

Floristic Surveys of Saguaro National Park Protected Natural Areas

William L. Halvorson and Brooke S. Gebow, editors

Technical Report No. 68

United States Geological Survey
Sonoran Desert Field Station
The University of Arizona ♦ Tucson, Arizona



USGS Sonoran Desert Field Station The University of Arizona, Tucson

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October 2000

United States Geological Survey
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and
School of Renewable Natural Resources
125 Biological Sciences East
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Saguaro National Park Staff

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Introduction

This report contains four floristic surveys from Saguaro National Park near Tucson, Arizona. The surveys were conducted between 1992 and 1995 after the park gave the four sites Protected Natural Area (PNA) status. PNA status signifies that areas contain important geological or ecological values. With the designations in place, the park tries to “zone” for uses that minimize human interference in these fragile or unique areas. Ecologically important PNAs such as those addressed in this report serve as:

1. Baseline areas against which the effects of human activities in similar areas can be measured
2. Sites for the study of natural processes in undisturbed ecosystems
3. Gene pool reserves for plant and animals species, particularly rare and endangered taxa

Three of the sites lie within the Rincon Mountain District of the park: Box Canyon, Madrona/Chimineia Canyon, and Wildhorse Canyon. The fourth is within the jurisdiction of the Tucson Mountain District and is called the “Bajada” site in this report. The Bajada survey concludes that the area is floristically diverse and interesting, but no more so than other low bajada areas within the west unit. Given the lack of trails in the area, the PNA status is probably not necessary.

Each plant list is based on selected transects within the PNA. Surveyors walked the transects and recorded all species encountered. They collected two sets of voucher specimens. The first set contains samples of all species for the site, and in each case these specimens were deposited in the herbarium at the University of Arizona. The second set consists of plants previously unrecorded in Saguaro National Park. Those specimens now reside in the park herbarium. Plant names in this report follow Kartesz (1994).

As a group, the studies provide valuable detail about the resources within Saguaro National Park. The plant lists also form a snapshot of the park flora in the 1990s. Surveyors noted exotic and rare species and also found plants unreported from both the Rincon and Tucson Mountain Districts of the park. This publication brings the information in the four studies together into a single volume for use by other workers.

Bajada Site (Tucson Mountain District)

By Rebecca Van Devender

Sections 21 and 28 of T13S, R11E in the Tucson Mountain Unit of Saguaro National Park (Figure 1) were designated as a Protected Natural Area in the General Management Plan (NPS 1988) and, as such, were given extra protection from disturbance and over-visitation within the park. This site was given the name “Bajada.” The area is 520 ha (2 mi²) of gently sloping bajada west of Sandario Road that is for the most part a rich paloverde-saguaro-ironwood desertscrub with a strong admixture of creosotebush (*Larrea tridentata*), triangleleaf bursage (*Ambrosia deltoidea*), ocotillo (*Fouquieria splendens*) and various cacti. Sections 21 and 28 are adjacent and bordered on all four sides by roads or human habitations (Figure 1). A total of 197 species in 44 families was found in the area (see Table 1 at the end of the chapter).

Methods

Surveys were conducted in both spring and summer of 1992 to compile a baseline inventory of the flora. The site was visited on April 7 and again on August 24 and 25 to obtain a thorough sampling of herbaceous vegetation, both annual and perennial, which might be apparent only in spring or summer.

In the spring, nine east-west transects were walked in an effort to cover uniformly as much of the available habitats as possible. In addition to the fairly flat bajada, which comprises the majority of the area, all four major east-west washes and areas along the perimeter on all four sides were sampled. The summer survey of eight east-west line transects emphasized the major washes where most of the summer herbs were concentrated. Little diversity was found on the open flats or on the perimeter.

Study Area Description

Sections 21 and 28 have fairly uniform topography with less than 46 m (150 ft) change in elevation. Elevation gradually decreases from 720 m (2360 ft) in the extreme southeast corner of S28 to 670 m (2200 ft) in the extreme northwest corner of S21. There is a gradual drop in elevation as well from east to west in both sections. Soil texture also changes from east to west and from south to north on the gently sloping bajada toward Avra Valley. Bedrock of the Tucson Mountains lies just east of Sandario Road in the NW¹/₄ of S27. Coarse and gravelly soils on the upper bajada grade into fine-grained silts and clays in the valley bottom. Changes in soils and, probably to a lesser extent, the decrease in elevation, result in subtle changes in the plant communities.

The SE¹/₄ of S28 is the richest and most diverse area overall within the PNA. It contains the best-developed paloverde-saguaro-ironwood desertscrub with an understory of triangleleaf bursage. Ocotillo (*Fouquieria splendens*), pencil cholla (*Opuntia*

