiognomy

Small trees to 5 m (16 ft) plus shrubs, subshrubs and cacti are present. Saguaros may be more than 10 m (30 ft) tall. In places subshrubs 0.5 m (1.5 ft) or less tall are co-dominant and other areas are nearly barren or monotypic. The slope is rarely steep, and the soils are a mix of sandstones and conglomerates.

Notes

This type is most evident on the outwash plain that radiates out from the mouth of Cave Canyon. All the types that grow on the valley floor are not always clearly defined and frequently mix with each other in transition areas or pockets.

Subassociation

154.1234 Jojoba—Brittle-bush—Broom snakeweed—Wild-buckwheat—Three-awn [*Simmondsia chinensis*—*Encelia farinose*—*Gutierrezia sarothrae*—*Eriogonum fasciculatum*—*Aristida parishii*]

Distribution

This type occupies north- and west-facing slopes in lower Cave Canyon, Cholla Canyon, and the canyon north of Lower Ruin. It occupies both sides of lower Deadman Canyon and a large area of varied exposure just to the east of it. Elevation range is from 815 m to 1,060 m (2,675-3,480 ft).

Floristics

Individual species are arranged principally by descending frequency value, and thereafter by descending prominence mean value, descending prominence range value, and alphabetized species common name.

Characteristic species	Prominence		
	Range	Mean	Frequency
Jojoba	3-5	4.00	0.90
Wild-buckwheat	1-4	2.89	0.90
Broom snakeweed	2-4	3.63	0.80
Three-awn (<i>Aristida parishii</i>)	2-4	3.38	0.80
Goldeneye	2-4	2.38	0.80
Odora	2-3	2.14	0.70
Globe-mallow	1-4	2.50	0.60
Buckhorn-Cholla	2-3	2.33	0.60
Wolfberry	2-3	1.83	0.60

Associated species	Prominence		
	Range	Mean	Frequency
Fendler lip-fern	1-3	2.40	0.50
Desert bedstraw	1-3	2.20	0.50
Desert needlegrass	1-4	1.80	0.50
Spike-moss	1-2	1.60	0.50
Side-oats grama	3-4	3.50	0.40
Sotol	1-4	2.75	0.40
Canotia	1-4	2.50	0.40
Century-plant	1-3	1.50	0.40

Associated species	Prominence		
	Range	Mean	Frequency
Bush-penstemon	2-4	3.00	0.30
Rock echevaria	3	3.00	0.30
Wolfberry	2-3	2.67	0.30
Desert rose-mallow	1-3	2.00	0.30
Englemann prickly-pear	2	2.00	0.30
Catclaw	1	1.00	0.30
Brittle-bush	1-4	4.00	0.20
Desert-marigold	2-3	2.50	0.20
Rock-cress	2-3	2.50	0.20
Wormwood (<i>Artemisia ludoviciana</i>)	2-3	2.50	0.20
Foothill paloverde	2	2.00	0.20
Spiderwort	2	2.00	0.20
Wright buckwheat	2-3	2.00	0.20
Ocotillo	1-2	1.50	0.20
Velvet mesquite	1	1.00	0.20

Occasional Species

Lehmann lovegrass, tanglehead, slim tridens, Wright lippia, brickellia (*Brickellia atractyloides*), desert-rock pea, four o'clock, aster (*Machaeranthera asteroides*), *Bothriochloa barbinodis*, Fendler lip-fern, hop-bush, bush muhly, desert-straw, *Trixis californica*, squirrel-tail, turpentinebush, white ratany, pincushion-cactus, *Ayenia filiformis*, menodora, saguaro, pretty dodder, rocky-daisy, Indian paintbrush, bluedicks, pointy-leaf phlox, four-o'clock (*Oxybaphus coccineus*), mountain parsley, small-leaved abutilon, and straggling mariposa.

Physiognomy

Shrubs to 3 m (10 ft), subshrubs and perennial grasses predominate. This habitat supports a variety of perennial grasses and forbs, but cover and density are often low. Foothill paloverde is less common here than in adjacent types. The rocky slopes are commonly very steep.

Notes

This type is generally on north- to west-facing slopes, but occupies other aspects in some areas. The lack of foothill paloverdes and saguaros plus the abundance of grasses may indicate that this type is, in part, the result of historical fire.

Subassociation

154.1235 Jojoba—Foothill paloverde—Three-awn—Spike-moss [*Simmondsia chinensis*—*Cercidium microphyllum*—*Aristida parishii*—*Selaginella arizonica*]

Distribution

This type is found on the southeastern slopes of Cholla Canyon (including Lower Ruin), the east slopes of Cave Canyon (from above the visitor center downward), the ridges between Cave Canyon and Deadman Canyon, plus a strip at medium elevations on the east-facing side of Deadman Canyon. The elevation range is from 805 m to 1,110 m (2,640-3,640 ft).

Floristics

Individual species are arranged principally by descending frequency value, and thereafter by descending prominence mean value, descending prominence range value, and alphabetized species common name.

Characteristic species	Prominence		
	Range	Mean	Frequency
Foothill paloverde	2-4	3.78	1.00
Jojoba	2-4	3.78	1.00
Three-awn	1-4	2.63	0.89
Spike-moss	3-4	3.71	0.78
Brittle-bush	2-4	3.29	0.78
Saguaro	1-4	3.14	0.78
Wild-buckwheat	1-4	2.86	0.78
Desert needlegrass	1-4	2.50	0.67

Associated species	Prominence		
	Range	Mean	Frequency
Goldeneye	2-4	3.20	0.56
Pincushion-cactus	1	1.00	0.56
Globe-mallow	1-4	2.25	0.44
Desert bedstraw	2-3	2.25	0.44
Odora	2-3	2.25	0.44
Helechillo	1-3	2.00	0.44
Ocotillo	1-3	2.00	0.44
Teddy-bear-cholla	1-4	2.67	0.33
Buckhorn-cholla	1-3	2.33	0.33

Associated species	Prominence		
	Range	Mean	Frequency
Century-plant	1-2	1.67	0.33
Spurge (<i>Euphorbia melanadenia</i>)	3	3.00	0.22
Banana yucca	1-3	2.00	0.22
Four o'clock	1-3	2.00	0.22
Brickellia (<i>Brickellia atractyloides</i>)	1-2	1.50	0.22
Rock echevaria	1	1.00	0.22
Tanglehead	1	1.00	0.22

Occasional Species

Hop-bush, turpentine-bush, barrel-cactus, bush muhly, Engelmann prickly-pear, Christmas-cactus, San-Felipe dyssodia, desert-straw, slim tridens, blackfoot, cloak-fern, cotton-top, sand dropseed, Fendler lip-fern, desert rose-mallow, desert senna, *Trixis californica*, cliff-brake, mock-pennyroyal (*Hedeoma nanum*), curly-mesquite-grass, rock-cress, catclaw, canotia, broom snakeweed, wolfberry, and four-o'clock (*Mirabilis bigelovii*).

Physiognomy

Small trees to 4 m (13 ft) with shrubs, cacti, perennial grasses, and forbs are all common. This type has the best stands of saguaro on the monument, which may exceed 12 m (40 ft) in height. Plants here average woodier and taller than type 154.1234 at the same elevation, while species diversity is somewhat less. The slopes are generally steep and rocky.

Subassociation

154.1236 Desert needlegrass—Jojoba—Side—oats grama [*Stipa speciosa*—*Simmondsia chinensis*—*Bouteloua curtipendula*]

Distribution

This type is growing on the western slopes of Honey Butte in upper Canyon Cave, and from uppermost Cholla Canyon across into the northwest-facing canyon bottom of Deadman Canyon, thence north along the ridgetop that marks the west monument boundary. Elevation range is 865-1,180 m (2,840-3,875 ft) on the monument.

Floristics

Individual species are arranged principally by descending frequency value, and thereafter by descending prominence mean value, descending prominence range value, and alphabetized species common name.

Characteristic species	Prominence		
	Range	Mean	Frequency
Desert needlegrass	4	4.00	1.00
Jojoba	3-4	3.88	1.00
Side-oats grama	2-4	3.00	1.00
Globe-mallow	2-4	2.88	1.00
Century-plant	2-4	2.88	0.88
Sotol	2-4	2.71	0.88
Broom snakeweed	2-4	3.33	0.75
Goldeneye	2-4	2.83	0.75
Fendler lip-fern	1-3	2.83	0.75

Associated species	Prominence		
	Range	Mean	Frequency
Wild-buckwheat	3	2.33	0.75
Rock echevaria	1-3	2.17	0.75
Canotia	1-2	1.33	0.75
Rock-cress	2-3	2.75	0.63
Wright buckwheat	2-3	2.25	0.63
Desert bedstraw	2	2.00	0.63
Three-awn (<i>Aristida parishii</i>)	2-4	3.00	0.50
Wormwood (<i>Artemisia ludoviciana</i>)	2-4	3.00	0.50

Associated species	Prominence		
	Range	Mean	Frequency
Buckhorn-cholla	3	3.00	0.50
Catclaw	2-3	2.75	0.50
Engelmann prickly-pear	2-3	2.225	0.50
Desert-straw	1-3	1.75	0.50
Slim tridens	2-4	3.00	0.38
Lehmann lovegrass	2-3	2.67	0.38
Turpentine-bush	1-4	2.33	0.38
Hedgehog	1-3	2.00	0.38
Odora	2	2.00	0.38
Bush muhly	2	2.00	0.26

Occasional Species

Spike dropseed, *Bothriochloa barbinodis*, ocotillo, wolfberry, cliff-brake, thistle, desert-broom, spike-moss, feather-plume, spurge (*Euphorbia melanadenia*), helechillo, Christmas-cactus, sand dropseed, Wright lippia, desert-marigold, sweet-bush, brickellia (*Brickellia atractyloides*), mountain-mahogany, cotton-top, San-Felipe dyssodia, hispid golden-aster, rayless encelia, green sprangletop, menodora, desert-rock pea, blackfoot, plains lovegrass, desert-lavender, saguaro, pincushion-cactus, bush muhly, Eaton firecracker, banana yucca, sugar sumac, bluedicks, straggling mariposa, Indian paintbrush, squirrel-tail, pointy-leaf phlox, mutton-grass, brownfoot, broom snakeweed, green violet, and teddy-bear-cholla.

Physiognomy

Perennial grasses and shrubs 1-2 m (3-6 ft) tall are most evident. Cacti, subshrubs and a variety of herbaceous perennials are present and density is high. Perennial grasses are well represented.

Subassociation

223.2221 Arizona sycamore—Arizona walnut—Blue wild-rye—Net-leaf hackberry [*Platanus wrightii*—*Juglans major*—*Elymus glaucus*—*Celtis reticulata*]

Distribution

Located at and below a permanent spring in Cave Canyon just south of the visitor center, this type occupies a few acres of canyon bottom from 915 m to 940 m (3,000 ft to 3,085 ft).

Floristics

Individual species are arranged principally by descending cover value, and thereafter by descending prominence value, and alphabetized species common name.

Characteristic species	Prominence	Cover
Arizona sycamore	4	4
Blue wild-rye	4	4
Arizona walnut	3	4
Horehound (nonnative)	4	3
Net-leaf hackberry	4	3
Velvet mesquite	4	3
Graythorn	3	3
Seep-willow sp.	3	3

Associated species	Prominence	Cover
Arizona dewberry	3	3
Western ragweed	3	2
Wormwood (<i>Artemisia dracunculus</i>)	3	2
<i>Bothriochloa barbinodis</i>	2	2
Blueberry elder	2	2
Desert-broom	2	2
Globe-mallow (<i>Sphaeralcea emoryi</i>)	2	2
Single-leaved ash	2	2
Wolfberry	2	2
Wormwood (<i>Artemisia ludoviciana</i>)	2	2
Desert needlegrass	3	1

Occasional Species

Wild-cucumber, weeping lovegrass, desert-straw, thistle, angle-pod (*Matelea producta*), aster (*Machaeranthera asteroides*), four-o'clock (*Mirabilis bigelovii*), field bindweed, bluedicks, water speedwell, golden corydalis, miners-lettuce, clematis, and spiderwort.

Physiognomy

Deciduous broadleaf trees \pm ~10 m (30 ft) tall form the overstory. Medium-sized trees and shrubs to 5 m (16 ft) form the understory. The ground cover is formed of grasses, vines and forbs. This type is restricted to damp ground and does not extend up the canyon sides.

Notes

Because this area is small and allowed only 1 relevé plot, the range and mean figures would be meaningless. Instead, raw data directly from the field form are presented. Please see Figure 1 and Table 1 for interpretation of the data.

The riparian habitat around the spring is a rare and unique microenvironment in Arizona Upland desertscrub that is sharply contrasted with the adjacent areas. The presence of a canopy and understory supply a habitat that is valuable to flora and fauna. An interesting example of this was the presence of a spotted owl (*Strix occidentalis*) perched in an Arizona sycamore in the fall of 1988 (photograph by Faye Morrison on file at TONT visitor center).

Appendix 2
Tonto National Monument
Permanent Vegetation Monitoring Plots

Plot Features

1. All monitoring plots = 10 x 20 m (200 sq m, 0.02 ha)—32.8 x 65.6 ft (2,150.5 sq ft, 0.05 a.).
2. Trees, shrubs, perennial herbs and grasses were all counted in the spring of 1989, while only perennial herbs and grasses were counted in the summer of 1989. Several plots included no herbaceous species for the summer reading (e.g., Plot #2).
3. Trees, shrubs, and perennial herbs and grasses were counted in 50, 2 x 2 m (4 sq m) 6.6 x 6.6 ft (43.0 sq ft), subplots in each plot.
4. Mean percent-cover represents the averaged percent-cover class scores of each species visually estimated in each of the 50 subplots. Refer to Table 1 for a list of percent-cover class codes.
5. Groundcover was visually estimated using cover class codes in each of the 50 subplots. These data were taken only in the summer of 1989.
6. Counts of individual plants were not possible in the cases of spike moss, a mat-forming prostrate plant, and wild blue rye, a perennial grass that was extremely dense in the riparian woodland (Plot #7).

The above data are provided in the following tables (1-10) for monitoring plots at TONT.

Table 1. Data collected from Tonto National Monument permanent vegetation monitoring. Plot #1 (TMP1)—Sonoran Desertscrub.

	Spring 1989			Summer 1989		
	Species count	Density per ha	Mean % cover	Species count	Density per ha	Mean % cover
Angle-pod (<i>Matelea producta</i>)	2	100	0.04			
Barrel-cactus	1	50	0.02			
Buckhorn-cholla	2	100	0.06			
Fendler lip-fern	2	100	0.06			
Globe-mallow (<i>Sphaeralcea emoryi</i>)	1	50	0.02			
Goldeneye	1	50	0.02			
Hedgehog	2	100	0.04			
<i>Janusia gracilis</i>	2	100	0.02			
Jojoba	40	2,000	1.38			
Menodora	17	850	0.30			
Odora	3	150	0.06			
Rock-cress	10	500	0.06			
San-Felipe dyssodia	1	50	0.02			
Spurge (<i>Euphorbia melanadenia</i>)	8	400	0.14	1	50	0.02
Wild-buckwheat	7	350	0.22			
Wolfberry	9	450	0.36			
				Groundcover data:		
				Rock		1.54
				Bare ground		4.44
				Litter		2.72
				Wood		0.16

Table 2. Data collected from Tonto National Monument permanent vegetation monitoring. Plot #2 (TMP2)—Sonoran Desertscrub.

	spring 1989			Summer 1989		
	Species count	Density per ha	Mean % cover	Species count	Density per ha	Mean % cover
Brittle-bush	34	1,700	0.30			
Broom snakeweed	1	50	0.02			
Catclaw	2	100	0.06			
Foothill paloverde	2	100	0.10			
Graythorn	1	50	0.04			
Jojoba	36	1,800	1.00			
Odora	12	600	0.08			
San-Felipe dyssodia	2	100	0.02			
Teddy-bear-cholla	2	100	0.04			
Wolfberry	5	250	0.20			
				Groundcover data:		
				Rock		1.30
				Bare ground		4.86
				Litter		2.18
				Wood		0.22

Table 3. Data collected from Tonto National Monument permanent vegetation monitoring. Plot #3 (TMP3)—Sonoran Desertscrub.

	Spring 1989			Summer 1989		
	Species count	Density per ha	Mean % cover	Species Density	count per ha	Mean % cover
Brittle-bush	89	4,450	1.32			
Broom snakeweed	3	150	0.04			
Canotia	1	50	0.04			
Catclaw	1	50	0.02			
Cliff-brake	1	50	0.02	1	50	0.02
Desert bedstraw	2	100	0.06			
Desert needlegrass	26	1,300	0.44	28	1,400	0.46
Desert-straw	3	150	0.04			
Fendler lip-fern	5	250	0.10	1	50	0.02
Foothill paloverde	10	500	0.56			
Four-o'clock (<i>Mirabilis bigelovii</i>)	7	350	0.14			
Globe-mallow (<i>Sphaeralcea emoryi</i>)	3	150	0.04			
Jojoba	33	1,650	1.22			
Ocotillo	1	50	0.04			
Odora	1	50	0.02			
Pincushion-cactus	2	100	0.04			
Reverchon three-awn	7	350	0.14	4	200	0.06
Rock-cress	2	100	0.04	4	200	0.06
Spike-moss			2.32			3.34
Wild-buckwheat	9	450	0.30			
Wolfberry	1	50	0.02			
				Groundcover data:		
				Rock		1.56
				Bare ground		3.56
				Litter		4.34
				Wood		0.14

Table 4. Data collected from Tonto National Monument permanent vegetation monitoring. Plot #4 (TMP4)—Sonoran Desertscrub.

	Spring 1989			Summer 1989		
	Species count	Density per ha	Mean % cover	Species count	Density per ha	Mean % cover
Bluedicks	20	1,000	0.22			
Brickellia (<i>Brickellia arrectyloides</i>)	1	50	0.02			
Broom snakeweed	438	21,900	2.14			
Bush-penstemon	1	50	0.08			
Canotia	2	100	0.08			
Catclaw	5	250	0.20			
Century-plant	14	700	0.10			
Desert bedstraw	2	100	0.04			
Desert needlegrass	10	500	0.22	13	650	0.24
Fendler lip-fern	27	1,350	0.32	38	1,900	0.42
Four-o'clock (<i>Oxybaphus coccineus</i>)	3	150	0.04			
Globe-mallow (<i>Sphaeralcea amoryi</i>)	38	1,900	0.52	24	1,200	0.30
Goldeneye	26	1,300	0.60			
Indian paintbrush	95	4,750	0.40			
Jojoba	6	300	0.16			
Mountain parsley	6	300	0.08			
Pincushion-cactus	2	100	0.04			
Pointy-leaf phlox	24	1,200	0.28			
Rock-cress	100	5,000	0.66	43	2,150	0.48
Rock echevaria	73	3,650	0.62	33	1,650	0.42
Side-oats grams	26	1,300	0.22	20	1,000	0.28
Small-leaved abutilon	2	100	0.04	2	100	0.04
Sotol	2	100	0.10			
spike-moss			0.12			0.24
Squirrel-tail	10	500	0.12	5	250	0.04
Stragling mariposa	3	150	0.06			
Wild-buckwheat	9	450	0.24			
Wormwood (<i>Artemisia ludoviciana</i>)	4	200	0.04	12	600	0.02
Wright buckwheat	1	50	0.02			
Wright lippia	4	200	0.14			
Unknown forb	1	50	0.02			
				Groundcover data:		
				Rock		3.38
				Bare ground		2.74
				Latter		3.28
				Wood		0.02

Table 5. Data collected from Tonto National Monument permanent vegetation monitoring. Plot #5 (TMP5)—Sonoran Desertscrub.