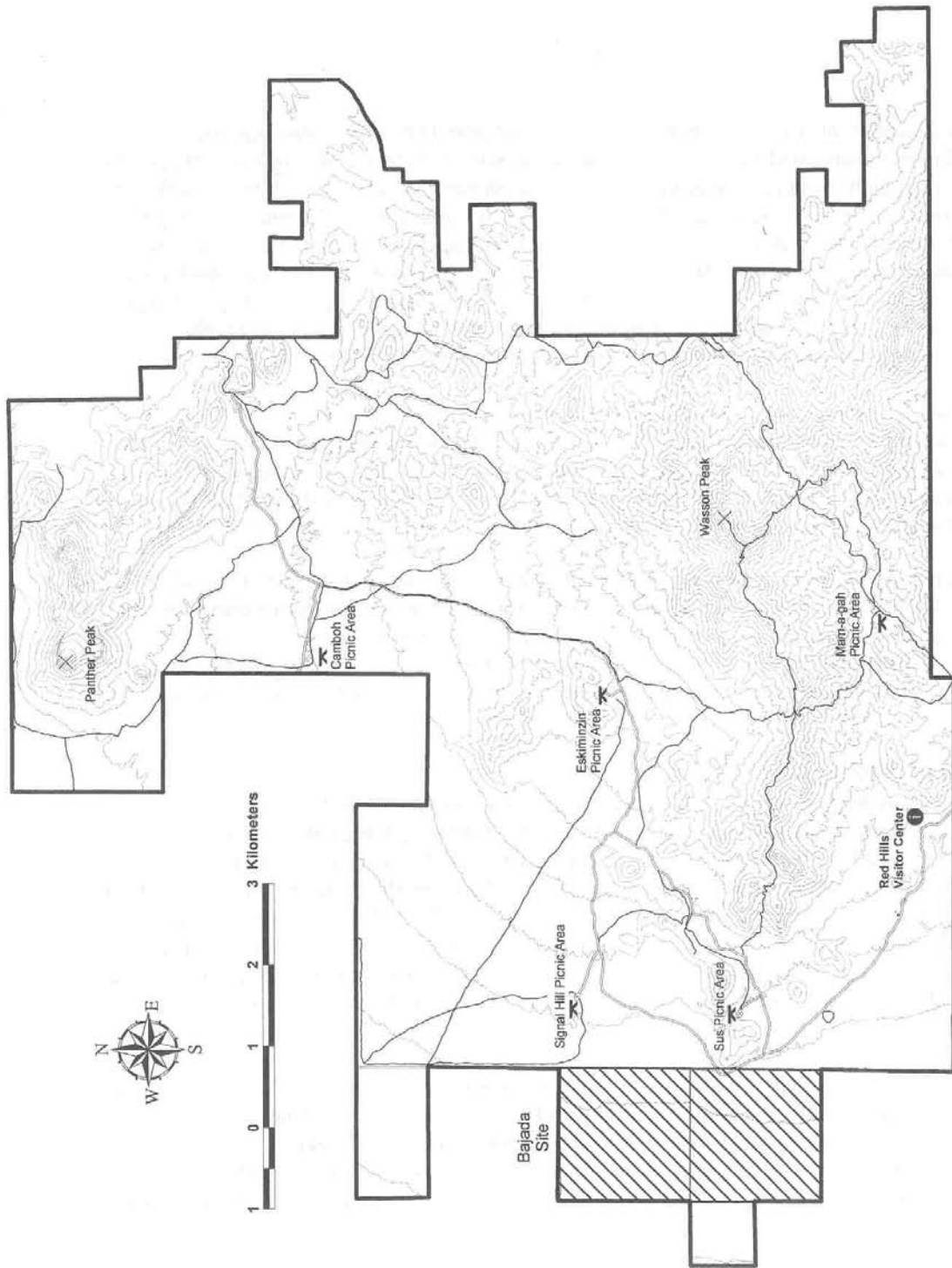


Figure 1. Bajada site plant survey location within the Tucson Mountain District of Saguaro National Park.

Moving from east to west in both sections, plant diversity decreases. Along the western boundary creosotebush dominates; saguaro (*Carnegiea gigantea*), foothills paloverde (*Parkinsonia microphylla*), ironwood (*Olneya tesota*) and the other cacti occur occasionally. The vegetation is more open with trees and shrubs more widely spaced.

The northern portion of S21 has the least diversity of vegetation within the PNA. It contains primarily creosotebush intermixed with triangleleaf bursage. Fewer species of spring annuals were also found in this area, and several of these are characteristic of the Avra Valley, rather than the Tucson Mountains (e.g. *Lupinus concinnus*, *Astragalus didymocarpus*, *Lotus humistratus*, *Cryptantha micrantha*). White bursage (*Ambrosia dumosa*) was found only in this area. It is always restricted to fine-grained, often sandy soils in the vicinity of Tucson.

Four major east-west washes and a network of smaller tributaries crisscross the area. The larger drainages are lined with ironwood, foothills paloverde, and velvet mesquite (*Prosopis velutina*), sometimes with an understory of desert hackberry (*Celtis pallida*) and wolfberry (*Lycium*). In the spring dense stands of annual and perennial herbs were observed along the banks in the shade of trees and shrubs. In summer, although the herbs were concentrated along riparian corridors, there was less density and diversity. In many places perennial grasses, especially bush muhly (*Muhlenbergia porteri*), were common along the banks. These corridors exemplify the potential abundance of bush muhly in the absence of cattle grazing.

A different vegetation type occurs in the disturbed areas immediately adjacent to Ft. Lowell Road on the south, Sandario Road on the east, Manville Road on the north, and, to a lesser extent, the west boundary fence adjoining private property. A significantly greater number of exotic and weedy native species, mostly herbs, were found in these areas. Filaree (*Erodium cicutarium*), wild oats (*Avena fatua*), fescue grass (*Bromus catharticus*), wild barley (*Hordeum murinum*), littleseed canary grass (*Phalaris minor*), little mallow (*Malva parviflora*), and puncture vine (*Tribulus terrestris*) were virtually restricted to roadsides.

Introduced Species

Fifteen introduced species were found in the PNA—twelve in spring and three in the summer. Only one, Mediterranean grass (*Schismus barbatus*), was abundant and widespread. This opportunistic annual was the most common species found in the spring throughout the study area due to an exceptional winter rainy season. All of the other introduced species were rare to locally common and most were restricted to roadsides or washes, microsites with extra available moisture. Most are spring annuals which will be more prevalent in wetter years like 1992. The only perennial and invasive species identified were buffel grass (*Pennisetum ciliare*) and Bermuda grass (*Cynodon dactylon*). Half a dozen clumps of buffel grass were observed, one near the west boundary fence, the others in or near the washes. A few localized patches of Bermuda grass were found on the roadcut above Sandario Road.

Addition to the Tucson Mountain Flora

Yellow saucers (*Malacothrix fendleri*) was added to the Tucson Mountain flora (Rondeau 1991) as a result of the spring survey. A single plant of this native annual was observed along Sandario Road.

Sensitive Species

During plant surveys, care was taken to search for three species considered rare at the time: Thornber pincushion cactus (*Mammillaria thornberi*), Tumamoc globeberry (*Tumamoca macdougallii*), and night-blooming cereus (*Peniocereus greggii*). Since the time of the study, all three plants have lost their “sensitive” status.

Fifteen discrete populations of Thornber pincushion cactus (*Mammillaria thornberi*) were noticed and recorded in the spring of 1992. Eight populations encountered in summer may not all be different, since those found in spring were not marked. Therefore, the total number of populations observed is uncertain. The majority of plants was located along the boundary fences or roads in relatively disturbed habitat. Plants were found under both trees (ironwood and paloverde) and shrubs (creosotebush and triangleleaf bursage). Clumps consisted of from about five to fifty-five individuals. Most plants appeared healthy. One population, near Sandario Road, had many plants with brown tops and some were obviously dead. It is interesting that Thornbur pincushion cactus seems to favor disturbed sites within the PNA.

Tumamoc globeberry (*Tumamoca macdougallii*) and night-blooming cereus (*Peniocereus greggii*) were also sought during the summer survey. The globeberry was formerly federally listed as endangered, but intensive surveys funded after the listing turned up abundant plants. Thus the globeberry was delisted. The night-blooming cereus also appears to be more common than originally thought. Neither species was observed, but they are notoriously difficult to see in the field. Both species occur in nearby, similar habitats in the Tucson Mountains and may turn up with more intensive field work.

Management Recommendations

The two sections of Saguaro National Park west of Sandario Road in the Tucson Mountains support typical Arizona Upland Sonoran desertscrub. Few signs of human use were observed within the area, and the habitat is relatively undisturbed. No one was encountered away from the roads during the surveys. Several small piles of rusty trash were seen but appeared to be old dump sites. Dogs can and do crawl under the west boundary fence where private property abuts the park. While the perimeter of such a small area surrounded by roads and houses is bound to be disturbed, there is little evidence that the weedy and exotic species characteristic of these habitats are seriously invading the PNA.

On the other hand, Mediterranean grass, a spring annual which can readily inhabit the more arid flats, is abundant and widespread throughout the area on a seasonal basis. Control is unlikely; it will have to be tolerated. The species does not seem to be adversely affecting the growth of native spring annuals which were quite common the year of the survey. It is not likely, either, to replace six-weeks fescue (*Vulpia octoflora*), the most similar native grass, which prefers rockier substrates.

One exotic species which does potentially pose a threat to the area is buffel grass. It is quite invasive and needs to be controlled before it gets a real foothold. Extensive areas in Sonora, Mexico have been intentionally converted from Sonoran Desert to tropical savanna by cultivation of fire-resistant buffel grass for livestock forage. Subsequent fires have decimated large areas of adjacent desert scrub. Buffel grass invasions are well underway in paloverde-saguaro desert scrub on Tumamoc Hill in the Tucson Mountains (T.L. Burgess personal communication, 1992). At this time it is uncommon in the PNA and could be eradicated by pulling out all plants and monitoring for new ones each year.

Although the PNA west of Sandario Road is an interesting and diverse area floristically, it is not very different from other low bajada areas within the Tucson Mountain Unit of Saguaro National Park. Thornbur pincushion cactus is thriving; Tumamoc globeberry and night-blooming cereus may be present. However, all of these sensitive species have been found to be more common and widespread than first believed. In addition, the area is rarely visited since no trails access the 520 ha (2 mi²) and there are no obvious signs of human impact. The area does not appear to need additional protection beyond that already provided by being included within the park.

Table 1. Bajada Site Checklist of Vascular Plants. Bajada is a Protected Natural Area within the Tucson Mountain District of Saguaro National Park. This list was compiled in 1992 by Rebecca Van Devender. Plant names follow Kartesz (1994).

+ = New addition to the Rondeau (1991) flora of the Tucson Mountains

* = Introduced species

{ } = Observations made during 1992 surveys

Acanthaceae

Carlowrightia arizonica Gray

Amaranthaceae

Amaranthus fimbriatus (Torrey) Bentham *ex* Watson {abundant, summer}

Amaranthus palmeri Watson

Tidestromia lanuginosa (Nuttall) Standley

Apiaceae

Bowlesia incana Ruiz & Pavón

Daucus pusillus Michaux

Spermolepis echinata (Nuttall *ex* DC.) Heller

Aristolochiaceae

Aristolochia watsonii Wootton & Standley {rare, wash, S21}

Asclepiadaceae

Sarcostemma cynanchoides Decaisne ssp. *hartwegii* (Vail) R. Holm

Asteraceae

Acourtia nana (Gray) Reveal & King {rare, W fence}

Acourtia wrightii (Gray) Reveal & King {rare, wash}

Adenophyllum porphyllodes (Strother) Gray

Ambrosia ambrosioides (Cavanilles) Payne

Ambrosia confertiflora DC.