	Spring 1989			Summer 1989		
	Species count	Density per ha	Mean % cover	Species count	Density per ha	Mean % cover
Bluedicks	4	200	0.08			
Broom snakeweed	603	30,150	1.94			
Brownfoot	4	200	0.04	1	50	0.02
Century-plant	23	1,150	0.20			
Cliff-brake				1	50	0.02
Desert needlegrass	87	4,350	1.18	83	4,150	1.82
Desert-rock pea	18	900	0.32	10	500	0.14
Desert-straw	2	100	0.04			
Fendler lip-fern	65	3,250	0.46	57	2,850	0.48
Globe-mallow (<i>Sphaeralcea emoryi</i>)	38	1,900	0.40	27	1,350	0.30
Green violet	2	100	0.04			
Hedgehog	2	100	0.02			
Indian paintbrush	2	100	0.04			
Jojoba	18	900	0.98			
Mutton-grass	216	10,800	1.18			
Pincushion-cactus	2	100	0.04			
Pointy-leaf phlox	78	3,900	0.52	10	500	0.08
Rock-cress	100	5,000	0.66	43	2,150	0.48
Rock echevaria	53	2,650	0.22	3	150	0.04
San-Felipe dyssodia	7	350	0.12	3	150	0.04
Side-oats grama	65	3,250	0.56	67	3,350	0.76
Spike-moss			0.98			1.34
Squirrel-tail	10	500	0.16	10	500	0.12
Stragglng mariposa	1	50	0.02			
Sugar sumac	1	50	0.02			
Teddy-bear-cholla	3	150	0.02			
Three-awn (<i>Aristida parishii</i>)	7	350	0.14	62	3,100	0.48
Three-awn sp.	1	50	0.02			
Turpentine-bush	1	50	0.04			
Wormwood (<i>Artemisia ludoviciana</i>)	4	100	0.04			
Wright buckwheat	11	550	0.18			
				Groundcover data:		
				Rock		2.46
				Bare ground		3.20
				Litter		3.28
				Wood		0.00

Table 6. Data collected from Tonto National Monument permanent vegetation monitoring.
Plot #6 (TMP6)—Semidesert Grassland.

	Spring 1989			Summer 1989		
	Species count	Density per ha	Mean % cover	Species count	Density per ha	Mean % cover
Bluedicks	7	350	0.06			
<i>Bothriochloa barbinodis</i>	1	50	0.02			
Broom snakeweed	518	25,900	1.52			
Canotia	15	750	0.46			
Century-plant	16	800	0.10			
Cliff-brake	4	200	0.08	1	50	0.02
Desert bedstraw	1	50	0.02			
Desert needlegrass	19	950	0.40	13	650	0.34
Desert-rock pea	5	250	0.08	1	50	0.04
Desert-straw	21	1,050	0.24	10	500	0.18
Fendler lip-fern	81	4,050	0.52	37	1,850	0.40
Globe-mallow (<i>Sphaeralcea emoryi</i>)	34	1,700	0.46	13	650	0.20
Green violet	10	500	0.14			
Groundsel (<i>Senecio lammoni</i>)	1	50	0.02			
Hedgehog	1	50	0.02			
Indian paintbrush	11	550	0.12			
Mountain parsley	7	350	0.10			
Mutton-grass	688	34,400	1.48	747	37,350	2.24
Pincushion-cactus	1	50	0.02			
Pointy-leaf phlox				1	50	0.02
Rock-cress	310	15,500	0.88			
Rock echevaria	28	1,400	0.28	3	150	0.02
San-Felipe dyssodia	2	100	0.04	2	100	0.04
Side-oats grama	128	6,400	0.84	172	8,600	1.32
Sotol	3	150	0.12			
Spiderwort	1	50	0.02			
Spike-moss			0.18			0.04
Spreading fleabane	1	50	0.02			
Squirrel-tail	1	50	0.02	3	150	0.06
Three-awn (<i>Aristida hamulosa</i>)	6	300	0.10	3	150	0.04
Three-awn (<i>A. parishii</i>)				26	1,300	0.20
Wormwood (<i>Artemisia ludoviciana</i>)	8	400	0.04			
Wright buckwheat	356	17,800	1.50			
Unknown forb				1	50	0.02
Unknown grass				1	50	0.02
				Groundcover data:		
				Rock		2.28
				Bare ground		3.24
				Litter		3.44
				Wood		0.00

Table 7. Data collected from Tonto National Monument permanent vegetation monitoring. Plot #7 (TMP7)—Interior Riparian Deciduous Woodland.

	Spring 1989			Summer 1989		
	Species count	Density Per ha	Mean % cover	Species count	Density per ha	Mean % cover
Arizona sycamore	3	150	0.18			
Arizona walnut	6	300	0.08			
Blue wild-rye			3.90			3.98
Bluedicks	1	50	0.02			
<i>Bothriochloa barbinodis</i>	3	150	0.06	5	250	0.12
Desert-broom	3	150	0.10			
Desert needlegrass	19	950	0.40	13	650	0.34
Desert-straw	1	50	0.02			
Globe-mallow (<i>Sphaeralcea emoryi</i>)	2	50	0.08	1	50	0.02
Graythorn	3	150	0.12			
Horehound	108	5,400	0.56	18	900	0.18
Net-leaf hackberry	62	3,100	1.40			
Spiderwort	1	50	0.02			
Velvet mesquite	1	50	0.14			
Weeping lovegrass	2	100	0.02			
Western ragweed	38	1,900	0.20	12	600	0.08
Wild-cucumber	14	700	0.30			
Wolfberry				3	150	0.06
Wormwood (<i>Artemisia dracunculus</i>)	14	700	0.16	5	250	0.18
Wormwood (<i>A. ludoviciana</i>)	8	400	0.04			
Unknown grass #1	2	100	0.08			
Unknown grass #2	1	50	0.08			
Unknown grass #3				5	200	0.12
				Groundcover data:		
					Rock	2.14
					Bare ground	1.04
					Litter	5.08
					Wood	0.72

Table 8. Data collected from Tonto National Monument permanent vegetation monitoring.
Plot #8 (TMP8)—Desert Riparian Scrub.

	Spring 1989			Summer 1989		
	Species count	Density per ha	Mean % cover	Species count	Density per ha	Mean % cover
Angle-pod (<i>Matelea producta</i>)	12	600	0.06	15	750	0.10
Aster (<i>Machaeranthera asteroides</i>)	8	400	0.16	5	250	0.10
Bedstraw (<i>Galium</i> sp.)	1	50	0.02			
Blue snapdragon-vine	1	50	0.06			
Bluedicks	1	50	0.02			
Bothriochloa barbinodis	5	250	0.14	10	500	0.12
Buckhorn-cholla	1	50	0.04			
Bush-penstemon	1	50	0.10			
Catdaw	14	700	1.22			
Cliff-brake	3	150	0.06	1	50	0.02
Desert-rock pea	4	200	0.04	2	100	0.02
Globe-mallow (<i>Sphaeralcea emoryi</i>)	75	3,750	1.54	69	3,450	1.42
Groundsel (<i>Senecio lemmoni</i>)	8	400	0.28			
Groundsel (<i>Senecio neomexicanus</i>)	2	100	0.06			
Indian paintbrush	2	100	0.04			
Jojoba	4	200	0.30			
Larkspur (<i>Delphinium</i> sp.)	6	300	0.06			
Lehmann lovegrass	36	1,800	0.34	30	1,500	0.34
Mock-pennyroyal (<i>Hedeoma nanum</i>)	3	150	0.06			
Odora	34	1,700	0.30	36	1,800	0.36
Pointy-leaf phlox	9	450	0.10	1	50	0.02
Reverchon three-awn	1	50	0.02	5	250	0.04
Rock-cress	1	50	0.02	9	450	0.06
San-Felipe dyssodia	1	50	0.02			
Side-oats grama	4	200	0.12	11	550	0.20
Slim tridens				2	100	0.02
Sotol	6	300	0.32			
Spiderwort	21	1,050	0.40	1	50	0.02
Spike dropseed	10	500	0.08			
Spreading fleabane	57	2,850	0.38			
Spurge (<i>Euphorbia melanadenia</i>)	5	250	0.08	3	150	0.06
Squirrel-tail	4	200	0.04	2	100	0.04
Sweet-bush				2	100	0.08
Thistle	3	150	0.06	2	100	0.04
<i>Trixis californica</i>				5	250	0.14
Velvet mesquite	1	50	0.14			
weeping lovegrass	18	900	0.60	35	1,750	0.82
Wild-cucumber	5	250	0.10			
Wolfberry	1	50	0.08			
Wormwood (<i>Artemisia dracunculus</i>)	52	2,600	1.32	56	2,800	1.32
Wormwood (<i>A. ludoviciana</i>)	80	4,000	0.28	36	1,800	0.12
Wright buckwheat	1	50	0.06	1	50	0.02
Unknown Composite shrub	1	50	0.04			
Unknown Cruciferae	13	650	0.10			
				Groundcover		
				Rock		2.46
				Bare ground		1.24
				Litter		4.82
				Wood		0.30

Table 9. Data collected from Tonto National Monument permanent vegetation monitoring. Plot #9 (TMP9)—Semidesert Grassland.

	Spring 1989			Summer 1989		
	Species count	Density per ha	Mean % cover	Species count	Density per ha	Mean % cover
Angle-pod (<i>Matelea producta</i>)	2	100	0.04			
Blue paloverde	1	50	0.06			
Bluedicks	1	50	0.02			
Brittle-bush	10	500	0.20			
Buckhorn-cholla	1	50	0.02			
Cliff-brake	2	100	0.04			
Cotton-top	1	50	0.02			
Desert bedstraw	2	100	0.06			
Desert needlegrass	8	400	0.32	8	400	0.32
Desert-straw	10	500	0.20			
Engelmann prickly-pear	1	50	0.02			
Fendler lip-fern	1	50	0.02	1	50	0.02
Globe-mallow (<i>Sphaeralcea emoryi</i>)	63	3,150	1.12	32	1,600	0.54
Goldeneye	1	50	0.02			
<i>Janusia gracilis</i>	1	50	0.02			
Jojoba	9	450	0.36			
Lehmann lovegrass	880	44,000	3.52	917	45,850	3.72
Odora	6	300	0.10	8	400	0.12
Pincushion-cactus	7	350	0.10			
Rock-cress	3	150	0.04			
San-Felipe dyssodia	25	1,250	0.58	22	1,100	0.42
Sand dropseed	1	50	0.04			
Side-oats grama	1	50	0.04	1	50	0.02
Slim tridens	8	400	0.14	1	50	0.02
Spiderwort	4	200	0.10	1	50	0.02
Spike-moss			0.78			0.50
Spreading fleabane	2	100	0.04			
Spurge (<i>Euphorbia melanadenia</i>)	42	2,100	0.48	28	1,400	0.34
Sweet-bush	6	300	0.44	14	700	0.26
Tanglehead	16	800	0.24	5	250	0.10
Teddy-bear-cholla	4	200	0.10			
Three-awn (<i>Aristida hamulosa</i>)	3	150	0.06	3	150	0.06
Three-awn (<i>A. parishii</i>)	7	350	0.12	3	150	0.04
Western ragweed	1	50	0.02			
Wild-buckwheat	4	200	0.12			
Wolfberry	2	100	0.10			
				Groundcover		
				Rock		2.56
				Bare ground		2.24
				Litter		4.30
				Wood		0.02

Table 10. Data collected from Tonto National Monument permanent vegetation monitoring. Plot #10 (TMP10)—Interior Chaparral.

	Spring 1989			Summer 1989		
	Species count	Density per ha	Mean % cover	Species count	Density per ha	Mean % cover
Banana yucca	2	100	0.16			
Broom snakeweed	51	2,550	1.00			
Cliff-brake				1	50	0.02
Desert needlegrass	1	50	0.06	6	300	0.12
Fendler lip-fern	24	1,200	0.24	23	1,150	0.22
Fescue sp.	20	1,000	0.26			
Globe-mallow (<i>Sphaeralcea emoryi</i>)	22	1,100	0.32	17	850	0.26
Mountain-mahogany	9	450	0.66			
Mountain parsley	7	350	0.12			
Mutton-grass	289	14,450	1.46	309	15,450	1.32
Rock-cress	3	150	0.06			
Shrub-live oak	10	500	0.76			
Side-oats grama	116	5,800	1.18	117	5,850	1.12
Single-leaved ash	1	50	0.14			
Sotol	2	100	0.14			
Spreading fleabane	13	650	0.08			
Squirrel-tail	43	2,150	0.46	55	2,750	0.30
Stragglng mariposa	6	300	0.12			
Thick-leaved groundcherry				1	50	0.02
Wormwood (<i>Artemisia ludoviciana</i>)	128	6,400	0.54	71	3,550	0.36
Wright buckwheat	3	150	0.04			
Unknown grass				1	50	0.02
				Groundcover		
					Rock	2.08
					Bare ground	1.36
					Litter	4.92
					Wood	0.32

Appendix 3
**Native Flora and List of Vascular Plant Species
of Tonto National Monument**

ACANTHACEAE, Acanthus Family

- *Carlowrightia arizonica* Gray
Recorded in Semidesert Grassland on southeast slope. A possible misidentification.

ADIANTACEAE [POLYPODIACEAE], Fern Family (in part)

- *Cheilanthes fendleri* Hook. FENDLER LIP-FERN
Common in rocks on ridges and slopes throughout the monument.
- *Cheilanthes wootoni* Maxon BEADED LIP-FERN
Collected under rocks by F. S. Crosswhite, 1962.
- *Notholaena cochinchinensis* Goodd. HELECHILLO
Occasional to common in rock especially on jojoba-dominated slopes.
- *Notholaena parryi* D. C. Eaton [*Cheilanthes parryi* (D. C. Eaton) Domin.] PARRY CLOAK-FERN
Cited in Burgess (1965). No collection.
- *Notholaena sinuata* (Sw.) Kaulf. WAVY CLOAK-FERN
Collected on rocky hillsides by F. S. Crosswhite, 1962.
- *Notholaena standleyi* Maxon CLOAK-FERN
Observed in rocks on jojoba-dominated slopes.
- *Pellaea truncata* Goodding. [*P. longimucronata* Hook.] CLIFF-BRAKE
Frequent in rocks throughout the monument.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

AGAVACEAE, Agave Family

- *Agave chrysantha* Peebles CENTURY-PLANT
Common on slopes and ridgetops in Arizona Upland, Semidesert Grassland, and Interior Chaparral.
- *Dasyllirion wheeleri* Wats. SOTOL
Common on slopes and ridgetops in Arizona Upland, Semidesert Grassland, and Interior Chaparral. Occasionally in Sonoran Riparian Woodland.
- *Yucca baccata* Torr. BANANA YUCCA
Common on slopes and ridgetops in Arizona Upland, Semidesert Grassland and Interior Chaparral. Occasionally in Sonoran Riparian Woodland and on the valley floor.

AMARANTHACEAE, Amaranth Family

- *Amaranthus fimbriatus* (Torr.) Benth. FRINGED AMARANTH
Collected on the front terrace by C. W. Strong, 1955.
- *Amaranthus palmeri* Wats. PALMER AMARANTH
Collected on the front terrace by P. Wells, 1955.
- *Amaranthus powellii* Wats.
(General common name: AMARANTH) Collected near the visitor center by R. L. Burgess, 1962.

ANACARDIACEAE, Sumac Family

- *Rhus ovata* Wats. SUGAR SUMAC
Occasional in Interior Chaparral and rare in Desert Riparian Scrub.
- *Rhus trilobata* Nutt. var. *pilosissima* Engelm. SQUAW-BUSH
Occasional in Interior Chaparral and Semidesert Grassland.

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ARISTOLOCHIACEAE, Birthwort Family

- *Aristolochia watsoni* Woot. & Standl. INDIAN-ROOT
Collected at visitor center parking lot by C. W. Strong, 1961.

ASCLEPIADACEAE, Milkweed Family

- *Asclepias asperula* (Decne. Woodson ssp. *capricornu* (Woodson) Woodson [*A. capricornu* Woodson]
(General common name: MILKWEED) Occasional in Interior Chaparral. Collected west of the Mesic Sycamore Community in Cave Canyon by W. R. Oakes, 1963.
- *Matelea parvifolia* (Torr.) Woods.
(General common name: ANGLE-POD) Occasional on the paloverde-dominated valley floor.
- *Matelea producta* (Torr.) Woods.
(General common name: ANGLE-POD) Found in the riparian area and Desert Riparian Scrub.
- *Sarcostemma cynanchoides* Decne. var. *hartwegii* (Vail) Shinnars. CLIMBING MILKWEED
Collected along the shoulder of the highway.

BORAGINACEAE, Borage Family

- *Amsinckia intermedia* Fisch. & Meyer. COAST FIDDLENECK
Uncommon annual in wet years. Collected on jojoba-dominated slopes.
- *Amsinckia tessellata* Gray CHECKER FIDDLENECK
Common annual, especially in wet years. Collected on jojoba-dominated slopes.
- *Cryptantha barbiger* (Gray) Greene BEARDED CRYPTANTHA
An annual in Sonoran Desertscrub associations.
- *Cryptantha micrantha* (Torr.) Johnst. PURPLE-ROOTED CRYPTANTHA
Collected on hilltop 15 yards east of the west boundary by F. S. Crosswhite, 1962.
- *Cryptantha muricata* (H. & A.) Nels. & Macbr.
(General common name: CRYPTANTHA) Collected on the flat north of Lower Ruin ridge and Upper Ruin trail by R. L. Burgess, 1962.

Key:

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- = voucher specimen collected.

- *Cryptantha nevadensis* Nels. & Kenn. NEVADA CRYPTANTHA
Collected in Sonoran Riparian Woodland.
- *Cryptantha pterocarya* (Torr.) Greene. WING-NUT CRYPTANTRA
Collected in gravel in Cholla Canyon.
- *Pectocarya recurvata* Johnst. ARCH-NUTTED COMB-BUR
Collected on rocky slopes by F. S. Crosswhite, 1962.
- *Plagiobothrys arizonicus* (Gray) Greene. BLOOD-WEED
Collected on hilltop 15 yards east of the west boundary by F. S. Crosswhite, 1962, above visitor center parking lot by J. Peavy, 1940, and on the north slope by W. Bromberg, 1958.
- *Plagiobothrys californicus* Greene. var. *fulvescens* Johnst.
Collected south of the residences, north of Honey Butte on hillside by R. L. Burgess, 1962.

CACTACEAE, Cactus Family

- *Carnegiea gigantea* (Engelm.) B. & R. SAGUARO
Common in subassociations of Sonoran Desertscrub especially on south and southeastfacing slopes. Less common elsewhere.
- *Echinocereus fasciculatus* (Engelm.) var. *boyce-thompsoni* (Orcutt.) L. Benson HEDGEHOG
Occasional on upper slopes of Sonoran Desertscrub and Semidesert Grassland.
- □ *Ferocactus cylindraceus* Orcutt. [*F. acanthodes* (Lemaire) B. & R.] BARREL-CACTUS
Scattered in Sonoran Desertscrub.
- *Mammillaria grahamii* Engelm. [*M. microcarpa* Engelm.] PINCUSHION-CACTUS
Common to scattered in Sonoran Desertscrub subassociations.
- *Opuntia acanthocarpa* Engelm. & Bigel. BUCKHORN-CHOLLA
Very common to common in Sonoran Desertscrub associations and in Interior Chaparral. Occasional in Semidesert Grassland.
- *Opuntia bigelovii* Engelm. TEDDY-BEAR-CHOLLA
Common to scattered in Sonoran Desertscrub associations. Occasional in Semidesert Grassland.

Key:

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- *Opuntia chlorotica* Engelm. & Bigel. PANCAKE-PEAR
Widely scattered at lower elevations.
- *Opuntia engelmannii* Salm-Dyck. [*O. phaeacantha* Engelm. var. *discata* (Griffiths) Benson & Walkington] ENGELMANN PRICKLY-PEAR
Very common to common in Sonoran Desertscrub subassociations on lower slopes and valley floor.
- *Opuntia fulgida* Engelm. JUMPING-CHOLLA
Cited in Burgess (1965). No collection.
- *Opuntia leptocaulis* DC. CHRISTMAS-CACTUS
Grows on mountain slopes dominated by Sonoran Desertscrub subassociations.
- *Opuntia violacea* Engelm. var. *macrocentra* (Engelm.) L. Benson [*O. macrocentra* Engelm.] BLACK-SPINED PRICKLY-PEAR
Collected north of Lower Ruin ridge by R. L. Burgess, 1962.

CAPRIFOLIACEAE, Honeysuckle Family

- *Sambucus glauca* Nutt. BLUEBERRY ELDER
- *Sambucus mexicana* Presl. MEXICAN ELDER
- *Sambucus microbotrys* Rydb. RED ELDERBERRY
There is surely only 1 species of *Sambucus* on the monument: *S. glauca*. A number of plants occur around the spring and in Cave Canyon below it.

CARYOPHYLLACEAE, Pink Family

- *Arenaria douglasii* Fenzl.
(General common name: SANDWORT) Collected on flat desert north of Lower Ruin ridge by R. L. Burgess, 1962.
- *Arenaria macradenia* Wats. ssp. *ferrisiae* Abrams. DESERT SANDWORT
Uncommon. Collected on northeast-facing slope at head of Deadman Canyon.
- *Silene antirrhina* L. SLEEPY CATCHFLY
Grows in sandy soils at low elevation.

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- *Silene laciniata* Cav. MEXICAN CAMPION
Collected below the ruins by R. L. Burgess, 1962.
- *Stellaria nitens* Nutt.
(General common name: STARWORT) Collected across the canyon from the ruins by R. L. Burgess, 1962.