Ambrosia deltoidea (Torrey) Payne {abundant}

Ambrosia dumosa (Gray) Payne {N¹/₂, S21}

Antheropeas lanosum Gray & Rydberg {abundant, spring, especially S28}

Baccharis sarothroides Gray {wash & road}

Baileya multiradiata Harvey & Gray *ex* Gray {rare, wash & road}

Brickellia coulteri Gray {washes}

Calycoseris wrightii Gray

Chaenactis stevioides Hooker & Arnott

Encelia farinosa Gray *ex* Torrey

Erigeron divergens Torrey & Gray

Filago arizonica Gray

Filago californica Nuttall {abundant, spring, especially S28}
Filago depressa Gray
Heterotheca subaxillaris (Lam.) Britton and Rusby
Hymenoclea salsola Torrey & Gray var. *pentalepis* (Rydberg) Benson
Hymenothrix wislizeni Gray {roads, summer}
Machaeranthera pinnatifida (Hooker) Shinnars ssp. *pinnatifida* var. *pinnatifida*
 +*Malacothrix fendleri* Gray {rare, spring, roadside}
Microseris lindleyi (DC.) Gray
Monoptilon bellioides (Gray) H. M. Hall {rare, spring W½, S21}
Parthenium incanum (Kunth) {wash}
Pectis papposa Harv. & Gray
Porophyllum gracile Benth
Psilostrophe cooperi (Gray) Greene {rare, wash,
Rafinesquia neomexicana Gray
Senecio flaccidus var. *monoensis* (Greene) B.L. Turner & T.M. Barkl.
 **Sonchus oleraceus* L. {uncommon}
Stephanomeria pauciflora (Torrey) A. Nelson
Stylocline micropoides Gray {abundant, spring}
Trixis californica Kellogg
Zinnia acerosa (DC.) Gray {rare, S28}

Boraginaceae

Amsinckia intermedia Fischer & Meyer {abundant, spring}
Amsinckia tessellata Gray
Cryptantha angustifolia (Torrey) Greene
Cryptantha barbiger (Gray) Greene {abundant, spring}
Cryptantha decipiens (Jones) Heller
Cryptantha micrantha (Torrey) Johnston {rare, spring, N½, S21}
Cryptantha pterocarya (Torrey) Greene
Pectocarya heterocarpa (Johnston)
Pectocarya platycarpa (Munz and Johnston) Johnston {abundant, spring}
Pectocarya recurvata Johnston {abundant, spring}

Brassicaceae

**Brassica tournefortii* Gouan {local, spring, mostly N½, S21}
Caulanthus lasiophyllus (H. & A.) Payson {abundant, spring}
Descurainia pinnata (Walt.) Britt.
Draba cuneifolia Nuttall ex Torrey & Gray {rare, spring, wash}
Lepidium lasiocarpum Nuttall
Lepidium virginicum var. *medium* (Greene) C.L. Hitchcock
Lesquerella gordonii (Gray) Watson {rare, spring}
 **Sisymbrium irio* L. {occasional, spring, especially in washes}
 **Sisymbrium orientale* L. {uncommon, spring, wash in S28}
Streptanthus carinatus Wright ex Gray
Thysanocarpus curvipes Hooker

Cactaceae

- Carnegiea gigantea* (Engelmann) Britton & Rose {especially E½, S28 & SE¼ S 21}
Echinocereus fendleri (Engelmann) F. Seitz var. *fasciculatus* (Engelmann ex B.D. Jackson) N.P. Taylor
Ferocactus wislizenii (Engelmann) Britton & Rose
Mammillaria grahamii Engelmann var. *grahamii* [incl. *M. microcarpa* Engelmann] {locally common SE¼, S28}
Mammillaria thornberi Orcutt {scattered under trees & bushes, especially along park boundary}
Opuntia acanthocarpa Engelmann & Bigelow var. *major* (Engelmann & Bigelow) L. Benson
Opuntia arbuscula Engelmann {especially SE ¼, S28}
Opuntia fulgida Engelmann var. *fulgida* {abundant, especially W½, S21 & S28 but not far NW corner S21}
Opuntia fulgida Engelmann var. *mamillata* (Schott ex Engelmann) Coulter
Opuntia x *kelvinensis* Grant & Grant [= *O. fulgida* Engelmann x *O. spinosior* (Engelmann) Toumey]
Opuntia leptocaulis DC. {especially SE¼, S28}
Opuntia phaeacantha Engelmann
Opuntia spinosior (Engelmann) Toumey {mostly S21}

Campanulaceae

- Nemacladus glanduliferus* Jepson {rare, spring, S28}

Caryophyllaceae

- Loeflingia squarrosa* Nuttall {rare, spring, S28}
Silene antirrhina L. {washes & road, spring}

Chenopodiaceae

- Chenopodium neomexicanum* Standley {rare, summer}

Convolvulaceae

- Evolvulus alsinoides* (L.) L. {rare, summer}

Crassulaceae

- Crassula connata* var. *connato* (Ruiz & Pavón) Berger {rare, spring, S28}

Cucurbitaceae

- Cucurbita digitata* Gray {local, summer, along west fence S28}

Euphorbiaceae

- Chamaesyce abramsiana* (L.C. Wheeler) Koutnik {abundant, summer, flats}
Chamaesyce florida (Engelmann) Millspaugh
Chamaesyce gracillima (Watson) Millspaugh
Chamaesyce hyssopifolia (L.) Small
Chamaesyce micromera (Boiss.) Wootton & Standley

Chamaesyce polycarpa (Benth) Millspaugh ex Parish
Chamaesyce setiloba (Engelmann ex Torrey) Millspaugh ex Parish
Jatropha cardiophylla (Torrey) Mueller-Argoviensis

Fabaceae

Acacia constricta Benth
Acacia greggii Gray
Astragalus didymocarpus Hooker & Arnott {N½, S21}
Astragalus lentiginosus Douglas ex Hooker var. *australis* Barneby
Calliandra eriophylla Benth
Lotus humistratus Greene {N½, S21}
Lotus strigosus (Nuttall) Greene var. *tomentellus* (Greene) Isely
Lupinus concinnus Agardh. {especially N½, S21}
Lupinus sparsiflorus Benth
Marina parryi (Torrey & Gray) Barneby
Nissolia schottii (Torrey) Gray {rare, wash}
Olneya tesota Gray
Parkinsonia microphylla Torrey {especially E½, S28 & SE¼, S21}}
Prosopis velutina Wooton
Senna covesii (Gray) Irwin & Barneby

Fouquieriaceae

Fouquieria splendens Engelmann {drops out on W side & N side}

Geraniaceae

**Erodium cicutarium* (L.) L'Her. ex Ait. {mostly in disturbed areas, spring, along roads & boundary fences}
Erodium texanum Gray

Hydrophyllaceae

Eucrypta micrantha (Torrey) Heller
Nama hispidum Gray {rare, spring, along N fence, S21}
Phacelia distans Benth {abundant, spring, washes & under trees}

Krameriaceae

Krameria grayi Rose & Painter

Lamiaceae

Hyptis emoryi Torrey
Salvia columbariae Benth

Loasaceae

Mentzelia affinis Greene

Malpighiaceae

Janusia gracilis A. Gray

Malvaceae

Abutilon incanum (Link) Sweet

Abutilon malacum Watson

Herissantia crispa (L.) Brizicky

**Malva parviflora* L. {local, spring, along road}

Sida abutifolia Miller

Sphaeralcea coulteri (Watson) Gray

Sphaeralcea laxa Wooton & Standley

Molluginaceae

Mollugo cerviana (L.) Seringe {rare, summer}

Nyctaginaceae

Allionia incarnata L.

Boerhavia coccinea Miller {rare, summer, near road}

Boerhavia coulteri (Hooker f.) Watson

Boeraavia intermedia Jones {abundant, summer}

Boerhavia scandens (L.)

Mirabilis bigelovii Gray {rare, wash, S21}

Oleaceae

Menodora scabra Gray

Onagraceae

Camissonia chamaenerioides (Gray) Raven

Oxalidaceae

Oxalis albicans Kunth ssp. *pilosa* (Nuttall) Eiten

Oxalis alpina (Rose) Rose ex Knuth

Papaveraceae

Eschscholtzia californica ssp. *mexicana* (Greene) C. Clark

Pedaliaceae

Proboscidea altheaefolia (Bentham) Decne.

Proboscidea parviflora (Wooton) Wooton & Standley {Rare, summer, N fence, S21}

Plantaginaceae

Plantago ovata Forsk

Plantago patagonica Jacq.

Poaceae

- Aristida adscencionis* L.
Aristida purpurea Nuttall
Aristida ternipes Cavanilles
**Avena fatua* L. {locally common along road, spring}
Bouteloua aristidoides (Kunth) Grisebach {abundant, summer, flats}
Bouteloua barbata Lagasca
Bouteloua curtipendula (Michaux) Torrey {rare, summer, wash}
Bouteloua repens (Kunth) Scribner & Merrill
Bouteloua rothrockii Vasey {rare, summer, wash}
Brachiaria arizonica (Scribner & Merrill) S.T. Blake
Bromus carinatus Hooker & Arnott
**Bromus catharticus* Vahl. {rare along road, spring}
**Bromus madritensis* L. {occasional to uncommon, spring}
**Cynodon dactylon* (L.) Persoon {rare, roadside}
Digitaria californica (Bentham) Henrard
**Eragrostis cilianensis* (All.) Janchen ex Lut. {rare, summer, wash}
Erioneuron pulchellum (Kunth) Tateoka
Heteropogon contortus (L.) Beauvois ex Roemer & Schultes {rare, summer, wash}
Hordeum murinum L. ssp. *glaucum* (Steud.) Tzvelev {locally along road, spring}
Leptochloa mucronata (Michaux) Kunth
Muhlenbergia microsperma (DC.) Trin.
Muhlenbergia porteri Scribner {abundant, washes}
Muhlenbergia rigens (Bentham) Hitchcock
Panicum hirticaule Presl. {rare, summer, wash}
**Pennisetum ciliare* (L.) Link {occasional, west fence & washes}
**Phalaris minor* Retz. {rare, spring, along road}
Poa bigelovii Vasey & Scribner
**Schismus barbatus* (Loefl. ex L.) Thell. {abundant, spring, far N end, S21 where dominant with creosotebush}
Setaria leucopila (Scribner & Merr.) K. Schum.
Sporobolus cryptandrus (Torrey) Gray {rare, summer, wash}
Vulpia octoflora (Walt.) Rydberg {abundant, spring, especially S28}