CELASTRACEAE, Bittersweet Family

- *Canotia holacantha* Ton.
(General common name: CANOTIA) Occurs throughout the monument, but is most common on slopes in Arizona Upland and Semidesert Grassland.

CHENOPODIACEAE, Goose Foot Family

- *Atriplex canescens* (Pursh) Nutt. CENIZO
Occasional on the valley floor and in canyons. Collected on rocky gravel with mesquite and hackberry by R. R. Johnson, 1962.
- *Atriplex polycarpa* (Torr.) Wats. ALL-SCALE
Collected above the Lower Ruin by C. W. Strong, 1961.

CLEOMACEAE, Cleome Family

- *Cleome lutea* Hook. var. *jonesii* Macbr. [*C. jonesii* (Macbr.) Tidestrom] YEILLOW BEE-PLANT Collected in mesquite thicket with sandy loam by R. R. Johnson, 1962.
- *Polanisia dodecandra* (L.) DC. ssp. *trachysperma* (T. & G.) Iltis (*P. trachysperma* T. & G.) WESTERN CLAMMYWEED
Collected along roadside by R. R. Johnson, 1962, near residential area by W. Bromberg, 1958, and near cattleguard by W. R. Oakes, 1961.

Key:

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- = voucher specimen collected.

COMMELINACEAE, Spiderwort Family

- *Tradescantia occidentalis* (Britt.) Smyth SPIDERWORT
Occasional in Semidesert Grassland, Sonoran Riparian Woodland and slopes with Sonoran Desertscrub subassociations.

COMPOSITAE [ASTERACEAE], Sunflower Family

- *Acourtia wrightii* (Gray) Reveal & King BROWNFOOT
Occasional on mountain slopes of Sonoran Desertscrub subassociations.
- *Ambrosia confertiflora* DC. [*Franseria confertiflora* (DC.) Rydb.] SLIMLEAF BURSAGE
Collected below the Lower Ruin and near the visitor center parking lot by C. W. Strong, 1961.
- *Ambrosia psilostachya* DC.
(General common name: WESTERN RAGWEED) Common in the riparian area.
- *Artemisia dracunculus* L. WORMWOOD
Common in the riparian area. Occasional in the Desert Riparian Scrub.
- *Artemisia ludoviciana* Nutt. WORMWOOD
Common in Interior Chaparral, Sonoran Riparian Woodland and on mountain slopes dominated by Sonoran Desertscrub subassociations. Occasional in Semidesert Grassland.
- *Baccharis brachyphylla* Gray SHORT-LEAVED BACCHARIS
Uncommon in Sonoran Desertscrub on the valley floor.
- *Baccharis salicifolia* (R. & P.) Pers. [*B. glutinosa* Pers.] SEEP-WILLOW
Occasional in arroyos in Sonoran Desertscrub. Collected in desert gravel with mesquite and saltbush by R. Johnson, 1962.
- *Baccharis sarothroides* Gray DESERT-BROOM
Common in Sonoran Riparian Woodland and the riparian area. Occasional in Sonoran Desertscrub, especially in disturbed areas along arroyos.
- *Baileya multiradiata* Harv. & Gray DESERT-MARIGOLD
Grows on lower slopes of Sonoran Desertscrub. Tends to like roadsides.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

- *Bebbia juncea* (Benth.) Greene SWEET-BUSH
Common to occasional in Sonoran Riparian Woodland and Semidesert Grassland. Occasional in Sonoran Desertscrub.
- *Brickellia atractyloides* Gray
(General common name: BRICKELLIA) Occasional in Semidesert Grassland and on the slopes of Sonoran Desertscrub.
- *Brickellia coulteri* Gray
(General common name: BRICKELLIA) Collected in needlegrass dominated Sonoran Desertscrub in Deadman Canyon and in Sonoran Riparian Woodland in Cave Canyon.
- *Cirsium neomexicanum* Gray THISTLE
Occasional in Sonoran Riparian Woodland and the riparian area.
- *Conyza canadensis* (L.) Cronq. HORSEWEED
Rare in the Sonoran Riparian Woodland.
- *Coreopsis californica* (Nutt.) Sharsmith [*C. douglasii* (DC.) Pall.]
(General common name: TICKSEED) Collected on the trail to Lower Ruin by J. Peavy, 1940.
- *Dyssodia porophylloides* Gray SAN-FELIPE DYSSODIA
Occasional in Semidesert Grassland and Sonoran Desertscrub subassociations on the slopes and valley floor.
- *Encelia farinosa* Gray BRITTLE-BUSH
Very common to common in Sonoran Desertscrub. Most abundant on south and southeast facing slopes. Also common in Desert Riparian Scrub and Semidesert Grassland.
- *Encelia virginensis* A. Nels. RAYLESS ENCELIA
Common in Interior Chaparral and adjoining subassociations.
- *Ericameria laricifolia* (Gray) Shinnery TURPENTINE-BUSH
Very common to common in Sonora Desert Scrub associations on the valley floor and lower slopes.
- *Erigeron divergens* Torr. & Gray; Nesom (1990a) SPREADING FLEABANE
Occasional in Semidesert Grassland, Interior Chaparral, Desert Riparian Scrub and slopes of Sonoran Desertscrub.

Key:

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- = from other lists and collections;
- = voucher specimen collected.

- *Filago arizonica* Gray ARIZONA FILAGO
Moderately abundant on saguaro hillside below Lower Ruin and on the Upper Ruin trail.
Collected by R. L. Burgess, 1962.
- *Gutierrezia sarothrae* (Pursh.) Britt. & Rusby. BROOM SNAKEWEED
Common to co-dominant in all Sonoran Desertscrub subassociations, and Semidesert
Grassland and Chaparral associations.
- *Gymnosperma glutinosum* (Spreng.) Less. TATALENCHO
Occasional in Sonoran Riparian Woodland.
- *Heterotheca villosa* (Pursh.) Shinnery; Nesom (1990b) HISPID GOLDEN-ASTER Occasional in
Semidesert Grassland.
- *Hymenoclea salsola* Torr. & Gray CHEESE-BUSH
Attains its greatest size and is most common along washes in the lower canyons and on the
valley floor. Occasional in Sonoran Desertscrub on the valley floor.
- *Isocoma acradenia* E. Greene var. *acradenia*; (M. A. Lane, pers. com. to R. Van Devender, The
University of Arizona, 1991)
Occasional to common in Sonoran Desertscrub on the valley floor. Tends to be more
common in disturbed areas.
- *Isocoma coronopifolia* (Gray) E. Greene [*I. tenuisecta* E. Greene]; Lane (1991)
Occasional to common Sonoran Desertscrub on the valley floor.
- *Lactuca ludoviciana* (Nutt.) DC. WESTERN LETTUCE Occasional in the riparian area.
- *Lasthenia chrysostoma* (F. & M.) Greene [*Baeria chrysostoma* F. & M.] GOLDFIELDS
Scattered in level areas between large boulders and outcrops on the ridge south of the
residential area. Collected by R. L. Burgess, 1962. Collected on north slope by
W. Bromberg, 1958.
- *Layia glandulosa* (Hook.) H. & A. TIDY-TIPS
Scattered on rocky saguaro hillside below Lower Ruin and on the trail to Upper Ruin.
Collected by R. L. Burgess, 1962.
- *Machaeranthera asteroides* var. *glandulosa* B. L. Turner. [*M. bigelovii* (Gray) Greene] [*Aster
bigelovii* Gray]; Turner (1987)

Key:

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- = voucher specimen collected.

(General common name: ASTER) Occasional in the riparian area and the Desert Riparian Scrub. Collected in twin culverts by W. R. Oakes, 1960, Cholla Wash and sandy roadside by C. W. Strong, 1961 and gravelly streambed by R. Johnson, 1962.

- *Machaeranthera gracilis* (Nutt.) Shinnery [*Haplopappus gracilis* (Nutt.) Gray]; Turner (1987)
(General common name: ASTER) Collected at entrance roadside near parking lot by R. L. Burgess, 1962.
- *Machaeranthera pinnatifida* (Hook.) Shinnery [*Haplopappus spinulosus* (Pursh) DC.]; Turner (1987)
(General common name: ASTER) Collected at the entrance road by J. Peavy and Benson, 1940.
- *Melampodium leucanthum* Torr. & Gray BLACKFOOT
Occasional in Semidesert Grassland and on slopes in Sonoran Desertscrub.
- *Microseris linearifolia* (DC.) Schultz Bip. SILVER-PUFFS
Collected on the north slope by W. Bromberg, 1958. Collected by R. L. Burgess below the Lower Ruins, north of Honey Butte and south of the residential area, 1962.
- *Pectis papposa* Harv. & Gray CHINCHWEED
Likes disturbed areas. Collected on the front terrace by P. Welles, 1955.
- *Perityle saxicola* (Eastw.) Shinnery ROCKY-DAISY
Potentially threatened species. Locally common on rock faces and cliffs on the monument.
- *Porophyllum gracile* Benth. ODORA
Frequent in Semidesert Grassland. Common to occasional on all Sonoran Desertscrub subassociations and Desert Riparian Scrub.
- *Psilostrophe cooperi* (Gray) Greene PAPERFLOWER
Locally common on higher ridges in Sonoran Desertscrub.
- *Rafinesquia neomexicana* Gray DESERT-CHICORY
Collected west of the pumphouse by H. Jones, 1963, and on the rocky ridge between Honey Butte and the residential area by R. L. Burgess, 1962. Common throughout the monument.

Key:

- = observed, not collected;
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- = voucher specimen collected.

- *Senecio douglasii* DC. var. *douglasii* (including *S. monoensis* Greene) SANDWASH GROUNDSEL
Collected by N. Dodge and J. Peavy, 1939, on the flat north of the residential area and by R. L. Burgess, 1962, along the entrance road.
- *Senecio lemmoni* Gray GROUNDSEL
Rare near the base of southwest-facing cliffs overlooking Deadman Canyon.
- *Senecio neomexicanus* Gray GROUNDSEL
Occasional in Interior Chaparral.
- *Stephanomeria pauciflora* (Torr.) A. Nels. DESERT-STRAW
Co-dominant in Semidesert Grassland on southeast-facing slopes. Occasional in Desert Riparian Scrub, the riparian area and on slopes of Sonoran Desertscrub.
- *Stylocline micropoides* Gray DESERT NEST-STRAW
Rare on the flat north of the Lower Ruin. Collected by R. L. Burgess, 1962.
- *Trixis californica* Kellogg
Occasional in Interior Chaparral, the riparian area, the Desert Riparian Scrub and Sonoran Desertscrub subassociations.
- *Viguiera parishii* E. Greene [*V. deltoidea* Gray] GOLDENEYE
Common in Sonoran Desertscrub on the valley floor. Occasional in lower slopes and canyons.
- *Xanthium strumarium* L. [*X. saccharatum* Wallr.] COMMON COCKLEBUR
A roadside plant seen along state Route 88.

CONVOLVULACEAE, Morning Glory Family

- *Cuscuta indecora* Choisy. PRETTY DODDER
Collected on jojoba-dominated slopes of Sonoran Desertscrub. Parasite on *Encelia farinosa*.

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- = voucher specimen collected.

CRASSULACEAE, Orpine Family

- *Dudleya saxosa* B. & R. ROCK ECHEVARIA
Common in Semidesert Grassland. Occasional in upper slopes of Sonoran Desertscrub and Interior Chaparral.
- *Tillaea erecta* H. & A. PIGMY WEED
Rare on desert hillside north of Honey Butte and east of the visitor center. (Appears to be rare on the monument, but this may be false rareness due to small size and ephemeral nature.) Collected by R. L. Burgess, 1961.

CRUCIFERAE [BRASSICACEAE], Mustard Family

- *Arabis perennans* Wats. ROCK-CRESS
Common on slopes of Sonoran Desertscrub. Occasional in Desert Riparian Scrub, Semidesert Grassland and Interior Chaparral.
- *Descurainia obtusa* (Greene) O. E. Schulz
(General common name: TANSY-MUSTARD) Collected on ridge south of the residential area by R. L. Burgess, 1962. Scattered throughout the monument.
- *Descurainia pinnata* (Walt.) Britt. YELLOW TANSY-MUSTARD
Usually common annual. Collected in Sonoran Desertscrub in Cholla Canyon.
- *Draba cuneifolia* Nutt. WHITLOW-GRASS
Scattered in loose desert soil north of Lower Ruin ridge. Collected by R. L. Burgess, 1962.
- *Erysimum capitatum* (Dougl.) Greene WALLFLOWER
Rare in Sonoran Desertscrub in Cholla Canyon.
- *Lepidium lasiocarpum* Nutt. var. *wrightii* (Gray) C. L. Hitchc. SAND PEPPERGRASS
Collected on the flat north of residential area by R. L. Burgess, 1962.
- *Lepidium lasiocarpum* Nutt. var. *typicum* SAND PEPPERGRASS
Collected on the west boundary by F. S. Crosswhite, 1962.
- *Lepidium medium* Greene PEPPERWORT
Uncommon on rocky slopes in Sonoran Desertscrub.

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- = voucher specimen collected.

- *Lepidium medium* Greene var. *pubescens* (Greene) Robins.
(General common name: PEPPERWORT) Collected on rocky hill south of the residential area by R. L. Burgess, 1962.
- *Lesquerella gordonii* (Gray) Wats. GORDON BLADDER-POD
Collected on the ridge north of Honey Butte by R. L. Burgess, 1962.
- *Lesquerella purpurea* (Gray) Wats. BLADDER-POD
Uncommon in Desert Riparian Scrub and adjacent areas.
- *Thelypodium lasiophyllum* (H. & A.) Greene
Collected on rocky desert hill trail to Upper Ruin by R. L. Burgess, 1962.
- *Thysanocarpus curvipes* Hook. FRINGE-POD
Collected in Sonoran Desertscrub on the valley floor.
- *Thysanocarpus curvipes* Hook. var. *elegans* (F. & M.) Robins (*T. amplexans* Greene)
FRINGE POD
Collected on the ridge south of the residential area by R. L. Burgess, 1962. Scattered throughout the monument.

CUCURBITACEAE, Gourd Family

- *Marah gilensis* Greene WILD-CUCUMBER
Occasional in the riparian area and Desert Riparian Scrub.
- *Cucurbita digitata* Gray FINGER-LEAVED GOURD
Collected at 850 m (2,800 ft) by Strong, 1961.

CUPRESSACEAE, Cypress Family

- *Juniperus erythrocarpa* Cory [*J. pinchotii* Sudw.] RED-BERRY JUNIPER
Occasional on slopes and ridgetops in Arizona Upland, Semidesert Grassland, and Interior Chaparral. Rare on the valley floor. (Other collections have been named *Juniperus monosperma* (Engelm.) Sarg. ONE-SEED JUNIPER, but it is doubtful that it grows on the monument.)

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

EPHEDRACEAE, Joint-Fir Family

- *Ephedra aspera* Engelm. JOINT-FIR
Recorded in joboba-dominated desertscrub on the desert floor.

EUPHORBIACEAE, Spurge Family

- *Argythamnia neomexicana* Muell. Arg. [*Ditaxis neomexicana* (Muell. Arg.) Heller]
(General common name: DITAXIS) Collected in disturbed area near parking lot by R. L. Burgess, 1962.
- *Croton texensis* (Klotzsch) Muell. Arg. DOVE-WEED
Collected near the parking lot by C. W. Strong, 1961, and below the Lower Ruins by W. R. Oakes, 1962.
- *Euphorbia arizonica* Engelm.
(General common name: SPURGE) Collected on south slope in Semidesert Grassland.
- *Euphorbia capitellata* Engelm.
(General common name: SPURGE) Collected on hill near the visitor center by R. L. Burgess, 1962.
- *Euphorbia melanadenia* Torr.
(General common name: SPURGE) Occasional in Semidesert Grassland, Sonoran Desertscrub and Desert Riparian Scrub.
- *Euphorbia polycarpa* Benth. var. *hirtella* Boiss. SMALL-SEEDED SAND-MAT
Abundant in disturbed areas. Collected along road near residents by R. L. Burgess, 1962.
- *Euphorbia revoluta* Engelm.
(General common name: SPURGE) Collected near the flagpole by C. W. Strong, 1961.

FAGACEAE, Oak Family

- *Quercus turbinella* Greene SHRUB-LIVE OAK
Common in Interior Chaparral and occasional in nearby associations. Rare in Desert Riparian Scrub.

Key:

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- = voucher specimen collected.

FOUQUIERIACEAE, Ocotillo Family

- *Fouquieria splendens* Engelm. OCOTILLO
Common to occasional in Sonoran Desertscrub. More common on slopes.

FUMERIACEAE, Fumitory Family

- *Corydalis aurea* Willd. GOLDEN CORYDALIS
Collected in the riparian area.

GERANIACEAE, Geranium Family

- *Erodium texanum* Gray LARGE-FLOWERED STORKSBILL
Scattered in rocky shrub desert on ridge north of Honey Butte. Collected by R. L. Burgess, 1962. Collected on rocky hill by F. S. Crosswhite, 1962.
- *Geranium carolinianum* L. CRANESBILL
Rare in the riparian area.

GRAMINEAE [POACEAE], Grass Family

- *Aristida adscensionis* L. SIX-WEEKS THREE-AWN
Collected in Semidesert Grassland on ridge top.
- *Aristida hamulosa* Henr. THREE-AWN
Common along highway shoulder east of the monument entrance.
- *Aristida havardii* Vasey [*A. barbata* Fourn.] HAVARD THREE-AWN
Collected on south slope of Semidesert Grassland.
- *Aristida oligantha* Michx. PRAIRIE THREE-AWN
Throughout the monument in rocky desert. Collected by R. L. Burgess, 1962.
- *Aristida parishii* A. Hitchc.
(General common name: THREE-AWN) Common in Semidesert Grassland. Common to occasional in Sonoran Desertscrub associations and Desert Riparian Scrub.

Key:

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- = voucher specimen collected.

- *Aristida purpurea* Nutt. PURPLE THREE-AWN
Collected along roadside by J. Beavy, 1940.
- *Aristida purpurea* Nutt. var. *nealleyi* (Vasey) Allred [*A. glauca* (Nees) Walp.] REVERCHON
THREE-AWN
Uncommon to common on valley floor east of residences.
- *Bothriochloa barbinoides* (Lag.) Herter
Common in Semidesert Grassland, Desert Riparian Scrub and the riparian area. Occasional on slopes with Sonoran Desertscrub.
- *Bouteloua aristidoides* (H. K. B.) Grisb. SIX-WEEKS-NEEDLE GRAMA
Fairly common in rocky desert. Collected on the ridge south of residential area by R. L. Burgess, 1962, and on the front terrace by P. Wells, 1955.
- *Bouteloua barbata* Lag. SIX-WEEKS GRAMA
Collected on the Front terrace by P. Welles, 1955.
- *Bouteloua curtipendula* (Michx.) Torr. SIDE-OATS GRAMA
Co-dominant on north and northwestern slopes of Semidesert Grassland and the upper slopes of Sonoran Desertscrub. Common on south and southeast slopes of Semidesert Grassland and Interior Chaparral. Decreasing in abundance down slope.
- *Bouteloua repens* (H.B.K.) Scribn. & Merr. [*B. filiformis* (Fourn.) Griffiths.] SLENDER GRAMA
Recorded in paloverde-dominated slopes in Sonoran Desertscrub.
- *Digitaria californica* (Benth.) Henr. [*Trichachne californica* (Benth.) Chase] COTTON-TOP
Occasional on slopes of Sonoran Desertscrub.
- *Elymus elymoides* (Nutt.) Swezey. [*Sitanion hystrix* (Nutt.) J. G. Smith] SQUIRREL-TAIL
Occasional in Interior Chaparral, slopes of Sonoran Desertscrub and Semidesert Grassland.
- *Elymus glaucus* Buckl. BLUE WILD-RYE
Collected in Sycamore Community by R. L. Burgess, 1962.
- *Eragrostis arida* Hitchc.
(General common name: LOVEGRASS) C. W. Strong, 1961.