Polygonaceae

- Chorizanthe brevicornu* Torrey {mostly N½, S21}
Eriogonum abertianum Torrey {rare, summer, wash}
Eriogonum deflexum Torrey

Ranunculaceae

- Delphinium scaposum* Greene

Rhamnaceae

- Ziziphus obtusifolia* (Hooker ex Torrey & Gray) Gray var. *canescens* (Gray) M. C. Johnston
{rare, S28}

Scrophulariaceae

Nuttallanthus texanus (Scheele) D.A. Sutton

Castilleja exerta ssp. *exerta*

Penstemon parryi (Gray) Gray {washes}

Solanaceae

Datura discolor Bernh.

Datura wrightii Regel

Lycium berlandieri Dunal

Lycium sp. {washes (vegetative only)}

Nicotiana trigonophylla Dunal

Physalis crassifolia Benth

Sterculiaceae

Ayenia filiformis Watson

Ulmaceae

Celtis pallida Torrey

Urticaceae

Parietaria hespera Hinton

Viscaceae

Phoradendron californicum Nuttall

Zygophyllaceae

Kallstroemia californica (Wats.) Vail

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

**Tribulus terrestris* L. {occasional, summer, roadside}

Box Canyon (Rincon Mountain District)

By Mark Fishbein, Victor Steinman, and Amy Johnson

The initial survey of Box Canyon, within the Rincon Mountain District of Saguaro National Park, was conducted September 3–5, 1993. We made follow-up observations of spring annuals April 13–14, 1994. Data were collected by walking transects. The goals of the study were to comment on the status of introduced species in the area, note species new to the Bowers and McLaughlin (1987) flora of the Rincon Mountains, and develop the checklist.

The study area (Figure 2) is approximately 8 km long from the mouth of the wash (T15S, R16E, NE ¼ of Section 8) to the extreme box-canyon wall one-half mile below Juniper basin (T14S, R17E, SW ¼ of Section 30). The canyon descends approximately 925 m from Juniper Basin at 1825 m to the mouth of the wash at 900 m elevation.

Box Canyon was designated as a Protected Natural Area in the park's General Management Plan (NPS 1987) because it contains perennial pools and rich riparian habitat. Access to this steep canyon is limited, and the boundary fence crossing the lower wash has successfully discouraged entrance by horses and cattle. No trails reach Box Canyon, but motivated hikers can get to it via the Tanque Verde Ridge trail that parallels the entire canyon just above its northern edge (Figure 2).

Vegetation

Due to its elevational gain and year-round water, the canyon supports a variety of vegetation communities: Saguaro-Foothills Palo Verde Desertscrub, Desert Riparian, Desert-grassland, and Oak Woodland. The Wildhorse Canyon chapter in this report contains detailed descriptions (see page 35) of these associations. The Box Canyon survey identified 387 species from 79 families. Survey results are listed in Table 2 at the end of this chapter. We deposited one set of voucher specimens in the University of Arizona herbarium and a second set of the plants new to the Saguaro National Park checklist in the park herbarium.

Introduced Species

Twenty-four introduced species were found within the Box Canyon PNA, among them, 15 grasses. The annual red brome (*Bromus madritensis*) and the perennial Bermuda grass (*Cynodon dactylon*) were particularly widespread throughout the canyon. Wild oats (*Avena fatua*) was common within the lower wash, and other grasses such as barley (*Critesion murinum*) and Lehmann lovegrass (*Eragrostis lehmanniana*) occurred throughout the streambed. The big, bunchy perennials buffel grass (*Pennisetum ciliare*) and fountain grass (*P. setaceum*) are also present.

Annuals such as camphorweed (*Centaurea melitensis*) and sow thistles (*Sonchus asper* and *S. oleraceus*) had patchy distributions but were present throughout the canyon. These composites are very opportunistic and can grow in a variety of areas.

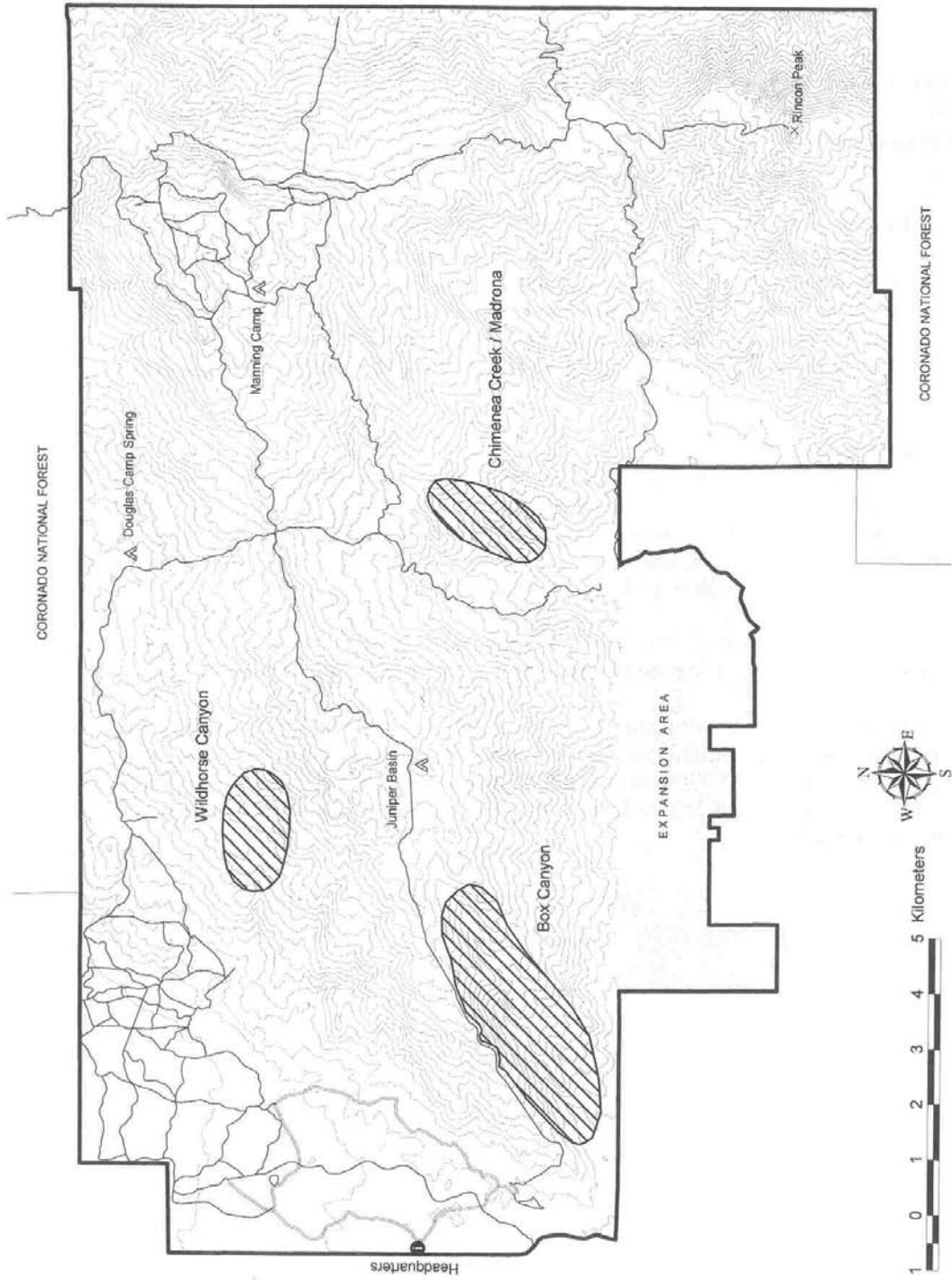


Figure 2. Plant survey locations within the Rincon Mountain District of Saguaro National Park.

Other exotic species encountered were uncommon to rare; at this time they are not considered to be threatening or damaging to the ecosystems they inhabit.

Additions to the Flora

Nine species new to the Bowers and McLaughlin (1987) Rincon Mountains flora have been marked with a plus sign (+) on the plant list. Seven of these species are natives: *Ruellia nudiflora*, *Mirabilis oxybaphoides*, *Pectocarya setosa*, *Bulbostylis cf. funckii*, *Cyperus cf. parishii*, *Bouteloua eludens*, and *Panicum lepidulum*. The two sedges (family Cyperaceae), *Bulbosylis funckii* and *Cyperus parishii*, were found in moist seepages within the desert riparian zone. The often invasive buffel grass (*Pennisetum ciliare*) was one of two introduced species new to the flora. The other was the prickly pear known as Indian fig (*Opuntia ficus-indica*), found in the lower canyon Desertscrub, where we saw one particularly large, well-established specimen.

Management Suggestions

The results of this study support the Protected Natural Area designation for Box Canyon. Over its elevational extent, the canyon is home to about 40% (387/995) of all the plant species known from the Rincon Mountains. Perennial water maintains a rich riparian flora and makes the canyon important terrestrial and aquatic wildlife habitat. Continuing the lack of formal access will help preserve this valuable Saguaro National Park drainage.

There is a thriving feather bush (*Lysiloma watsoni*) population in Box Canyon. Monitoring this population is a priority, given it is at the northern edge of the species' distribution.

Finally, we suggest that measures be taken to eradicate buffel grass (*Pennisetum ciliare*) and fountain grass (*P. setaceum*). Buffel grass has been noted for the first time in this survey, and fountain grass was new in 1987 (Bowers and McLaughlin 1987). Though steep canyon walls serve as natural barriers to plant dispersal, these invaders will likely migrate up the canyon with time, given no intervention.

Table 2. Box Canyon Checklist of Vascular Plants. Box Canyon is a Protected Natural Area within the Rincon Mountain District of Saguaro National Park. This list was compiled in 1993 and 1994 by Mark Fishbein, Victor Steinman, and Amy Johnson. Plant names follow Kartesz (1994).