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- *Eragrostis intermedia* A. Hitchc. PLAINS LOVEGRASS
Locally common on upper slopes of Sonoran Desertscrub.
- *Erioneuron pulchellum* (H.B.K.) Tateoka. [*Tridens pulchellus* (H.B.K.) Hitchc.] FLUFFGRASS
Occasional in Sonoran Desertscrub especially on the valley floor.
- *Festuca grayi* (Abrams) Piper.
(General common name: FESCUE) Collected north of Honey Butte and east of visitor center by R. L. Burgess, 1962.
- *Heteropogon contortus* (L.) Beauv. TANGLEHEAD
Scattered to common in Semidesert Grassland. Occasional on slopes in Sonoran Desertscrub.
- *Hilaria belangeri* (Steudl.) Nash CURLY-MESQUITE-GRASS
Locally common on slopes in Sonoran Desertscrub.
- *Hilaria mutica* (Buckl.) Benth. TOBOSA GRASS
On TONT herbarium list, but not found.
- *Leptochloa dubia* (H.B.K.) Nees. GREEN SPRANGLETOP
Recorded on slopes in Sonoran Desertscrub.
- *Leptochloa filiformis* (Lam.) Beauv. RED SPRANGLETOP
Collected on northeast-facing slope in Semidesert Grassland.
- *Muhlenbergia porteri* Scribn. BUSH MUHLY
Occasional on slopes in Sonoran Desertscrub.
- *Muhlenbergia microsperma* (DC.) Kunth. LITTLE-SEED MUHLY
Collected along trail to Lower Ruin by J. Peavy, 1940.
- *Poa bigelovii* Vasey & Scribn. BIGELOW BLUEGRASS
Moist, deciduous woods. Collected in Sycamore Community in the draw south of the visitor center and scattered on rocky desert hillside across canyon from Lower Ruin by R. L. Burgess, 1962.

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- *Poa fendleriana* (Steud.) Vasey MUTTON-GRASS
Occasional in Semidesert Grassland, Interior Chaparral, and high slopes of Sonoran Desertscrub.
- *Sporobolus contractus* Hitchc. SPIKE DROPSEED
Recorded in Semidesert Grassland on a southeast slope.
- *Sporobolus cryptandrus* (Torr.) Gray SAND DROPSEED
Occasional in Desert Riparian Scrub. To be expected in the riparian area.
- *Stipa speciosa* Trin. & Rupr. DESERT NEEDLEGRASS
Dominant on the upper slopes of Sonoran Desertscrub. Co-dominant in Interior Chaparral and Semidesert Grassland on southerly slopes. Common on northwest slopes of Semidesert Grassland and mid and lower slopes of Sonoran Desertscrub.
- *Stipa tenuissima* Trin. NEEDLEGRASS
Collected on ridge north of Honey Butte and east of visitor center by R. L. Burgess, 1962. It is very doubtful that this species grows on the monument.
- *Tridens muticus* (Torrey.) Nash var. *muticus* SLIM TRIDENS
Common in Semidesert Grassland. Occasional on slopes in Sonoran Desertscrub.
- *Vulpia myuros* (L.) R. C. Gmelin var. *hirsuta* Hackel FOXTAIL FESCUE
Growing in mud in the riparian area.
- *Vulpia octoflora* (Walt.) Rydb. [*Festuca octoflora* Walt.] SIX-WEEKS FESCUE
Specimen at TONT herbarium collected off the monument.

HYDROPHYLLACEAE, Water Leaf Family

- *Emmenanthe penduliflora* Benth. WHISPERING-BELLS
Rare on desert hillside north of Honey Butte and east of the visitor center. Collected in Sycamore Community by R. L. Burgess, 1962.
- *Phacelia affinis* Gray PURPLE-BELL PHACELIA
Common on rocky desert slopes throughout the monument. Collected on ridge south of the residential area by R. L. Burgess, 1962.

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- *Phacelia crenulata* Torr.
(General common name: PHACELIA) Collected in Sonoran Desertscrub in Cholla Canyon.
- *Phacelia cryptantha* Greene SMALL-FLOWERED PHACELIA
Collected in Sonoran Desertscrub near Lower Ruin.
- *Phacelia distans* Benth. WILD-HELIOTROPE
Collected in Sonoran Desertscrub on the lower slopes of Cholla Canyon.
- *Phacelia fremontii* Torr. FREMONT PHACELIA
Moderately common on rocky desert hillside south of the residential area. Collected by R. L. Burgess, 1962.
- *Phacelia ivesiana* Torr. IVES PHACELIA
Collected in cactus patch along trail below Lower Ruin by H. Jones, 1963.
- *Phacelia ramosissima* Dougl.
(General common name: PHACELIA) Collected on the trail to Lower Ruin by J. Peavy, 1940.
- *Pholistoma auritum* (Lindl.) Lilja.
Collected under shrubs below the Lower Ruin by R. L. Burgess, 1962, and on the north slope by G. Baker, 1958.

JUGLANDACEAE, Walnut Family

- *Juglans major* (Tory.) Heller ARIZONA WALNUT
Co-dominant in the riparian scrub in Cave Canyon.

KRAMERIACEAE, Ratany Family

- *Krameria erecta* Willd. [*K. parvifolia* Benth. var. *glandulosa* (Rose & Painter) Macbr.]; Simpson (1989) SMALL-LEAVED RATANY
Occasional on ridge top in Semidesert Grassland.
- *Krameria grayi* Rose & Painter WHITE RATANY
Occasional on lower slopes in Sonoran Desertscrub.

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LABIATAE [LAMIACEAE], Mint Family

- *Hedeoma nanum* (Torr.) Briq. ssp. *macrocalyx* Stewart
(General common name: MOCK-PENNYROYAL) Occasional in Sonoran Riparian Woodland and on slopes in Sonoran Desertscrub.
- *Hedeoma oblongifolium* (Gray) Heller MOCK-PENNYROYAL
Probably all *Hedeoma* on the monument are *nanum*.
- cf. *Hyptis emoryi* Torr. DESERT-LAVENDER
Possibly misrecorded on high slope of Sonoran Desertscrub.
- *Salvia columbariae* Benth. CHIA
Collected along slope on Lower Ruin trail by H. Jones, 1963, and north of Honey Butte by R. L. Burgess, 1962.
- *Salvia pinguifolia* (Fern.) Woot. & Standl. ROCK SAGE
Local in Interior Chaparral.

LEGUMINOSAE, Pea Family

MIMOSOIDEAE, Mimosa Subfamily

- *Acacia constricta* Benth. WHITE-THORN
Occasional in Sonoran Desertscrub on the valley floor.
- *Acacia greggii* Gray CATCLAW
Co-dominant in Desert Riparian Scrub. Common to occasional in Sonoran Desertscrub.
- *Prosopis velutina* Woot. VELVET MESQUITE
Common to co-dominant in all associations on the monument except Semidesert Grassland, where it is occasional.

LEGUMINOSAE, Pea Family

CAESALPINIOIDEAE, Senna Subfamily

- *Cercidium floridum* Benth. BLUE PALOVERDE
Very common in Desert Riparian Scrub. Common in Sonoran Desertscrub on the valley floor.
Occasional on the lower slopes of Sonoran Desertscrub.

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- *Cercidium microphyllum* (Torr.) Rose & Johnst. FOOTHILL PALOVERDE
Dominant in one part of Sonoran Desertscrub. Very common to occasional in other subassociations. Occasional in Semidesert Grassland.
- *Senna covesii* (Gray) Barneby [*Cassia covesii* Gray] DESERT SENNA
Common in Sonoran Desertscrub on the valley floor.

LEGUMINOSAE, Pea Family
PAPILIONOIDEAE, Bean Subfamily

- *Astragalus nuttallianus* DC. NUTTALL LOCOWEED
Collected north of Honey Butte ridge and below the Lower Ruin by R. L. Burgess, 1962.
- *Dalea formosa* Torr. FEATHER-PLUME
Locally common near ridgetops in Interior Chaparral and Arizona Upland.
- *Lotus humistratus* Greene HILL LOCUST
Collected below the Lower Ruin, in sycamore woods and along the Upper Ruin trail by R. L. Burgess, 1962. Collected north of the pump-house by H. Jones, 1963.
- *Lotus rigidus* (Benth.) Clements & Clements DESERT-ROCK PEA
Occasional in Interior Chaparral, Sonoran Desertscrub, Semidesert Grassland, and Desert Riparian Scrub.
- *Lupinus arizonicus* Wats. ARIZONA LUPINE
W. Bromberg, 1958.
- *Lupinus concinnus* Agardh. ELEGANT LUPINE
Collected along highway shoulder.
- *Lupinus sparsiflorus* Benth.
(General common name: LUPINE)
Collected along highway shoulder.
- *Lupinus succulentus* Dougl.
(General common name: LUPINE) Moderately common throughout the monument.
Collected on ridge of rocky desert south of the residential area and along the Upper Ruin trail by R. L. Burgess, 1962.

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- *Vicia exigua* Nutt.
(General common name: VETCH) Relatively rare on rocky desert hillside across from Lower Ruin. Collected by R. L. Burgess, 1962.

LILIACEAE, Lily Family

- *Calochortus flexuosus* Wats. STRAGGLING MARIPOSA
Occasional in Interior Chaparral.
- *Calochortus kennedyi* Porter DESERT MARIPOSA
Collected below Lower Ruin by R. L. Burgess, 1962.
- *Calochortus nuttallii* T. & G. SEGO-LILY
Collected along trail to Lower Ruin by J. Beavy, 1940.
- *Dichelostemma pulchellum* (Salisb.) Heller BLUEDICKS
Occasional throughout the monument.

LOASACEAE, Stick Leaf Family

- *Mentzelia pumila* (Nutt.) Torr. & Gray var. *multiflora* (Nutt.) Urban & Gilg. BLAZING-STAR
Few plants growing between Semidesert Grassland and Sonoran Desertscrub in Cave Canyon.

MALPIGHIACEAE, Malpighia Family

- *Janusia gracilis* Gray
Occasional in Sonoran Desertscrub on the valley floor and in Desert Riparian Scrub.

MALVACEAE, Mallow Family

- *Abutilon parvulum* Gray SMALL-LEAVED ABUTILON
Occasional on rocky slopes in Sonoran Desertscrub.
- *Gossypium thurberi* Todaro. DESERT COTTON
According to R. L. Burgess, 1965, a few plants were introduced onto the monument.

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- *Hibiscus coulteri* Harv. DESERT ROSE-MALLOW
Occasional on slopes with Sonoran Desertscrub.
- *Sphaeralcea ambigua* Gray DESERT-MALLOW
R. L. Burgess, 1962.
- *Sphaeralcea coccinea* (Pursh) Rydb. SCARLET GLOBE-MALLOW
Collected below Lower Ruin by R. L. Burgess, 1962.
- *Sphaeralcea emoryi* Torr. GLOBE-MALLOW
Dominant in Semidesert Grassland on southeast slopes. Very common in Interior Chaparral and the upper slopes of Sonoran Desertscrub. Common on mid and lower slopes of Sonoran Desertscrub of the valley floor. Occasional in Desert Riparian Scrub and the riparian area.
- *Sphaeralcea rusbyi* Gray
(General common name: GLOBE-MALLOW) Uncommon on north-facing slopes of Sonoran Desertscrub.

NYCTAGINACEAE, Four O'Clock Family

- *Allionia incarnata* L. TRAILING FOUR-O'CLOCK
Occasional in Semidesert Grassland.
- *Boerhaavia coccinea* Mill. RED SPIDERLING
Collected near the parking lot by W. R. Oakes, 1958.
- *Commicarpus scandens* (L.) Standl.
Occasional in Sonoran Desertscrub on the valley floor.
- *Mirabilis bigelovii* Gray
(General common name: FOUR-O'CLOCK) Occasional in Sonoran Desertscrub.
- *Mirabilis coccineus* (Torr.) B. & H. [*Oxybaphus coccineus* Torr.]
(General common name: FOUR-O'CLOCK) Rare on slopes in Sonoran Desertscrub.

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OLEACEAE, Olive Family

- *Fraxinus anomala* Torr. SINGLE-LEAVED ASH
Uncommon in Interior Chaparral.
- *Menodora scabra* Gray
(General common name: MENODORA) Occasional on Sonoran Desertscrub subassociations.

ONAGRACEAE, Evening Primrose Family

- *Camissonia contorta* (Dougl.) Kearney [*Oenothera contorta* Dougl.] DWARF-CONTORTED PRIMROSE
Uncommon. Collected along the Upper Ruin trail by R. L. Burgess, 1962.
- *Camissonia micrantha* (Hornem.) Raven [*Oenothera micrantha* Hornem.]
(General common name: PRIMROSE) Collected on slope below Lower Ruin by R. L. Burgess, 1962.
- *Epilobium foliosum* (T. & G.) Suksd. [*E. minutum* Lindl. ex Lehm.]
(General common name: WILLOW-WEED) Collected on the north slope of Honey Butte by F. S. Crosswhite, 1962.
- *Oenothera caespitosa* Nutt.
(General common name: PRIMROSE) Collected in Cave Canyon by W. R. Oakes, 1960.
- *Oenothera primiveris* Gray LARGE-YELLOW-DESERT PRIMROSE
Collected on hill south of the residential area by R. L. Burgess, 1962.

OROBANCHACEAE, Broom Rape Family

- *Orobanche fasciculata* Nutt. var. *lutea* (Parry) Achey PINON-STRANGLEROOT
Collected on west slope in saddle by C. Theon, 1958.

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- = voucher specimen collected.

PAPAVERACEAE, Poppy Family

- *Eschscholtzia mexicana* Greene MEXICAN GOLD-POPPY
Scattered on rocky desert ridge north of Honey Butte. Collected by R. L. Burgess, 1962.
Extremely abundant elsewhere on the monument.
- *Platystemon californicus* Benth. CREAM-CUPS
Fairly common on rocky slopes of ridge running north from Honey Butte, across (east) from visitor center and below and across from Lower Ruin. Collected by R. L. Burgess, 1962.

PLANTAGINACEAE, Plantain Family

- *Plantago insularis* Eastw. WOOLY PLANTAIN
Collected near entrance gate on Highway 88 by W. R. Oakes, 1962.
- *Plantago patagonica* Jacq. var. *gnaphalioides* (Nutt.) Gray [*P. purshii* R. & S. Pursh]
PLANTAIN
Moderately common in scattered locations throughout the monument. Collected along Upper Ruin trail by R. L. Burgess, 1962.
- *Plantago rhodosperma* Decne. RED-SEEDED PLANTAIN
Infrequent on jojoba-dominated subassociations of Sonoran Desertscrub.

PLATANACEAE, Plane Tree Family

- *Platanus wrightii* Wats. ARIZONA SYCAMORE
Co-dominant in the riparian scrub in Cave Canyon.

POLEMONIACEAE, Phlox Family

- *Allophyllum gilioides* (Benth.) A. & V. Grant [*Gilia gilioides* (Benth.) Greene] STRAGGLING GILIA
Collected on hillside below Lower Ruin by R. L. Burgess, 1962.

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- *Eriastrum diffusum* (Gray) Mason
Collected on rocky flats and slope below Lower Ruin by H. Jones, 1964, and near entrance road by J. Peavy, 1940.
- *Gilia flavocincta* A. Nels.
(General common name: GILIA) R. L. Burgess, 1962, called this *G. tenuiflora*.
- *Gilia scopulorum* Jones ROCK GILIA
Moderately common in undisturbed desert throughout the monument. Collected on rocky desert slope south of the residential area by R. L. Burgess, 1962.
- *Gilia sinuata* Dougl.
(General common name: GILIA) Collected on rocky desert hillside along Upper Ruin trail by R. L. Burgess, 1962.
- *Linanthus bigelovii* (Gray) Greene
Common on desert flat north of Lower Ruin ridge. Collected by R. L. Burgess, 1962.
- *Microsteris gracilis* (Hook.) Greene
Collected along ridges of houses by R. L. Burgess, 1962, and on north slope of Honey Butte by F. S. Crosswhite, 1962.
- *Phlox tenuifolia* E. Nels. POINTY-LEAF PHLOX
Occasional in Semidesert Grassland and slopes of Sonoran Desertscrub.

POLYGALACEAE, Milk Wort Family

- *Polygala macradenia* Gray
(General common name: MILKWORT) Collected on rocky desert hillside north of Honey Butte by R. L. Burgess, 1964.

POLYGONACEAE, Buckwheat Family

- *Chorizanthe brevicornu* Torr. BRITTLE SPINE-FLOWER
Relatively common in shrub desert. Collected on flat north of Lower Ruin ridge by R. L. Burgess, 1962.

Key:

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- = voucher specimen collected.

- *Eriogonum densum* Greene [*E. vimineum* var. *densum* Stokes]
(General common name: WILD-BUCKWHEAT) Collected along roads and highway by R. L. Burgess, 1962, and C. W. Strong, 1961.
- *Eriogonum fasciculatum* Benth. WILD-BUCKWHEAT
Very common to common in Interior Chaparral and upper and mid slopes of Sonoran Desertscrub. Co-dominant on lower slopes of Sonoran Desertscrub. Common on valley floor of Sonoran Desertscrub.
- *Eriogonum wrightii* Torr. WRIGHT BUCKWHEAT
Common in Semidesert Grassland and Interior Chaparral. Occasional in Sonoran Desertscrub subassociations and Desert Riparian Scrub.
- *Rumex hymenosepalus* Torr. CANIGRE
Scattered throughout monument in disturbed areas. Collected by R. L. Burgess, 1962.

PORTULACACEAE, Portulaca Family

- *Calandrinia ciliata* (R. & P.) DC. RED-MAIDS
Collected below ruins by R. L. Burgess, 1962.
- *Claytonia perfoliata* Donn MINERS-LETTUCE
Common in shaded riparian scrub.

PRIMULACEAE, Primrose Family

- *Androsace occidentalis* Pursh. ROCK-JASMINE
Collected on crest of hill, 15 yards east of west boundary by F. S. Crosswhite, 1962. Rare on west slope north of Honey Butte and east of the visitor center. Collected by R. L. Burgess, 1962.

RANUNCULACEAE, Crowfoot Family

- *Anemone tuberosa* Rydb. DESERT WINDFLOWER
Scattered throughout the monument. Collected along trail to Lower Ruin by J. Peavy, 1940, and north of Honey Butte on ridge south of the residential area by R. L. Burgess, 1962.

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- *Clematis ligusticifolia* Nutt. CLEMATIS
Grows in the riparian area.
- *Delphinium parishii* Gray [*D. amabile* Tidestrom incl. ssp. *apachense* (Eastw.) Ewan]
(General common name: LARKSPUR) Infrequent on slopes of Sonoran Desertscrub.
- *Myosurus nitidus* Eastw.
(General common name: MOUSE-TAIL) Rare. Collected among rocks on steep, rocky desert north-facing slope across from Lower Ruin by R. L. Burgess, 1962.

RHAMNACEAE, Buck-thorn Family

- *Rhamnus crocea* Nutt. RED-BERRY BUCK-THORN
Collected in deciduous sycamore woods in Cave Canyon south of the visitor center by R. L. Burgess, 1962.
- *Ziziphus obtusifolia* (Hook. ex T. & G.) A. Gray GRAYTHORN
Very common in Desert Riparian Scrub. Common in Sonoran Desertscrub on the valley floor.

ROSACEAE, Rose Family

- *Cercocarpus montanus* Raf. MOUNTAIN-MAHOGANY
Co-dominant in Interior Chaparral. Occasional in neighboring areas.
- *Rubus arizonensis* Focke. ARIZONA DEWBERRY
Locally common around the spring in Cave Canyon.

RUBIACEAE, Madder Family

- *Galium stellatum* Kell. DESERT BEDSTRAW
Scattered to common on the slopes of Sonoran Desertscrub. Occasional in Interior Chaparral and Semidesert Grassland.

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- = voucher specimen collected.

SALICACEAE, Willow Family

- *Populus fremontii* Wats. FREMONT COTTONWOOD
Old photo shows 1 large plant in Cave Canyon below visitor center. Apparently gone from the monument now.

SAPINDACEAE, Soapberry Family

- *Dodonaea viscosa* Jacq. HOP-BUSH
Occasional on the slopes in Sonoran Desertscrub.

SCROPHULARIACEAE, Figwort Family

- *Antirrhinum nuttallianum* Benth.
(General common name: SNAPDRAGON) Collected on slope below Lower Ruin by W. R. Oakes, 1962, and on flat north of Lower Ruin ridge by R. L. Burgess, 1962.
- *Castilleja chromosa* A. Nels. INDIAN PAINTBRUSH
Uncommon on rocky slopes in Sonoran Desertscrub.
- *Keckiella antirrhinoides* (Benth.) Straw ssp. *microphylla* (Gray) BUSH-PENSTEMON
Common in Interior Chaparral, Sonoran Riparian Woodland and on lower slopes of Sonoran Desertscrub. Occasional elsewhere.
- *Maurandya antirrhiniflora* Humb. & Bonpl. BLUE SNAPDRAGON-VINE
Common in Sonoran Riparian Woodland in Cave Canyon.
- *Mimulus rubellus* Gray RED-STEMMED MIMULUS
Infrequent loose soil areas between rocks. Collected on ridgetop south of the residential area by R. L. Burgess, 1962.
- *Orthocarpus purpurascens* Benth. OWL-CLOVER
Collected above double gate along roadside by M. Rasmussen, 1982, and north of Honey Butte by R. L. Burgess, 1962.
- *Penstemon eatoni* Gray EATON FIRECRACKER
Occasional on rocky slopes in Sonoran Desertscrub and Semidesert Grassland.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

- *Penstemon subulatus* Jones BEARD-TONGUE
Collected at Paloverde Flat north of Lower Ruin by R. L. Burgess, 1962.
- *Veronica anagallis-aquatica* L. WATER SPEEDWELL
Found in aquatic environment in the spring in Cave Canyon.

SELAGINELLACEAE, Selaginella Family

- *Selaginella arizonica* Maxon SPIKE-MOSS
Very common on rocky slopes in Sonoran Desertscrub and Semidesert Grassland.

SIMMONDSIACEAE, Jojoba Family

- *Simmondsia chinensis* (Link.) Schneid. JOJOBA
Dominant or co-dominant in all Sonoran Desertscrub subassociations. Co-dominant in Desert Riparian Scrub and Semidesert Grassland on southeast slopes. Very common in Semidesert Grassland on northwest slope and in Interior Chaparral.

SOLANACEAE, Nightshade Family

- *Chamaesaracha coronopus* (Dunal) Gray SMALL GROUNDCHERRY
According to R. L. Burgess, 1965 "upland desert" more common in disturbed areas.
- *Datura meteloides* DC. SACRED DATURA
Collected below utility area by C. W. Strong, 1961.
- *Lycium fremontii* Gray WOLFBERRY
Co-dominant in Sonoran Desertscrub subassociations on the valley floor. Very common on the lower slopes and occasional on the mid and upper slopes of Sonoran Desertscrub. Common in the riparian area, Desert Riparian Scrub and Semidesert Grassland on southeast slopes.
- *Nicotiana attenuata* Torr.
(General common name: TOBACCO) C. W. Strong, 1961.
- *Nicotiana trigonophylla* Dunal. DESERT TOBACCO
Frequent on slopes of Sonoran Desertscrub.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

- *Physalis crassifolia* Benth. THICK-LEAVED GROUNDCHERRY
Common in Sonoran Desertscrub subassociations. Likes disturbed areas.

STERCULIACEAE, Cacao Family

- *Ayenia filiformis* Wats. [*A. compacta* L.]; Cristobol (1960).
Collected on slopes of jojoba-dominated Sonoran Desertscrub. Probably often overlooked.

ULMACEAE, Elm Family

- *Celtis pallida* Torr. DESERT HACKBERRY
Common with paloverde in Sonoran Desertscrub on the valley floor. Occasional elsewhere on the valley floor.
- *Celtis reticulata* Torr. NET-LEAF HACKBERRY
Very common in the riparian area. Collected in cave at back of Upper Ruin by C. W. Strong, 1961.

UMBELLIFERAE [APIACEAE], Parsley Family

- *Bowlesia incana* Ruiz & Pavon. HAIRY BOWLESIA
Abundant in Cave Canyon. Collected by R. L. Burgess, 1962.
- *Caucalis microcarpa* H. & A.
Scattered on rocky desert hillside across canyon from Lower Ruin. Collected by R. L. Burgess, 1962.
- *Daucus pusillus* Michx. AMERICAN CARROT
Scattered in the riparian area. Also collected in Desert Riparian Scrub.
- *Pseudocymopterus montanus* (Gray) Coult. & Rose. MOUNTAIN PARSLEY
Occasional in Interior Chaparral, northwest slopes of Semidesert Grassland, and upper slopes of Sonoran Desertscrub.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

URTICACEAE, Nettle Family

- *Parietaria pensylvanica* Muhl. HAMMERWORT
Common annual. R. L. Burgess, 1962.

VERBENACEAE, Vervain Family

- *Aloysia wrightii* (Gray) Heller WRIGHT LIPPIA
Occasional throughout the monument.
- *Glandularia bipinnatifida* (Nutt.) Nutt. [incl. *Verbena ambrosifolia* Rydb.] WESTERN-PINK
VERBENA
Collected on high ridge of Sonoran Desertscrub.
- *Glandularia gooddingii* (Briq.) Solbrig. [*Verbena gooddingii* Briq.] GOODDING VERBENA
Collected near water in Cave Canyon by R. L. Burgess, 1962.

VIOLACEAE, Violet Family

- *Hybanthus verticillatus* (Ort.) Baill. GREEN VIOLET
Local at the head of Cholla Canyon on northwest slope of Semidesert Grassland.

VISCACEAE, Mistletoe Family

- *Phoradendron californicum* Nutt. (incl. var. *distans* Trel.) DESERT MISTLETOE
Collected from acacia trees on entrance road by C. W. Strong, 1961.
- *Phoradendron capitellatum* Torr. ex Trel. [*P. bolleanum* (Seem.) Eichler var. *capitellatum* (Torr. ex Trel.) K. & P.]
(General common name: MISTLETOE) Collected from juniper trees by C. W. Strong, 1961.

ZYGOPHYLLACEAE, Caltrop Family

- *Kallstroemia californica* (Wats.) Vail CALIFORNIA CALTROP
Collected on parking lot island by R. L. Burgess, 1962.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

- *Kallstroemia parviflora* Norton
Collected on parking lot island by R. L. Burgess, 1962.
- *Larrea divaricata* Cav. ssp. *tridentata* (Sess. & moc. ex DC.) Felger & Lowe CREOSOTEBUSH
Scattered in Sonoran Desertscrub of the valley floor and the Desert Riparian Scrub.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

Appendix 4

Nonnative Flora and List of Vascular Plant Species of Tonto National Monument

CHENOPODIACEAE, Goose Foot Family

- *Salsola iberica* Sennen & Pau. [*S. kali* L. var. *tenuifolia* (Tausch.) Aellen] RUSSIAN THISTLE
Annual native of Eurasia. Likes disturbed areas. See Beatley 1973 for further information.

COMPOSITAE [ASTERACEAE], Sunflower Family

- *Centaurea melitensis* L. MALTA STAR-THISTLE Annual native of Europe.
Occasional to common along road shoulders. Near residents' road turnoff.
- *Sonchus asper* (L.) Hill. SPINY SOW-THISTLE Annual native of Europe.
Scattered in disturbed areas and at moist sites.
- *Sonchus oleraceus* L. SPINY SOW-THISTLE Annual native of Europe.
Scattered in riparian area (Phillips 1992a).

CONVOLVULACEAE, Morning Glory Family

- *Convolvulus arvensis* L. FIELD BINDWEED Native of Europe.
One plant seen in the riparian area.

CRUCIFERAE [BRASSICACEAE], Mustard Family

- *Capsella bursa-pastoris* (L.) Medic SHEPHERDS PURSE Annual native of Europe.
Locally abundant in disturbed areas. Collected near the riparian area in the shade.
- *Sisymbrium irio* L. LONDON ROCKET Annual or biennial from Europe.
Locally common on slopes of the riparian area.
- *Sisymbrium orientale* L. Annual from Asia.
Collected along path in the riparian area. Uncommon.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

EUPHORBIACEAE, Spurge Family

- *Euphorbia supina* Raf. PROSTRATE SPURGE Annual native of eastern United States. Occasional in upland desert (Burgess 1965).

GERANIACEAE, Geranium Family

- *Erodium cicutarium* (L.) L'Her. FILAREE Annual native of Europe. Locally abundant to scattered. Usually on open ground.

GRAMINEAE [POACEAE], Grass Family

- *Avena fatua* L. WILD OAT Annual native of Europe. Locally common in Cave Canyon wash (Phillips 1992a).
- *Bromus diandrus* Roth. [*B. rigidus* Roth.] RIPGUT GRASS Annual from Europe. Locally abundant in Cave Canyon wash under trees. Also found on the highway shoulder near the east boundary.
- *Bromus rubens* L. RED BROME Annual native of Europe. Abundant in nearly every situation on the monument, especially after wet winters.
- *Bromus trinii* Desv. CHILEAN CHESS Annual native of Europe. Scattered on rocky hillside across canyon from Lower Ruin (Burgess 1965). This study failed to re-establish its existence on the monument.
- *Eragrostis cilianensis* (All.) Mosher. STINK GRASS Annual from Europe. Collected on the front terrace by Wells and Mason, 1955. Not collected in this study.
- *Eragrostis curvula* (Schrad.) Nees var. *conferta* Nees. WEEPING LOVEGRASS Native of Africa. Abundant in Cave Canyon in the Desert Riparian Scrub and riparian area, and on the Semidesert Grassland slope to Upper Ruin. Scattered elsewhere.
- *Eragrostis lehmanniana* Nees. LEHMANN LOVEGRASS Native of South Africa. Co-dominant in Semidesert Grassland on south and east slopes. Common on upper slopes of Sonoran Desertscrub and in Desert Riparian Scrub. Occasional in Semidesert Grassland on north and west slopes.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

- *Hordeum leporinum* Link. WILD BARLEY Annual from Europe.
Infrequent in Sonoran Riparian Woodland and disturbed areas.
- *Lamarckia aurea* (L.) Moench. GOLDENTOP Annual native of the Mediterranean.
Rare. Collected in Sonoran Desertscrub east of the Lower Ruin.
- *Polypogon monspeliensis* (L.) Desv. RABBIT-FOOT GRASS Annual native of Europe.
A few plants near the spring in wet ground.
- *Schismus barbatus* (L.) Thell. MEDITERRANEAN GRASS Annual from the Mediterranean region.
Locally abundant in most situations on the monument.
- *Sorghum halepense* (L.) Pers. JOHNSON GRASS Native of the Old World.
Occasional on roadsides.
- *Triticum aestivum* L. WHEAT
Probably a chance germination from seed placed in bird feeders.
Collected along trail through cactus patch near parking lot by R. L. Burgess, 1962.

LABIATAE [LAMIACEAE], Mint Family

- *Marrubium vulgare* L. HOREHOUND Native of Europe.
Locally abundant in Sonoran and riparian scrub of Cave Canyon.

LEGUMINOSAE, Pea Family

PAPILIONOIDEAE, Bean Subfamily

- *Medicago polymorpha* L. [*M. hispida* Gaertn.] MEDICK Annual of the Old World.
Rare in Sonoran Riparian Woodland.
- *Melilotus indicus* (L.) All. YELLOW SWEET-CLOVER
Annual native of Eurasia. Scattered on roadsides.

RUBIACEAE, Madder Family

- *Galium aparine* L. BEDSTRAW Annual from Europe.
Occasional in Sonoran Desertscrub and probably elsewhere. Collected below Lower Ruin.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

SOLANACEAE, Nightshade Family

- *Nicotiana glauca* Graham. TREE TOBACCO Native of South America.
Collected in Cholla Wash by C. W. Strong. Not seen during this study.

Key:

- = observed, not collected;
- = from other lists and collections;
- = voucher specimen collected.

Appendix 5
**List of Acronyms of
Tonto National Monument Species
Listed on Figure 2**

Acronym	Species	Common name
ACGR	<i>Acacia greggii</i>	Catclaw
ARPA	<i>Aristida parishii</i>	Three-awn
BOCU	<i>Bouteloua curtipendula</i>	Side-oats grama
CEMI	<i>Cercidium microphyllum</i>	Foothill paloverde
CEMO	<i>Cercocarpus montanus</i>	Mountain-mahogany
CERE	<i>Celtis reticulata</i>	Net-leaf hackberry
DAWN	<i>Dasyilirion wheeleri</i>	Sotol
ELGL	<i>Elymus glaucus</i>	Blue wild-rye
ENFA	<i>Encelia farinosa</i>	Brittle-bush
GUSA	<i>Gutierrezia sarothrae</i>	Broom snakeweed
JUMA	<i>Juglans major</i>	Arizona walnut
LYFE	<i>Lycium fremontii</i>	Wolfberry
PLWR	<i>Platanus wrightii</i>	Arizona sycamore
PRVE	<i>Prosopis velutina</i>	Velvet mesquite
QUTU	<i>Quercus turbinella</i>	Shrub-live oak
SEAR	<i>Selaginella arizonica</i>	Spike-moss
SICH	<i>Simmondsia chinensis</i>	Jojoba
SPEM	<i>Sphaeralcea emoryi</i>	Globe-mallow
STPA	<i>Stephanomeria pauciflora</i>	Desert-straw
STSP	<i>Stipa speciosa</i>	Desert needlegrass

Appendix 6
**Scientific Name/Common Name
Species Cross-Reference List**

The following alphabetized cross-reference list provides access to plant-specific information contained within this report. Each entry of the cross-reference list contains 4 elements: (1) plant *scientific name*, always printed in italic typeface; (2) plant COMMON NAME, always printed in small capitals; (3) plant family name, always printed in plain typeface; and (4) plant status, native or nonnative. Synonymous scientific names appear enclosed by brackets []; the more recently accepted name are in bold typeface. Please note that "NL" appears in any entry for which no common name is listed.

--A--

- Abutilon parvulum*—SMALL-LEAVED ABUTILON—Malvaceae (Native)
ABUTILON, SMALL-LEAVED—*Abutilon parvulum*—Malvaceae (Native)
Acacia constricta—WHITE-THORN—Leguminosae (Mimosoideae subfamily) (Native)
Acacia greggii—CATCLAW—Leguminosae (Mimosoideae subfamily) (Native)
Acourtia wrightii—BROWNFOOT—Compositae [Asteraceae] (Native)
Agave chrysantha—CENTURY-PLANT—Agavaceae (Native)
ALL-SCALE—*Atriplex polycarpa*—Chenopodiaceae (Native)
Allionia incarnata—TRAILING FOUR-O'CLOCK—Nyctaginaceae (Native)
Allophylum gilioides [*Gilia gilioides*]—STRAGGLING GILIA—Polemoniaceae (Native)
Aloysia wrightii—WRIGHT LIPPIA—Verbenaceae (Native)
AMARANTH—*Amaranthus powellii*—Amaranthaceae (Native)
AMARANTH, FRINGED—*Amaranthus fimbriatus*—Amaranthaceae (Native)
AMARANTH, PALMER—*Amaranthus palmeri*—Amaranthaceae (Native)
Amaranthus fimbriatus—FRINGED AMARANTH—Amaranthaceae (Native)
Amaranthus palmeri—PALMER AMARANTH—Amaranthaceae (Native)
Amaranthus powellii—AMARANTH—Amaranthaceae (Native)
Ambrosia confertiflora [*Franseria confertiflora*]—SLIMLEAF BURSAGE—Compositae [Asteraceae] (Native)
Ambrosia psilostachya—WESTERN RAGWEED—Compositae [Asteraceae] (Native)
Amsinckia intermedia—COAST FIDDLENECK—Boraginaceae (Native)
Amsinckia tessellata—CHECKER FIDDLENECK—Boraginaceae (Native)
Androsace occidentalis—ROCK-JASMINE—Primulaceae (Native)
Anemone tuberosa—DESERT WINDFLOWER—Ranunculaceae (Native)

ANGLE-POD—*Matelea parvifolia*—Asclepiadaceae (Native)

ANGLE-POD—*Matelea producta*—Asclepiadaceae (Native)

Antirrhinum nuttallianum—SNAPDRAGON—Scrophulariaceae (Native)

Arabis perennans—ROCK-CRESS—Cruciferae [Brassicaceae] (Native)

Arenaria douglasii—SANDWORT—Caryophyllaceae (Native)

Arenaria macradenia ssp. *Ferrisiae*—DESERT SANDWORT—Caryophyllaceae (Native)

Argythamnia neomexicana [*Ditaxis neomexicana*]—DITAXIS—Euphorbiaceae (Native)

Aristida adscensionis—SIX-WEEKS THREE-AWN—Gramineae [Poaceae] (Native)

Aristida barbata [***A. havardii***]—HAVARD THREE-AWN—Gramineae [Poaceae] (Native)

Aristida glauca [***A. purpurea* var. *nealleyi***]—REVERCHON THREE-AWN—Gramineae [Poaceae] (Native)

Aristida hamulosa—THREE-AWN—Gramineae [Poaceae] (Native)

Aristida havardii [*A. barbata*]—HAVARD THREE-AWN—Gramineae [Poaceae] (Native)

Aristida oligantha—PRAIRIE THREE-AWN—Gramineae [Poaceae] (Native)

Aristida parishii—THREE-AWN—Gramineae [Poaceae] (Native)

Aristida purpurea—PURPLE THREE-AWN—Gramineae [Poaceae] (Native)

Aristida purpurea* var. *nealleyi [*A. glauca*]—REVERCHON THREE-AWN—Gramineae [Poaceae] (Native)

Aristolochia watsoni—INDIAN-ROOT—Aristolochiaceae (Native)

Artemisia dracunculus—WORMWOOD—Compositae [Asteraceae] (Native)

Artemisia ludoviciana—WORMWOOD—Compositae [Asteraceae] (Native)

Asclepias asperula* ssp. *capricornu [*A. capricornu*]—MILKWEED—Asclepiadaceae (Native)

Asclepias capricornu [***A. asperula* ssp. *capricornu***]—MILKWEED—Asclepiadaceae (Native)

ASH, SINGLE-LEAVER—*Fraxinus anomola*—Oleaceae (Native)

ASTER—*Haplopappus gracilis* [***Machaeranthera gracilis***]—Compositae [Asteraceae] (Native)

ASTER—*Haplopappus spinulosus* [***Machaeranthera pinnatifida***]—Compositae [Asteraceae] (Native)

ASTER—*Machaeranthera bigelovii* [***M. asteroides* var. *glandulosa***]—Compositae [Asteraceae] (Native)

Astragalus nuttallianus—NUTTALL LOCOWEED—Leguminosae (Papilionoideae subfamily) (Native)

Atriplex canescens—CENIZO—Chenopodiaceae (Native)

Atriplex polycarpa—ALL-SCALE—Chenopodiaceae (Native)

Avena fatua—WILD OAT—Gramineae [Poaceae] (Nonnative)

Ayenia compacta [***A. filiformis***]—NL—Sterculiaceae (Native)

Ayenia filiformis [*A. compacta*]—NL—Sterculiaceae (Native)

--B--

Baccharis brachyphylla—SHORT-LEAVED BACCHARIS—Compositae [Asteraceae] (Native)

Baccharis glutinosa [***B. salicifolia***]*—SEEP-WILLOW—Compositae [Asteraceae] (Native)*
Baccharis salicifolia [*B. glutinosa*]*—SEEP-WILLOW—Compositae [Asteraceae] (Native)*
Baccharis sarothroides—DESERT-BROOM—Compositae [Asteraceae] (Native)
 BACCHARIS, SHORT-LEAVED—*Baccharis brachyphylla—Compositae [Asteraceae] (Native)*
Baeria chrysostoma [***Lasthenia chrysostoma***]*—GOLDFIELDS—Compositae [Asteraceae] (Native)*
Baileya multiradiata—DESERT-MARIGOLD—Compositae [Asteraceae] (Native)
 BARLEY, WILD—*Hordeum leporinum—Gramineae [Poaceae] (Nonnative)*
 BARREL-CACTUS—***Ferocactus cylindraceus*** [*F. acanthodes*]*—Cactaceae (Native)*
 BEARD-TONGUE—*Penstemon subulatus—Scrophulariaceae (Native)*
Bebbia juncea—SWEET-BUSH—Compositae [Asteraceae] (Native)
 BEDSTRAW—*Galium aparine—Rubiaceae (Nonnative)*
 BEDSTRAW, DESERT—*Galium stellatum—Rubiaceae (Native)*
 BEE-PLANT, YELLOW—***Cleome lutea var. jonesii*** [*C. jonesii*]*—Cleomaceae (Native)*
 BINDWEED, FIELD—*Convolvulus arvensis—Convolvulaceae (Nonnative)*
 BLACKFOOT—*Melampodium leucanthum—Compositae [Asteraceae] (Native)*
 BLADDER-POD—*Lesquerella purpurea—Cruciferae [Brassicaceae] (Native)*
 BLADDER-POD, GORDON—*Lesquerella gordonii—Cruciferae [Brassicaceae] (Native)*
 BLAZING-STAR—*Mentzelia pumila—Loasaceae (Native)*
 BLOOD-WEED—*Plagiobothrys arizonicus—Boraginaceae (Native)*
 BLUEDICHS—*Dichelostemma pulchellum—Liliaceae (Native)*
 BLUEGRASS, BIGELOW—*Poa bigelovii—Gramineae [Poaceae] (Native)*
Boerhaavia coccinea—RED SPIDERLING—Nyctaginaceae (Native)
Bothriochloa barbinodis—NL—Gramineae [Poaceae] (Native)
Bouteloua aristidoides—SIX-WEEKS-NEEDLE GRAMA—Gramineae [Poaceae] (Native)
Bouteloua barbata—SIX-WEEKS GRAMA—Gramineae [Poaceae] (Native)
Bouteloua curtipendula—SIDE-OATS GRAMA—Gramineae [Poaceae] (Native)
Bouteloua filiformis [***B. repens***]*—SLENDER GRAMA—Gramineae [Poaceae] (Native)*
Bouteloua repens [*B. filiformis*]*—SLENDER GRAMA—Gramineae [Poaceae] (Native)*
 BOWLESIA, HAIRY—*Bowlesia incana—Umbelliferae [Apiaceae] (Native)*
Bowlesia incana—HAIRY BOWLESIA—Umbelliferae [Apiaceae] (Native)
 BRICKELLIA—*Brickellia atractyloides—Compositae [Asteraceae] (Native)*
 BRICKELLIA—*Brickellia coulteri—Compositae [Asteraceae] (Native)*
Brickellia atractyloides—BRICKELLIA—Compositae [Asteraceae] (Native)
Brickellia coulteri—BRICKELLIA—Compositae [Asteraceae] (Native)

BRITTLE-BUSH—*Encelia farinosa*—Compositae [Asteraceae] (Native)
 BROME, RED—*Bromus rubens*—Gramineae [Poaceae] (Nonnative)
Bromus diandrus [*B. rigidus*]—RIPGUT GRASS—Gramineae [Poaceae] (Nonnative)
Bromus rigidus [***B. diandrus***]—RIPGUT GRASS—Gramineae [Poaceae] (Nonnative)
Bromus rubens—RED BROME—Gramineae [Poaceae] (Nonnative)
Bromus trinitii—CHILIAN CHESS—Gramineae [Poaceae] (Nonnative)
 BROWNFOOT—*Acourtia wrightii*—Compositae [Asteraceae] (Native)
 BUCKHORN-CHOLLA—*Opuntia acanthocarpa*—Cactaceae (Native)
 BUCK-THORN, RED-BERRY—*Rhamnus crocea*—Rhamnaceae (Native)
 BUCKWHEAT, WRIGHT—*Erioponum wrightii*—Polygonaceae (Native)
 BURSAGE, SLIMLEAF—***Ambrosia confertiflora*** [*Franseria confertiflora*]—Compositae [Asteraceae] (Native)
 BUSH-PENSTEMON—*Keckiella antirrhinoides* var. *microphylla*—Scrophulariaceae (Native)

—C—

Calandrinia ciliata—RED-MAIDS—Portulacaceae (Native)
Calochortus flexuosus—STRAGGLING MARIPOSA—Liliaceae (Native)
Calochortus kennedyi—DESERT MARIPOSA—Liliaceae (Native)
Calochortus nuttallii—SEGO-LILY—Liliaceae (Native)
 CALTROP, CALIFORNIA—*Kallstroemia californica*—Zygophyllaceae (Native)
Camissonia contorta [*Oenothera contorta*]—DWARF-CONTORTED PRIMROSE—Onagraceae (Native)
Camissonia micrantha [*Oenothera micrantha*]—PRIMROSE—Onagraceae (Native)
 CAMPION, MEXICAN—*Silene laciniata*—Caryophyllaceae (Native)
 CANIGRE—*Rumex hymenosepalus*—polygonaceae (Native)
 CANOTIA—*Canotia holacantha*—Celastraceae (Native)
Canotia holacantha—CANOTIA—Celastraceae (Native)
Capsella bursa-pastoris—SHEPHERDS PURSE—Cruciferae [Brassicaceae] (Nonnative)
Carlwrightia arizonica—NL—Acanthaceae (Native)
Carnegiea gigantea—SAGUARO—Cactaceae (Native)
 CARROT, AMERICAN—*Daucus pusillus*—Umbelliferae [Apiaceae] (Native)
Cassia covesii [***Senna covesii***]—DESERT SENNA—Leguminosae (Caesalpinioideae subfamily) (Native)
Castilleja chromosa—INDIAN PAINTBRUSH—Scrophulariaceae (Native)
 CATCHFLY, SLEEPY—*Silene antirrhina*—Caryophyllaceae (Native)
 CATCLAW—*Acacia greggii*—Leguminosae (Mimosoideae subfamily) (Native)
Caucalis microcarpa—NL—Umbelliferae [Apiaceae] (Native)

Celtis pallida—DESERT HACKBERRY—Ulmaceae (Native)
Celtis reticulata—NET-LEAF HACKBERRY—Ulmaceae (Native)
 CENIZO—*Atriplex canescens*—Chenopodiaceae (Native)
Centaurea melitensis—MALTA STAR-THISTLE—Compositae [Asteraceae] (Native)
 CENTURY-PLANT—*Agave chrysantha*—Agavaceae (Native)
Cercidium floridum—BLUE PALOVERDE—Leguminosae (Caesalpinioideae subfamily) (Native)
Cercidium microphyllum—FOOTHILL PALOVERDE—Leguminosae (Caesalpinioideae subfamily) (Native)
Cercocarpus montanus—MOUNTAIN-MAHOGANY—Rosaceae (Native)
Chamaesaracha coronopus—SMALL GROUNDCHERRY—Solanaceae (Native)
 CHEESE-BUSH—*Hymenoclea salsola*—Compositae [Asteraceae] (Native)
Cheilanthes fendleri—FENDLER LIP-FERN—Adiantaceae [Polypodiaceae] (Native)
Cheilanthes parryi [***Notholaena parryi***]—PARRY CLOAD-FERN—Adiantaceae [Polypodiaceae] (Native)
Cheilanthes wootoni—BEADED LIP-FERN—Adiantaceae [Polypodiaceae] (Native)
 CHESS, CHILIAN—*Bromus trinitii*—Gramineae [Poaceae] (Native)
 CHIA—*Salvia columbariae*—Labiatae [Lamiaceae] (Native)
 CHINCHWEED—*Pectis papposa*—Compositae [Asteraceae] (Native)
Chorizanthe brevicornu—BRITTLE SPINE-FLOWER—Polygonaceae (Native)
 CHRISTMAS-CACTUS—*Opuntia leptocaulis*—Cactaceae (Native)
Cirsium neomexicanum—THISTLE—Compositae [Asteraceae] (Native)
 CLAMMYWEED, WESTERN—***Polanisia dodecandra ssp. trachysperma*** [P. trachysperma]—Cleomaceae (Native)
Claytonia perfoliata—MINERS-LETTUCE—Portulacaceae (Native)
 LEMATIS—*Clematis ligusticifolia*—Ranunculaceae (Native)
Clematis ligusticifolia—CLEMATIS—Ranunculaceae (Native)
Cleome jonesii [***C. lutea var. jonesii***]—YELLOW BEE-PLANT—Cleomaceae (Native)
Cleome lutea var. jonesii [*C. jonesii*]—YELLOW BEE-PLANT—Cleomaceae (Native)
 CLIFF-BRAKE—*Pellaea truncata*—Adiantaceae [Polypodiaceae] (Native)
 CLIMBING MILKWEED—*Sarcostemma cynanchoides* var. *hartwegii*—Asclepiadaceae (Native)
 CLOAK-FERN—*Notholaena standleyi*—Adiantaceae [Polypodiaceae] (Native)
 CLOAK-FERN, PARRY—***Notholaena parryi*** [*Cheilanthes parryi*]—Adiantaceae [Polypodiaceae] (Native)
 CLOCK-FERN, WAVY—*Notholaena sinuate*—Adiantaceae [Polypodiaceae] (Native)
 COCKLE BUR, COMMON—***Xanthium strumarium*** [*X. saccharatum*]—Compositae [Asteraceae] (Native)
 COMB-BUR, ARCH-NUTTED—*Pectocarya recurvata*—Boraginaceae (Native)
Commicarpus scandens—NL—Nyctaginaceae (Native)
Convolvulus arvensis—FIELD BINDWEED—Convolvulaceae (Nonnative)

Conyza canadensis—HORSEWEED—Compositae [Asteraceae] (Native)
Coreopsis californica [*C. douglasii*]—TICKSEED—Compositae [Asteraceae] (Native)
Coreopsis douglasii [***C. californica***]—TICKSEED—Compositae [Asteraceae] (Native)
Corydalis aurea—GOLDEN CORYDALIS—Fumariaceae (Native)
 CORYDALIS, GOLDBER—*Corydalis aurea*—Fumariaceae (Native)
 COTTON, DESERT—*Gossypium thurberi*—Malvaceae (Native)
 COTTON-TOP—***Digitaria californica*** [*Trichachne californica*]—Gramineae [Poaceae] (Native)
 COTTONWOOD, FRENONT—*Populus fremontii*—Salicaceae (Native)
 CRANESBILL—*Geranium carolinianum*—Geraniaceae (Native)
 CREAM-CUPS—*Platystemon californicus*—Papaveraceae (Native)
 CREOSOTE-BUTH—*Larrea divaricata* ssp. *tridentata*—Zygophyllaceae (Native)
Croton texensis—DOVE-WEED—*Euphorbiaceae* (Native)
 CRYPTANTHA—*Cryptantha muricata*—Boraginaceae (Native)
 CRYPTANTHA, BEARDED—*Cryptantha barigera*—Boraginaceae (Native)
 CRYPTANTHA, NEVADA—*Cryptantha nevadensis*—Boraginaceae (Native)
 CRYPTANTHA, PURPLE-ROOTED—*Cryptantha micrantha*—Boraginaceae (Native)
 CRYPTANTHA, WING-NUT—*Cryptantha pterocarya*—Boraginaceae (Native)
Cryptantha barbiger—BEARDED CRYPTANTHA—Boraginaceae (Native)
Cryptantha micrantha—PURPLE-ROOTED CRYPTANTHA—Boraginaceae (Native)
Cryptantha muricata—CRYPTANTHA—Boraginaceae (Native)
Cryptantha nevadensis—NEVADA CRYPTANTHA—Boraginaceae (Native)
Cryptantha pterocarya—WING-NUT CRYPTANTHA—Boraginaceae (Native)
Cucurbita digitata—FINGER-LEAVED GOURD—Cucurbitaceae (Native)
 CURLY-MESQUITE-GRASS—*Hilaria belangeri*—Gramineae [Poaceae] (Native)
Cuscuta indecora—PRETTY DODDER—Convolvulaceae (Native)

--D--

Dalea formosa—FEATHER-PLUME—Leguminosae (Papilionoideae subfamily) (Native)
Dasyllirion wheeleri—SOTOL—Agavaceae (Native)
Datura meteloides—SACRED DATURA—Solanaceae (Native)
 DATURA, SACRED—*Datura meteloides*—Solanaceae (Native)
Daucus pusillus—AMERICAN CARROT—Umbelliferae [Apiaceae] (Native)
Delphinium amabile ssp. *apachense* [***D. parishii***]—LARKSPUR—Ranunculaceae (Native)
Delphinium parishii [*D. amabile* ssp. *apachense*]—LARKSPUR—Ranunculaceae (Native)

Desurainia obtusa—TANSY-MUSTARD—Cruciferae [Brassicaceae] (Native)
Descurainia pinnata—YELLOW TANSY-MUSTARD—Cruciferae [Brassicaceae] (Native)
 DESERT-BROOM—*Baccharis sarothroides*—Compositae [Asteraceae] (Native)
 DESERT-CHICORY—*Rofinesquia neomexicana*—Compositae [Asteraceae] (Native)
 DESERT-LAVENDER—*Hyptis emoryi*—Labiatae [Lamiaceae] (Native)
 DESERT-MALLOW—*Sphaeralcea ambigua*—Malvaceae (Native)
 DESERT-MARIGOLD—*Baileya multiradiata*—Compositae [Asteraceae] (Native)
 DESERT-STRAW—*Stephanomeria pauciflora*—Compositae [Asteraceae] (Native)
 DEWBERRY, ARIZONA—*Rubus arizonensis*—Rosaceae (Native)
Dichelostemma pulchellum—BLUEDICKS—Liliaceae (Native)
Digitaria californica [*Trichachne californica*]—COTTON-TOP—Gramineae [Poaceae] (Native)
 DITAXIS—*Argythamnia neomexicana* [*Ditaxis neomexicana*]—DITAXIS—Euphorbiaceae (Native)
Ditaxis neomexicana [***Argythamnia neomexicana***]—DITAXIS—Euphorbiaceae (Native)
 DODDER, PRETTY—*Cuscuta indecora*—Convolvulaceae (Native)
Dodonaea viscosa—HOP-BUSH—Sapindaceae (Native)
 DOVE-WEED—*Croton texensis*—Euphorbiaceae (Native)
Draba cuneifolia—WHITLOW-GRASS—Cruciferae [Brassicaceae] (Native)
 DROPSEED, SAND—*Sporobolus cryptandrus*—Gramineae [Poaceae] (Native)
 DROPSEED, SPIKE—*Sporobolus contractus*—Gramineae [Poaceae] (Native)
Dudleya saxosa—ROCK ECHEVARIA—Crassulaceae (Native)
Dyssodia porophylloides—SAN-FELIPE DYSSODIA—Compositae [Asteraceae] (Native)
 DYSSODIA, SAN-FELIPE—*Dyssodia porophylloides*—Compositae [Asteraceae] (Native)

--E--

ECHEVARIA, ROCK—*Dudleya saxosa*—Crassulaceae (Native)
Echinocereus fasciculatus var. *boyce-thompsoni*—HEDGEHOG—Cactaceae (Native)
 ELDER, BLUEBERRY—*Sambucus glauca*—Caprifoliaceae (Native)
 ELDER, MEXICAN—*Sambucus mexicana*—Caprifoliaceae (Native)
 ELDERBERRY, RED—*Sambucus microbotrys*—Caprifoliaceae (Native)
Elymus elymoides [*Sitanion hystrix*]—SQUIRREL-TAIL—Gramineae [Poaceae] (Native)
Elymus glaucus—BLUE WILD-RYE—Gramineae [Poaceae] (Native)
Emmenanthe penduliflora—WHISPERING-BELLS—Hydrophyllaceae (Native)
Encelia farinosa—BRITTLE-BUSH—Compositae [Asteraceae] (Native)
 ENCELIA, RAYLESS—*Encelia virginensis*—Compositae [Asteraceae] (Native)

Encelia virginensis—RAYLESS ENCELIA—Compositae [Asteraceae] (Native)
Ephedra aspera—JOINT-FIR—Ephedraceae (Native)
Epilobium foliosum [*E. minutum*]—WILLOW-WEED—Onagraceae (Native)
Epilobium minutum [***E. foliosum***]—WILLOW-WEED—Onagraceae (Native)
Eragrostis arida—LOVEGRASS—Gramineae [Poaceae] (Native)
Eragrostis cilianensis—STINK GRASS—Gramineae [Poaceae] (Nonnative)
Eragrostis curvula var. *conferta*—WEEPING LOVEGRASS—Gramineae [Poaceae] (Nonnative)
Eragrostis intermedia—PLAINS LOVEGRASS—Gramineae [Poaceae] (Native)
Eragrostis lehmanniana—LEHMANN LOVEGRASS—Gramineae [Poaceae] (Nonnative)
Eriastrum diffusum—NL—Polemoniaceae (Native)
Ericameria laricifolia—TURPENTINE-BUSH—Compositae [Asteraceae] (Native)
Erigeron divergens—SPREADING FLEABANE—Compositae [Asteraceae] (Native)
Eriogonum densum [*E. vimineum* var. *densum*]—WILD-BUCKWHEAT—Polygonaceae (Native)
Eriogonum fasciculatum—WILD-BUCKWHEAT—Polygonaceae (Native)
Eriogonum vimineum var. *densum* [***E. densum***]—WILD-BUCKWHEAT—Polygonaceae (Native)
Eriogonum wrightii—WRIGHT BUCKWHEAT—Polygonaceae (Native)
Erioneuron pulchellum [*Tridens pulchellus*]—FLUFF-GRASS—Gramineae [Poaceae] (Native)
Erodium cicutarium—FILAREE—Geraniaceae (Nonnative)
Erodium texanum—LARGE-FLOWERED STORKBILL—Geraniaceae (Native)
Erysimum capitatum—WALLFLOWER—Cruciferae [Brassicaceae] (Native)
Eschscholtzia mexicana—MEXICAN GOLD-POPPY—Papaveraceae (Native)
Euphorbia arizonica—SPURGE—Euphorbiaceae (Native)
Euphorbia capitellata—SPURGE—Euphorbiaceae (Native)
Euphorbia melanadenia—SPURGE—Euphorbiaceae (Native)
Euphorbia polycarpa var. *hirtella*—SMALL-SEEDED SAND-MAT—Euphorbiaceae (Native)
Euphorbia revolute—SPURGE—Euphorbiaceae (Native)
Euphorbia supine—PROSTRATE SPURGE—Euphorbiaceae (Nonnative)

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FEATHER-PLUME—*Dalea formosa*—Leguminosae (Papilionoideae subfamily) (Native)
Ferocactus acanthodes [***F. cylindraceus***]—BARREL-CACTUS—Cactaceae (Native)
Ferocactus cylindraceus [*F. acanthodes*]—BARREL-CACTUS—Cactaceae (Native)
 FESCUE—*Festuca grayi*—Gramineae [Poaceae] (Native)
 FESCUE, FOXTAIL—*Vulpia myuros* var. *hirsuta*—Gramineae [Poaceae] (Native)

FESCUE, SIX-WEEKS—*Vulpia octoflora* [*Festuca octoflora*]—Gramineae [Poaceae] (Native)
Festuca grayi—FESCUE—Gramineae [Poaceae] (Native)
Festuca octoflora [*Vulpia octoflora*]—SIX-WEEKS FESCUE—Gramineae [Poaceae] (Native)
FIDDLENECK, CHECKER—*Amsinckia tessellata*—Boraginaceae (Native)
FIDDLENECK, COAST—*Amsinckia intermedia*—Boraginaceae (Native)
FILAGO, ARIZONA—*Filago arizonica*—Compositae [Asteraceae] (Native)
Filago arizonica—ARIZONA FILAGO—Compositae [Asteraceae] (Native)
FILAREE—*Erodium cicutarium*—Geraniaceae (Nonnative)
FIRECRACKER, EATON—*Penstemon eatoni*—Scrophulariaceae (Native)
FLEABANE, SPREADING—*Erigeron divergens*—Compositae [Asteraceae] (Native)
FLUFF-GRASS—*Erioneuron pulchellum* [*Tridens pulchellus*]—Gramineae [Poaceae] (Native)
Fouquieria splendens—OCOTILLO—Fouquieriaceae (Native)
FOUR-O’CLOCK—*Mirabilis bigelovii*—Nyctaginaceae (Native)
FOUR-O’CLOCK—*Mirabilis coccineus* [*Oxybaphus coccineus*]—Nyctaginaceae (Native)
FOUR-O’CLOCK, TRAILING—*Allionia incarnata*—Nyctaginaceae (Native)
Franseria confertiflora [*Ambrosia confertiflora*]—SLIMLEAF BURSAGE—Compositae [Asteraceae] (Native)
Fraxinus anomala—SINGLE-LEAVED ASH—Oleaceae (Native)
FRINGE-POD—*Thysanocarpus curvipes*—Cruciferae [Brassicaceae] (Native)
FRINGE-POD—*Thysanocarpus curvipes* var. *elegans* [*T. amplectans*]—Cruciferae [Brassicaceae] (Native)

--G--

Galium aparine—BEDSTRAW—Rubiaceae (Native)
Galium stellatum—DESERT BEDSTRAW—Rubiaceae (Native)
Geranium carolinianum—CRANESBILL—Geraniaceae (Native)
GILIA—*Gilia flavocincta*—Polemoniaceae (Native)
GILIA—*Gilia sinuata*—Polemoniaceae (Native)
Gilia flavocincta—GILIA—Polemoniaceae (Native)
Gilia gilioides [*Allophyllum gilioides*]—STRAGGLING GILIA—Polemoniaceae (Native)
GILIA, ROCK—*Gilia scopulorum*—Polemoniaceae (Native)
Gilia scopulorum—ROCK GILIA—Polemoniaceae (Native)
Gilia sinuata—GILIA—Polemoniaceae (Native)
GILIA, STRAGGLING—*Allophyllum gilioides* [*Gilia gilioides*]—Polemoniaceae (Native)
Glandularia bipinnatifida—WESTERN-PINK VERBENA—Verbenaceae (Native)
Glandularia gooddingii [*Verbena gooddingii*]—GOODDING VERBENA—Verbenaceae (Native)

GLOBE-MALLOW—*Sphaeralcea emoryi*—Malvaceae (Native)
 GLOBE-MALLOW—*Sphaeralcea rusbyi*—Malvaceae (Native)
 GLOBE-MALLOW, SCARLET—*Sphaeralcea coccinea*—Malvaceae (Native)
 GOLDEN-ASTER, HISPID—*Heterotheca villosa*—Compositae [Asteraceae] (Native)
 GOLDENEYE—*Viguiera parishii* [*V. deltoidea*]—Compositae [Asteraceae] (Native)
 GOLDENTOP—*Lamarckia aurea*—Gramineae [Poaceae] (Nonnative)
 GOLDFIELDS—*Lasthenia chrysostoma* [*Baeria chrysostoma*]—Compositae [Asteraceae] (Native)
 GOLD-POPPY, MEXICAN—*Eschscholtzia mexicana*—Papaveraceae (Native)
Gossypium thurberi—DESERT COTTON—Malvaceae (Native)
 GOURD, FINGER-LEAVED—*Cucurbita digitata*—Cucurbitaceae (Native)
 GRAMA, SIDE-OATS—*Boteloua curtipendula*—Gramineae [Poaceae] (Native)
 GRAMA, SIX-WEEKS—*Bouteloua barbata*—Gramineae [Poaceae] (Native)
 GRAMA, SIX-WEEKS-NEEDLE—*Bouteloua aristidoides*—Gramineae [Poaceae] (Native)
 GRAMA, SLENDER—*Bouteloua repens* [*B. filiformis*]—Gramineae [Poaceae] (Native)
 GRAYTHORN—*Ziziphus obtusifolia*—Rhamnaceae (Native)
 GROUNDCHERRY, SMALL—*Chamaesaracha coronopus*—Solanaceae (Native)
 GROUNDCHERRY, THICK-LEAVED—*Physalis crassifolia*—Solanaceae (Native)
 GROUNSEL—*Senecio lemmoni*—Compositae [Asteraceae] (Native)
 GROUNSEL—*Senecio mexicanus*—Compositae [Asteraceae] (Native)
 GROUNSEL, SANDWASH—*Senecio douglasii* var. *douglasii*—Compositae [Asteraceae] (Native)
Gutierrezia sarothrae—BROOM SNAKEWEED—Compositae [Asteraceae] (Native)
Gymnosperma glutinosum—TATALENCHO—Compositae [Asteraceae] (Native)

--H--

HACKBERRY, DESERT—*Celtis pallida*—Ulmaceae (Native)
 HACKBERRY, NET-LEAF—*Celtis reticulata*—Ulmaceae (Native)
 HAMMERWORT—*Parietaria pensylvanica*—Urticaceae (Native)
Haplopappus gracilis [*Machaeranthera gracilis*]—ASTER—Compositae [Asteraceae] (Native)
Haplopappus spinulosus [*Machaeranthera pinnatifida*]—ASTER—Compositae [Asteraceae] (Native)
Hedeoma nanum ssp. *macrocalyx*—MOCK-PENNYROYAL—Labiatae [Lamiaceae] (Native)
Hedeoma oblongifolium—MOCK-PENNYROYAL—Labiatae [Lamiaceae] (Native)
 HEDGEHOG—*Echinocereus fasciculatus* var. *boyce-thompsoni*—Cactaceae (Native)
 HELECHILLO—*Notholaena cochinchinensis*—Adiantaceae [Polypodiaceae] (Native)
Heteropogon contortus—TANGLEHEAD—Gramineae [Poaceae] (Native)

Heterotheca villosa—HISPID GOLDER-ASTER—Compositae [Asteraceae] (Native)
Hibiscus coulteri—DESERT ROSE-MALLOW—Malvaceae (Native)
Hilaria belangeri—CURLY-MESQUITE-GRASS—Gramineae [Poaceae] (Native)
Hilaria mutica—TOBOSA GRASS—Gramineae [Poaceae] (Native)
HOP-BUSH—*Dodonaea viscosa*—Sapindaceae (Native)
Hordeum leporinum—WILD BARLEY—Gramineae [Poaceae] (Nonnative)
HOREHOUND—*Marrubium vulgare*—Labiatae [Lamiaceae] (Nonnative)
HORSEWEED—*Conyza canadensis*—Compositae [Asteraceae] (Native)
Hybanthus verticillatus—GREEN VIOLET—Violaceae (Native)
Hymenoclea salsosa—CHEESE-BUSH—Compositae [Asteraceae] (Native)
Hyptis emoryi—DESERT-LAVENDER—Labiatae [Lamiaceae] (Native)

--I--

INDIAN-ROOT—*Aristolochia watsoni*—Aristolochiaceae (Native)
Isocoma acradenia var. *acradenia*—NL—Compositae [Asteraceae] (Native)
Isocoma coronopifolia [*I. tenuisecta*]—NL—Compositae [Asteraceae] (Native)
Isocoma tenuisecta [***I. coronopifolia***]—NL—Compositae [Asteraceae] (Native)

--J--

Janusia gracilis—NL—Malpighiaceae (Native)
JOHNSON GRASS—*Sorghum halepense*—Gramineae [Poaceae] (Nonnative)
JOINT-FIR—*Ephedra aspera*—Ephedraceae (Native)
JOJOBA—*Simmondsia chinensis*—Simmondsiaceae (Native)
Juglans major—ARIZONA WALNUT—Juglandaceae (Native)
JUMPING-CHOLLA—*Opuntia fulgida*—Cactaceae (Native)
JUNIPER, ONE-SEED—*Juniperus monosperma*—Cupressaceae (Native)
JUNIPER, RED-BERRY—*Juniperus erythrocarpa* [*J. pinchotti*]—Cupressaceae (Native)
Juniperus monosperma—ONE-SEED JUNIPER—Cupressaceae (Native)
Juniperus pinchotti [*J. erythrocarpa*]—RED-BERRY JUNIPER—Cupressaceae (Native)
Juniperus erythrocarpa [*J. pinchotti*]—RED-BERRY JUNIPER—Cupressaceae (Native)

--K--

Kallstroemia californica—CALIFORNIA CALTROP—Zygophyllaceae (Native)
Kallstroemia parviflora—NL—Zygophyllaceae (Native)

Keckiella antirrhinoides var. *microphylla*—BUSH-PENSTEMON—Scrophulariaceae (Native)

Krameria erecta [*K. parvifolia* var. *glandulosa*]—SMALL-LEAVED RATANY—Krameriaceae (Native)

Krameria grayi—WHITE RATANY—Krameriaceae (Native)

Krameria parvifolia var. *glandulosa* [***K. erecta***]—SMALL-LEAVED RATANY—Krameriaceae (Native)

--L--

Lactuca ludoviciana—WESTERN LETTUCE—Compositae [Asteraceae] (Native)

Lamarckia aurea—GOLDERTOP—Gramineae [Poaceae] (Nonnative)

LARKSPUR—***Delphinium parishii*** [*D. amabile* ssp. *apachense*]—Ranunculaceae (Native)

Larrea divaricata ssp. *tridentata*—CREOSOTE-BUSH—Zygophyllaceae (Native)

Lasthenia chrysostoma—[*Baeria chrysostoma*]—GOLDFIELDS—Compositae [Asteraceae] (Native)

Layia glandulosa—TIDY-TIPS—Compositae [Asteraceae] (Native)

Lepidium lasiocarpum var. *typicum*—SAND PEPPERGRASS—Cruciferae [Brassicaceae] (Native)

Lepidium lasiocarpum var. *wrightii*—SAND PEPPERGRASS—Cruciferae [Brassicaceae] (Native)

Lepidium medium—PEPPERWORT—Cruciferae [Brassicaceae] (Native)

Lepidium medium var. *pubescens*—PEPPERWORT—Cruciferae [Brassicaceae] (Native)

Leptochloa dubia—GREEN SPRANGLETOP—Gramineae [Poaceae] (Native)

Leptochloa filiformis—RED SPRANGLETOP—Gramineae [Poaceae] (Native)

Lesquerella gordonii—GORDON BLADDER-POD—Cruciferae [Brassicaceae] (Native)

Lesquerella purpurea—BLADDER-POD—Cruciferae [Brassicaceae] (Native)

LETTUCE, WESTERN—*Lactuca ludoviciana*—Compositae [Asteraceae] (Native)

Linanthus bigelovii—NL—Polemoniaceae (Native)

LIP-FERN, BEADED—*Cheilanthes wootoni*—Adiantaceae [Polypodiaceae] (Native)

LIP-FERN, FENDLER—*Cheilanthes fendleri*—Adiantaceae [Polypodiaceae] (Native)

LIPPIA, WRIGHT—*Aloysia wrightii*—Verbenaceae (Native)

LOCOWEED, NUTTALL—*Astragalus nuttallianus*—Leguminosae (Papilionoideae subfamily) (Native)

LOCUST, HILL—*Lotus humistratus*—Leguminosae (Papilionoideae subfamily) (Native)

LONDON ROCKER—*Sisymbrium irio*—Cruciferae [Brassicaceae] (Nonnative)

Lotus humistratus—HILL LOCUST—Leguminosae (papilionoideae family) (Native)

Lotus rigidus—DESERT-ROCK PEA—Leguminosae (Papilionoideae subfamily) (Native)

LOVEGRASS—*Eragrostis arida*—Gramineae [Poaceae] (Native)

LOVEGRASS—*Eragrostis divaricata*—Gramineae [Poaceae] (Nonnative)

LOVEGRASS, LEHMANN—*Eragrostis lehmanniana*—Gramineae [Poaceae] (Nonnative)

LOVEGRASS, PLAINS—*Eragrostis intermedia*—Gramineae [Poaceae] (Native)

LOVEGRASS, WEeping—*Eragrostis curvula* var. *conferta*—Gramineae [Poaceae] (Nonnative)
 LUPINE—*Lupinus sparsiflorus*—Leguminosae (Papilionoideae subfamily) (Native)
 LUPINE—*Lupinus succulentus*—Leguminosae (Papilionoideae subfamily) (Native)
 LUPINE, ARIZONA—*Lupinus arizonicus*—Leguminosae (Papilionoideae subfamily) (Native)
 LUPINE, ELEGANT—*Lupinus concinnus*—Leguminosae (Papilionoideae subfamily) (Native)
Lupinus arizonicus—ARIZONA LUPINE—Leguminosae (Papilionoideae subfamily) (Native)
Lupinus concinnus—ELEGANT LUPINE—Leguminosae (Papilionoideae subfamily) (Native)
Lupinus sparsiflorus—LUPINE—Leguminosae (Papilionoideae subfamily) (Native)
Lupinus succulentus—LUPINE—Leguminosae (Papilionoideae subfamily) (Native)
Lycium fremontii—WOLFBERRY—Solanaceae (Native)

--M--

Machaeranthera asteroides* var. *glandulosa [*M. bigelovii*]—ASTER—Compositae [Asteraceae] (Native)
Machaeranthera bigelovii [***M. asteroides* var. *glandulosa***]—ASTER—Compositae [Asteraceae] (Native)
Machaeranthera gracilis [*Haplopappus gracilis*]—ASTER—Compositae [Asteraceae] (Native)
Machaeranthera pinnatifida [*Haplopappus spinulosus*]—ASTER—Compositae [Asteraceae] (Native)
Mammillaria grahamii [*M. microcarpa*]—PINCUSHION-CACTUS—Cactaceae (Native)
Mammillaria microcarpa [***M. grahamii***]—PINCUSHION-CACTUS—Cactaceae (Native)
Marah gilensis—WILD-CUCUMBER—Cucurbitaceae (Native)
 MARIPOSA, DESERT—*Calochortus kennedyi*—Liliaceae (Native)
 MARIPOSA, STRAGGLING—*Calochortus flexuosus*—Liliaceae (Native)
Marrubium vulgare—HOREHOUND—Labiatae [Lamiaceae] (Nonnative)
Matelea parvifolia—ANGLE-POD—Asclepiadaceae (Native)
Matelea producta—ANGLE-POD—Asclepiadaceae (Native)
Maurandya anrirrhiniflora—BLUE SNAPDRAGON-VINE—Scrophulariaceae (Native)
Medicago hispida [***M. polymorpha***]—MEDICK—Leguminosae (Papilionoideae subfamily) (Nonnative)
Medicago polymorpha [*M. hispida*]—MEDICK—Leguminosae (Papilionoideae subfamily) (Nonnative)
 MEDICK—***Medicago polymorpha*** [*M. hispida*]—Leguminosae (Papilionoideae subfamily) (Nonnative)
 MEDITERRANEAN GRASS—*Schismus barbatus*—Framineae [Poaceae] (Nonnative)
Melampodium leucanthum—BLACKFOOT—Compositae [Asteraceae] (Native)
Melilotus indicus—YELLOW SWEET-CLOVER—Leguminosae (Papilionoideae subfamily) (Nonnative)
 MENODORA—*Menodora scabra*—Oleaceae (Native)
Menodora scabra—MENODORA—Oleaceae (Native)
Mentzelia pumila var. *multiflora*—BLAZING-STAR—Loasaceae (Native)

MESQUITE, VELVET—*Prosopis velutina*—Leguminosae (Mimosoideae subfamily) (Native)
Microseris linearifolia—SILVER-PUFFS—Compositae [Asteraceae] (Native)
Microsteris gracilis—NL—Polemoniaceae (Native)
MILKWEED—*Asclepias asperula* ssp. *capricornu* [*A. capricornu*]—Asclepiadaceae (Native)
MILKWORT—*Polygala macradenia*—Polygalaceae (Native)
MIMULUS, RED-STEMMED—*Mimulus rubellus*—Scrophulariaceae (Native)
Mimulus rubellus—RED-STEMMED MIMULUS—Scrophulariaceae (Native)
MINERS-LETTUCE—*Claytonia perfoliata*—Portulacaceae (Native)
Mirabilis bigelovii—FOUR-O’CLOCK—Nyctaginaceae (Native)
Mirabilis coccineus [*Oxybaphus coccineus*]—FOUR-O’CLOCK—Nyctaginaceae (Native)
MISTLETOE—***Phoradendron capitellatum*** [*P. bolleanum* var. *capitellatum*]—Viscaceae (Native)
MISTLETOE, DESERT—*Phoradendron californicum*—Viscaceae (Native)
MOCK-PENNYROYAL—*Hedeoma nanum* ssp. *macrocalyx*—Labiatae [Lamiaceae] (Native)
MOCK-PENNYROYAL—*Hedeoma oblongifolium*—Labiatae [Lamiaceae] (Native)
MOUNTAIN-MAHOGANY—*Cercocarpus montanus*—Rosaceae (Native)
MOUSE-TAIL—*Myosurus nitidus*—Ranunculaceae (Native)
Muhlenbergia microsperma—LITTLE-SEED MUHLY—Gramineae [Poaceae] (Native)
Muhlenbergia porteri—BUSH MUHLY—Gramineae [Poaceae] (Native)
MUHLY, BUSH—*Muhlenbergia porteri*—Gramineae [Poaceae] (Native)
MUHLY, LITTLE-SEED—*Muhlenbergia microsperma*—Gramineae [Poaceae] (Native)
MUTTON-GRASS—*Poa fendleriana*—Gramineae [Poaceae] (Native)
Myosurus nitidus—MOUSE-TAIL—Ranunculaceae (Native)

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NEEDLEGRASS—*Stipa tenuissima*—Gramineae [Poaceae] (Native)
NEEDLEGRASS, DESERT—*Stipa speciosa*—Gramineae [Poaceae] (Native)
NEST-STRAW, DESERT—*Stylocline micropoides*—Compositae [Asteraceae] (Native)
Nicotiana attenuata—TOBACCO—Solanaceae (Native)
Nicotiana glauca—TREE TOBACCO—Solanaceae (Nonnative)
Nicotiana trigonophylla—DESERT TOBACCO—Solanaceae (Native)
Notholaena cochinchinensis—HELECHILLO—Adiantaceae [Polypodiaceae] (Native)
Notholaena parryi [*Cheilanthes parryi*]—PARRY CLOAK-FERN—Adiantaceae [Polypodiaceae] (Native)
Notholaena sinuata—WAVY CLOAK-FERN—Adiantaceae [Polypodiaceae] (native)
Notholaena standleyi—CLOAK-FERN—Adiantaceae [Polypodiaceae] (Native)

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OAK, SHRUB-LIVE—*Quercus turbinella*—Fagaceae (Native)
OAT, WILD—*Avena fatua*—Gramineae [Poaceae] (Nonnative)
OCOTILLO—*Fouquieria splendens*—Fouquieriaceae (Native)
ODORA—*Porophyllum gracile*—Compositae [Asteraceae] (Native)
Oenothera caespitosa—PRIMROSE—Onagraceae (Native)
Oenothera contorta [***Camissonia contorta***]—DWARF-CONTORTED PRIMROSE—Onagraceae (Native)
Oenothera micrantha [***Camissonia micrantha***]—PRIMROSE—Onagraceae (Native)
Oenothera primiveris—LARGE-YELLOW-DESERT PRIMROSE—Onagraceae (Native)
Opuntia acanthocarpa—BUCKHORN-CHOLLA—Cactaceae (Native)
Opuntia bigelovii—TEDDY-BEAR-CHOLLA—Cactaceae (Native)
Opuntia chlorotica—PANCAKE-PEAR—Cactaceae (Native)
Opuntia engelmannii [*O. phaeacantha* var. *discata*]—ENGELMANN PRICKLY-PEAR—Cactaceae (Native)
Opuntia fulgida—JUMPING-CHOLLA—Cactaceae (Native)
Opuntia leptocaulis—CHRISTMAS-CACTUS—Cactaceae (Native)
Opuntia macrocentra [***O. violacea* var. *macrocentra***]—BLACK-SPINED PRICKLY-PEAR—Cactaceae (Native)
Opuntia phaeacantha var. *discata* [***O. engelmannii***]—ENGELMANN PRICKLY-PEAR—Cactaceae (Native)
Opuntia violacea* var. *macrocentra [*O. macrocentra*]—BLACK-SPINED PRICKLY-PEAR—Cactaceae (Native)
Orobanche fasciculata var. *lutea*—PINON-STRANGLEROOT—Orobanchaceae (Native)
Orthocarpus purpurascens—OWL-CLOVER—Scrophulariaceae (Native)
OWL-CLOVER—*Orthocarpus purpurascens*—Scrophulariaceae (Native)
Oxybaphus coccineus [***Mirabilis coccineus***]—FOUR-O’CLOCK—Nyctaginaceae (Native)

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PAINTBRUSH, INDIAN—*Castilleja chromosa*—Scrophulariaceae (Native)
PALOVERDE, BLUE—*Cercidium floridum*—Leguminosae (Caesalpinioideae subfamily) (Native)
PALOVERDE, FOOTHILL—*Cercidium microphyllum*—Leguminosae (Caesalpinioideae subfamily) (Native)
PANCAKE-PEAR—*Opuntia chlorotica*—Cactaceae (Native)
PAPERFLOWER—*Psilostrophe cooperi*—Compositae [Asteraceae] (Native)
Parietaria pensylvanica—HAMMERWORT—Urticaceae (Native)
PARSLEY, MOUNTAIN—*Pseudocymopterus montanus*—Umbelliferae [Apiaceae] (Native)
PEA, DESERT-ROCK—*Lotus rigidus*—Leguminosae (Papilionoideae subfamily) (Native)
Pectis papposa—CHINCHWEED—Compositae [Asteraceae] (Native)

Pectocarya recurvata—ARCH-NUTTED COMB-BUR—Boraginaceae (Native)
Pellaea truncata—CLIFF-BRAKE—Adiantaceae [Polypodiaceae] (Native)
Penstemon eatoni—EATON FIRECRACKER—Scrophulariaceae (Native)
Penstemon subulatus—BEARD-TONGUE—Scrophulariaceae (Native)
 PEPPERGRASS, SAND—*Lepidium lasiocarpum* var. *typicum*—Cruciferae [Brassicaceae] (Native)
 PEPPERGRASS, SAND—*Lepidium lasiocarpum* var. *wrightii*—Cruciferae [Brassicaceae] (Native)
 PEPPERWORT—*Lepidium medium*—Cruciferae [Brassicaceae] (Native)
 PEPPERWORT—*Lepidium medium* var. *pubescens*—Cruciferae [Brassicaceae] (Native)
Perityle saxicola—ROCKY-DAISY—Compositae [Asteraceae] (Native)
 PHACELIA—*Phacelia crenulata*—Hydrophyllaceae (Native)
 PHACELIA—*Phacelia ramosissima*—Hydrophyllaceae (Native)
Phacelia affinis—PURPLE-BELL PHACELIA—Hydrophyllaceae (Native)
Phacelia crenulata—PHACELIA—Hydrophyllaceae (Native)
Phacelia cryptantha—SMALL-FLOWERED PHACELIA—Hydrophyllaceae (Native)
Phacelia distans—WILD-HELIOTROPE—Hydrophyllaceae (Native)
 PHACELIA, FEMONT—*Phacelia fremontii*—Hydrophyllaceae (Native)
Phacelia fremontii—FREMONT PHACELIA—Hydrophyllaceae (Native)
 PHACELIA, IVES—*Phacelia ivesiana*—Hydrophyllaceae (Native)
Phacelia ivesiana—IVES PHACELIA—Hydrophyllaceae (Native)
 PHACELIA, PURPLE-BELL—*Phacelia affinis*—Hydrophyllaceae (Native)
Phacelia ramosissima—PHACELIA—Hydrophyllaceae (Native)
 PHACELLA, SMALL-FLOWERED—*Phacelia cryptantha*—Hydrophyllaceae (Native)
 PHLOX, POINTY-LEAF—*Phlox tenuifolia*—Polemoniaceae (Native)
Phlox tenuifolia—POINTY-LEAF PHLOX—Polemoniaceae (Native)
Pholistoma auritum—NL—Hydrophyllaceae (Native)
Phoradendron bolleanum var. *capitellatum* [***P. capitellatum***]—MISTLETOE—Viscaceae (Native)
Phoradendron californicum—DESERT MISTLETOE—Viscaceae (Native)
Phoradendron capitellatum [*P. bolleanum* var. *capitellatum*]—MISTLETOE—Viscaceae (Native)
Physalis crassifolia—THICK-LEAVED GROUNDCHERRY—Solanaceae (Native)
 PIGMY WEED—*Tillaea erecta*—Crassulaceae (Native)
 PINCUSHION-CACTUS—***Mammillaria grahamii*** [*M. microcarpa*]—Cactaceae (Native)
 PINON-STRANGLEROOT—*Orobanche fasciculata* var. *lutea*—Orobanchaceae (Native)
Plagiobothrys arizonicus—BLOOD-WEED—Boraginaceae (Native)
Plagiobothrys californicus var. *fulvescens*—NL—Boraginaceae (Native)

Plantago insularis—WOOLY PLANTAIN—Plantaginaceae (Native)
Plantago patagonica* var. *gnaphalioides [*P. purshii*]—PLANTAIN—Plantaginaceae (Native)
Plantago purshii [***P. patagonica* var. *gnaphalioides***]—PLANTAIN—Plantaginaceae (Native)
Plantago rhodosperma—RED-SEEDED PLANTAIN—Plantaginaceae (Native)
 PLANTAIN—***Plantago patagonica* var. *gnaphalioides*** [*P. purshii*]—Plantaginaceae (Native)
 PLANTAIN, RED-SEED—*Plantago rhodosperma*—Plantaginaceae (Native)
 PLANTAIN, WOOLY—*Plantago insularis*—Plantaginaceae (Native)
Platanus wrightii—ARIZONA SYCAMORE—Platanaceae (Native)
Platystemon californicus—CREAM-CUPS—Papaveraceae (Native)
Poa bigelovii—BIGELOW BLUEGRASS—Gramineae [Poaceae] (Native)
Poa fendleriana—MUTTON-GRASS—Gramineae [Poaceae] (Native)
Polanisia dodecandra* ssp. *trachysperma [*P. trachysperma*]—WESTERN CLAMMYWEED—Cleomaceae (Native)
Polanisia trachysperma [***P. dodecandra* ssp. *trachysperma***]—WESTERN CLAMMYWEED—Cleomaceae (Native)
Polygala macradenia—MILKWORT—Polygalaceae (Native)
Polypogon monspeliensis—RABBIT-FOOT GRASS—Gramineae [Poaceae] (Nonnative)
Populus fremontii—FREMONT COTTONWOOD—Salicaceae (Native)
Porophyllum gracile—ODORA—Compositae [Asteraceae] (Native)
 PRICKLY-PEAR, BLACK-SPINED—***Opuntia violacea* var. *macrocentra*** [*O. macrocentra*]—Cactaceae (Native)
 PRICKLY-PEAR, ENGELMANN—***Opuntia engelmannii*** [*O. phaeacantha* var. *discata*]—Cactaceae (Native)
 PRIMROSE—***Camissonia micrantha*** [*Oenothera micrantha*]—Onagraceae (Native)
 PRIMROSE, DWARF-CONTORTED—***Camissonia contorta*** [*Oenothera contorta*]—Onagraceae (Native)
 PRIMROSE, LARGE-YELLOW-DESERT—*Oenothera primiveris*—Onagraceae (Native)
Prosopis velutina—VELVET MESQUITE—Leguminosae (Mimosoideae subfamily) (Native)
Pseudocymopterus montanus—MOUNTAIN PARSLEY—Umbelliferae [Apiaceae] (Native)
Psilostrophe cooperi—PAPERFLOWER—Compositae [Asteraceae] (Native)

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Quercus turbinella—SHRUB-LIVE OAK—Fagaceae (Native)

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RABBIT-FOOT GRASS—*Polypogon monspeliensis*—Gramineae [Poaceae] (Nonnative)
Rafinesquia neomexicana—DESERT-CHICORY—Compositae [Asteraceae] (Native)
 RAGWEED, WESTERN—*Ambrosia psilostachya*—Compositae [Asteraceae] (Native)
 RATAMY, SMALL-LEAVED—***Krameria erecta*** [*K. parvifolia* var. *glandulosa*]—Krameriaceae (Native)

RATANY, WHITE—*Krameria grayi*—Krameriaceae (Native)

RED-MAID—*Calandrinia ciliata*—Portulacaceae (Native)

Rhamnus crocea—RED-BERRY BUCK-THORN—Thamniceae (Native)

Rhus ovata—SUGAR SUMAC—Anacardiaceae (Native)

Rhus trilobata var. *pilosissima*—SQUAW-BUSH—Anacardiaceae (Native)

RIPGUT GRASS—*Bromus diandrus* [*B. Rigidus*]—Gramineae [Poaceae] (Nonnative)

ROCK-CRESS—*Arabis perennans*—Cruciferae [Brassicaceae] (Native)

ROCK-JASMINE—*Androsace occidentalis*—Primulaceae (Native)

ROCKY-DAISY—*Perityle saxicola*—Compositae [Asteraceae] (Native)

ROSE-MALLOW, DESERT—*Hibiscus coulteri*—Malvaceae (Native)

Rubus arizonensis—ARIZONA DEWBERRY—Rosaceae (Native)

Rumex hymenosepalus—CANIGRE—Polygonaceae (Native)

RUSSIAN THISTLE—*Salsola iberica* [*S. kali* var. *tenuifolia*]—Chenopodiaceae (Nonnative)

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SAGE, ROCK—*Salvia pinguifolia*—Labiatae [Lamiaceae] (Native)

SAGUARO—*Carnegiea gigantea*—Cactaceae (Native)

Salsola iberica [*S. kali* var. *tenuifolia*]—RUSSIAN THISTLE—Chenopodiaceae (Nonnative)

Salsola kali var. *tenuifolia* [*S. iberica*]—RUSSIAN THISTLE—Chenopodiaceae (Nonnative)

Salvia columbariae—CHIA—Labiatae [Lamiaceae] (Native)

Salvia pinguifolia—ROCK SAGE—Labiatae [Lamiaceae] (Native)

Sambucus glauca—BLUEBERRY ELDER—Caprifoliaceae (Native)

Sambucus mexicana—MEXICAN ELDER—Caprifoliaceae (Native)

Sambucus microbotrys—RED ELDERBERRY—Caprifoliaceae (Native)

SAND-MAT, SMALL-SEEDED—*Euphorbia polycarpa* var. *hirtella*—Euphorbiaceae (Native)

SANDWORT—*Arenaria douglasii*—Caryophyllaceae (Native)

SANDWORT, DESERT—*Arenaria macradenia* ssp. *ferrisiae*—Caryophyllaceae (Native)

Sarcostemma cynanchoides var. *hartwegii*—CLIMBING MILKWEED—Asclepiadaceae (Native)

Schismus barbatus—MEDITERRANEAN GRASS—Gramineae [Poaceae] (Nonnative)

SEEP-WILLOW—*Baccharis salicifolia* [*B. glutinosa*]—Compositae [Asteraceae] (Native)

SEGO-LILY—*Calochortus nuttallii*—Liliaceae (Native)

Selaginella arizonica—SPIKE-MOSS—Selaginellaceae (Native)

Senecio douglasii var. *douglasii*—SANDWASH GROUNDSEL—Compositae [Asteraceae] (Native)

Senecio lemmoni—GROUNDSEL—Compositae [Asteraceae] (Native)

Senecio neomexicanus—GROUNDSEL—Compositae [Asteraceae] (Native)
Senna covesii [*Cassia covesii*]—DESERT SENNA—Leguminosae (Caesalpinioideae subfamily) (Native)
 SENNA, DESERT—***Senna covesii*** [*Cassia covesii*]—Leguminosae (Caesalpinioideae subfamily)
 SHEPHERDS PURSE—*Capsella bursa-pastoris*—Cruciferae [Brassicaceae] (Nonnative)
Silene antirrhina—SLEEPY CATCHFLY—Caryophyllaceae (Native)
Silene laciniata—MEXICAN CHAMPION—Caryophyllaceae (Native)
 SILVER-PUFFS—*Microseris linearifolia*—Compositae [Asteraceae] (Native)
Simmondsia chinensis—JOJOBA—Simmondsiaceae (Native)
Sisymbrium irio—LONDON ROCKET—Cruciferae [Brassicaceae] (Nonnative)
Sisymbrium orientale—NL—Cruciferae [Brassicaceae] (Nonnative)
Sitanion hystrix [***Elymus elymoides***]—SQUIRREL-TAIL—Gramineae [Poaceae] (Native)
 SNAKEWEED, BROOM—*Gutierrezia sarothrae*—Compositae [Asteraceae] (Native)
 SNAPDRAGON—*Antirrhinum nuttallianum*—Scrophulariaceae (Native)
 SANPDRAGON-VINE, BLUE—*Maurandya antirrhiniflora*—Scrophulariaceae (Native)
Sonchus asper—SPINY SOW-THISTLE—Compositae [Asteraceae] (Nonnative)
Sonchus oleraceus—SPINY SOW-THISTLE—Compositae [Asteraceae] (Nonnative)
Sorghum halepense—JOHNSON GRASS—Gramineae [Poaceae] (Nonnative)
 SOTOL—*Dasyilirion wheeleri*—Agavaceae (Native)
 SOW-THISTLE, SPINY—*Sonchus asper*—Compositae [Asteraceae] (Nonnative)
 SOW-THISTLE, SPINY—*Sonchus oleraceus*—Compositae [Asteraceae] (Nonnative)
 SPEEDWELL, WATER—*Veronica anagallis-aquatica*—Scrophulariaceae (Native)
Sphaeralcea ambigua—DESERT-MALLOW—Malvaceae (Native)
Sphaeralcea coccinea—SCARLET GLOBE-MALLOW—Malvaceae (Native)
Sphaeralcea emoryi—GLOBE-MALLOW—Malvaceae (Native)
Sphaeralcea rusbyi—GLOBE-MALLOW—Malvaceae (Native)
 SPIDERLING, RED—*Boerhaavia coccinea*—Nyctaginaceae (Native)
 SPIDERWORT—*Tradescantia occidentalis*—Commelinaceae (Native)
 SPIKE-MOSS—*Selaginella arizonica*—Selaginellaceae (Native)
 SPINE-FLOWER, BRITTLE—*Chorizanthe brevicornu*—Polygonaceae (Native)
Sporobolus contractus—SPIKE DROPSEED—Gramineae [Poaceae] (Native)
Sporobolus cryptandrus—SAND DROPSEED—Gramineae [Poaceae] (Native)
 SPRANGLETOP, GREEN—*Leptochloa dubia*—Gramineae [Poaceae] (Native)
 SPRANGLETOP, RED—*Leptochloa filiformis*—Gramineae [Poaceae] (Native)
 SPURGE—*Euphorbia arizonica*—Euphorbiaceae (Native)

SPURGE—*Euphorbia capitellata*—Euphorbiaceae (Native)
 SPURGE—*Euphorbia melanadenia*—Euphorbiaceae (Native)
 SPURGE—*Euphorbia revoluta*—Euphorbiaceae (Native)
 SPURGE, PROSTRATE—*Euphorbia supina*—Euphorbiaceae (Nonnative)
 SQUAW-BUSH—*Rhus trilobata* var. *pilosissima*—Anacardiaceae (Native)
 SQUIRREL-TAIL—*Elymus elymoides* [*Sitanion hystrix*]—Gramineae [Poaceae] (Native)
 STAR-THISTLE, MALTA—*Centaurea melitensis*—Compositae [Asteraceae] (Nonnative)
 STARWORT—*Stellaria nitens*—Caryophyllaceae (Native)
Stellaria nitens—STARWORT—Caryophyllaceae (Native)
Stephanomeria pauciflora—DESERT-STRAW—Compositae [Asteraceae] (Native)
 STINK GRASS—*Eragrostis cilianensis*—Gramineae [Poaceae] (Nonnative)
Stipa speciosa—DESERT NEEDLEGRASS—Gramineae [Poaceae] (Native)
Stipa tenuissima—NEEDLEGRASS—Gramineae [Poaceae] (Native)
 STORKSBALL, LARGE-FLOWERED—*Erodium texanum*—Geraniaceae (Native)
Stylocline micropoides—DESERT NEST-STRAW—Compositae [Asteraceae] (Native)
 SUMAC, SUGAR—*Rhus ovata*—Anacardiaceae (Native)
 SWEET-BUSH—*Bebbia juncea*—Compositae [Asteraceae] (Native)
 SWEET-CLOVER, YELLOW—*Melilotus indicus*—Leguminosae (papilionoideae subfamily) (Nonnative)
 SYCAMORE, ARIZONA—*Platanus wrightii*—Platanaceae (Native)

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TANGLEHEAD—*Heteropogon contortus*—Gramineae [Poaceae] (Native)
 TANSY-MUSTARD—*Descurainia obtusa*—Cruciferae [Brassicaceae] (Native)
 TANSY-MUSTARD, YELLOW—*Descurainia pinnata*—Cruciferae [Brassicaceae] (Native)
 TATALENCHO—*Gymnosperma glutinosum*—Compositae [Asteraceae] (Native)
 TEDDY-BEAR-CHOLLA—*Opuntia bigelovii*—Cactaceae (Native)
Thelypodium lasiophyllum—NL—Cruciferae [Brassicaceae] (Native)
 THISTLE—*Cirsium neomexicanum*—Compositae [Asteraceae] (Native)
 THREE-AWN—*Aristida hamulosa*—Gramineae [Poaceae] (Native)
 THREE-AWN—*Aristida parishii*—Gramineae [Poaceae] (Native)
 THREE-AWN, HAVARD—*Aristida havardii* [*A. barbata*]—Gramineae [Poaceae] (Native)
 THREE-AWN, PRAIRIE—*Aristida oligantha*—Gramineae [Poaceae] (Native)
 THREE-AWN, PURPLE—*Aristida purpurea*—Gramineae [Poaceae] (Native)
 THREE-AWN, REVERCHON—*Aristida glauca* [*A. purpurea* var. *nealleyi*]—Gramineae [Poaceae] (Native)

THREE-AWN, SIX-WEEKS—*Aristida adscensionis*—Gramineae [Poaceae] (Native)
Thysanocarpus amplexans [***T. curvipes* var. *elegans***]—FRINGE-POD—Cruciferae [Brassicaceae] (Native)
Thysanocarpus curvipes—FRINGE-POD—Cruciferae [Brassicaceae] (Native)
Thysanocarpus curvipes* var. *elegans [*T. amplexans*]—FRINGE-POD—Cruciferae [Brassicaceae] (Native)
TICKSEED—***Coreopsis californica*** [*C. douglasii*]—Compositae [Asteraceae] (Native)
TIDY-TIPS—*Layia glandulosa*—Compositae [Asteraceae] (Native)
Tillaea erecta—PIGMY WEED—Crassulaceae (Native)
TOBACCO—*Nicotiana attenuata*—Solanaceae (Native)
TOBACCO, DESERT—*Nicotiana trigonophylla*—Solanaceae (Native)
TOBACCO, TREE—*Nicotiana glauca*—Solanaceae (Nonnative)
TOBOSA GRASS—*Hilaria mutica*—Gramineae [Poaceae] (Native)
Tradescantia occidentalis—SPIDERWORT—Commelinaceae (Native)
Trichachne californica [***Digitaria californica***]—COTTON-TOP—Gramineae [Poaceae] (Native)
Tridens muticus var. *muticus*—SLIM TRIDENS—Gramineae [Poaceae] (Native)
Tridens pulchellus [*Erioneuron pulchellum*]—FLUFF-GRASS—Gramineae [Poaceae] (Native)
TRIDENS, SLIM—*Tridens muticus* var. *muticus*—Gramineae [Poaceae] (Native)
Triticum aestivum—WHEAT—Gramineae [Poaceae] (Nonnative)
Trixis californica—NL—Compositae [Asteraceae] (Native)
TURPENTINE-BUSH—*Ericameria laricifolia*—Compositae [Asteraceae] (Native)

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VERBENA, GOODDING—***Glandularia gooddingii*** [*Verbena gooddingii*]—Verbenaceae (Native)
Verbena gooddingii [***Glandularia gooddingii***]—GOODDING VERBENA—Verbenaceae (Native)
VERBENA, WESTERN-PINK—*Glandularia bipinnatifida*—Verbenaceae (Native)
Veronica anagallis-aquatica—WATER SPEEDWELL—Scrophulariaceae (Native)
VETCH—*Vicia exigua*—Leguminosae (Papilionoideae subfamily) (Native)
Vicia exigua—VETCH—Leguminosae (Papilionoideae subfamily) (Native)
Viguiera parishii [*V. deltoidea*]—GOLDENEYE—Compositae [Asteraceae] (Native)
Viguiera deltoidea [***V. parishii***]—GOLDENEYE—Compositae [Asteraceae] (Native)
VIOLET, GREEN—*Hybanthus verticillatus*—Violaceae (Native)
Vulpia myuros var. *hirsuta*—FOXTAIL FESCUE—Gramineae [Poaceae] (Native)
Vulpia octoflora [*Festuca octoflora*]—SIX-WEEKS FESCUE—Gramineae [Poaceae] (Native)

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WALLFLOWER—*Erysimum capitatum*—Cruciferae [Brassicaceae] (Native)
WALNUT, ARIZONA—*Juglans major*—Juglandaceae (Native)
WHEAT—*Triticum aestivum*—Gramineae [Poaceae] (Native)
WHISPERING-BELLS—*Emmenanthe penduliflora*—Hydrophyllaceae (Native)
WHITE-THORN—*Acacia constricta*—Leguminosae (Mimosoideae subfamily) (Native)
WHITLOW-GRASS—*Draba cuneifolia*—Cruciferae [Brassicaceae] (Native)
WILLOW-WEED—*Epilobium foliosum* [*E. minutum*]—Onagraceae (Native)
WILD-BUCKWHEAT—*Eriogonum densum* [*E. vimineum* var. *densum*]—Polygonaceae (Native)
WILD-BUCKWHEAT—*Eriogonum fasciculatum*—Polygonaceae (Native)
WILD-CUCUMBER—*Marah gilensis*—Cucurbitaceae (Native)
WILD-HELIOTROPE—*Phacelia distans*—Hydrophyllaceae (Native)
WILD-RYE, BLUE—*Elymus glaucus*—Gramineae [Poaceae] (Native)
WINDFLOWER, DESERT—*Anemone tuberosa*—Ranunculaceae (Native)
WOLFBERRY—*Lycium fremontii*—Solanaceae (Native)
WORMWOOD—*Artemisia dracunculus*—Compositae [Asteraceae] (Native)
WORMWOOD—*Artemisia ludoviciana*—Compositae [Asteraceae] (Native)

--X--

Xanthium saccharatum [***X. strumarium***]—COMMON COCKLEBUR—Compositae [Asteraceae] (Native)
Xanthium strumarium [*X. saccharatum*]—COMMON COCKLEBUR—Compositae [Asteraceae] (Native)

--Y--

YUCCA, BANANA—*Yucca baccata*—Agavaceae (Native)
Yucca baccata—BANANA YUCCA—Agavaceae (Native)

--Z--

Ziziphus obtusifolia—GRAYTHORN—Rhamnaceae (Native)

The cover photograph was taken October 4, 1935, in Saguaro National Monument by the first National Park Service photographer, George Alexander Grant (1891-1964).



As the nation's principal conservation agency, the U.S. Department of the Interior has responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting fish, wildlife and plants, preserving the environmental and cultural values of national parks and historic places, and providing for enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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