+ = New addition to the flora of the Rincon Mountains of Bowers and McLaughlin (1987)

* = Introduced species

Acanthaceae

Anisacanthus thurberi (Torrey) Gray
Carlowrightia arizonica Gray
 + *Ruellia nudiflora* (Engelmann & Gray)
 Urban
Siphonoglossa longiflora (Torrey) Gray

Adiantaceae

Adiantum capillis-veneris L.
Astrolepis cochisensis (Goodding)
 Bentham & Windham
Astrolepis sinuata (Lagasca) Bentham & Windham
Bommeria hispida (Metternich ex Kuhn)
 Underwood
Cheilanthes bonariensis (Willdenow) Proctor
Cheilanthes fendleri Hooker
Cheilanthes lindheimeri Hooker
Cheilanthes wootonii Maxon
Cheilanthes wrightii Hooker
Notholaena lemmonii D.C. Eaton
Notholaena standleyi Maxon
Pellaea truncata Goodding
Pellaea wrightiana Hooker
Pentagramma triangularis (Kaulfuss)
 Yatskievych, Windham & Wollenweber
 ssp. *maxonii* (Weatherby)
 Yatskievych, Windham & Wollenweber

Agavaceae

Agave cf. palmeri Engelmann
Agave schottii Engelmann var. *schottii*
Dasyilirion wheeleri S. Watson
Nolina microcarpa S. Watson
Yucca schottii Engelmann

Amaranthaceae

Amaranthus palmeri S. Watson
Gomphrena sonora Torrey

Amaryllidaceae

Zephyranthes longifolia Hemsley

Anacardiaceae

Rhus trilobata (Nuttall)
 var. *pilosissima* Engelmann

Apocynaceae

Haplophyton cimicidum DC.

Araliaceae

Aralia humilis Cavanilles

Aristolochiaceae

Aristolochia watsonii Wooton & Standley

Asclepiadaceae

Asclepias linaria Cavanilles
Asclepias nyctaginifolia Gray
Matelea arizonica (Gray) Shinnery
Matelea parviflora (Torrey) Woodson
Sarcostemma cynanchoides Decaisne
 ssp. *hartwegii* (Vail) R. Holm

Asteraceae

Acourtia thurberi (Gray) Reveal & King
Acourtia wrightii (Gray) Reveal & King
Ambrosia ambrosioides (Cavanilles) Payne
Ambrosia confertiflora DC.
Antheropeas lanosum (Gray) Rydberg
Artemisia ludoviciana Nuttall
 ssp. *albula* (Wooton) Keck
Baccharis brachyphylla Gray

Baccharis salicifolia (Ruiz & Pavón) Persoon
Baccharis sarothroides Gray
Baccharis thesioides Kunth
Bahia absinthifolia Benth
 var. *dealbata* (Gray) Gray
Baileya multiradiata Harvey & Gray ex Gray
Bebbia juncea (Benth) Greene
Brickellia betonicifolia Gray
Brickellia californica (Torrey & Gray) Gray
Brickellia coulteri Gray
Brickellia venosa (Wooton & Standley) B.L.
 Robinson
Carminatia tenuiflora DC.
Carphochaete bigelovii Gray
 + *Centaurea melitensis* L.
Cirsium neomexicanum Gray
Conyza canadensis (L.) Cronquist
Coreocarpus arizonicus (Gray) Blake
Cosmos parviflorus (Jacquin) Persoon
Encelia farinosa Gray
Ericameria laricifolia (Gray) Shinn
Erigeron divergens Torrey & Gray
Erigeron oreophilus Greenman
Eupatorium solidaginifolium Gray
Gnaphalium leucocephalum Gray
Gnaphalium canescens DC.
Guardiola platyphylla Gray
Gymnosperma glutinosum (Sprengel)
 Lessing
Heliomeris longifolia var. *annua* (Jones)
 Yates
Heterotheca subaxillaris (Lamarck) Britton
 & Rusby
Hymenoclea monogyra Torrey & Gray ex
 Gray
Hymenothrix wrightii Gray
Isocoma tenuisecta Greene
Lasthenia californica DC. ex Lindley
Machaeranthera canescens var. *incana*
 (Lindl.) Gray
Machaeranthera gracilis (Nuttall) Shinn
Machaeranthera pinnatifida (Hooker)
 Shinn ssp. *pinnatifida* var. *pinnatifida*
Machaeranthera tagetina Greene
Microseris lindleyi (DC.) Gray

Parthenise mollis Gray
Parthenium incanum Kunth.
Perityle lemmoni (Gray) Macbride
Porophyllum gracile Benth
Psilostrophe cooperi (Gray) Greene
Senecio lemmoni Gray
 **Sonchus asper* (L.) Hill
 **Sonchus oleraceus* L.
Stephanomeria pauciflora (Torrey) A.
 Nelson
Tagetes lemmonii Gray
Tagetes micrantha Cavanilles
Thymophylla pentachaeta var. *pentachaeta*
Trixis californica Kellogg
Viguiera dentata (Cavanilles) Sprengel
 var. *lancifolia* Blake
Zinnia acerosa (DC.) Gray

Boraginaceae

Amsinckia intermedia Fisch. & Mey.
Cryptantha angustifolia (Torrey) Greene
Cryptantha barbigera (Gray) Greene
Cryptantha micrantha (Torrey) I.M. Johnston
Cryptantha pterocarya (Torrey) Greene
 var. *cycloptera* (Greene) Macbride
Lappula occidentalis (Watson) Greene
Pectocarya platycarpa (Munz & I. M.
 Johnston)
 Munz & I. M. Johnston
Pectocarya recurvata I. M. Johnston
Pectocarya setosa Gray

Brassicaceae

Arabis perennans S. Watson
Caulanthus lasiosphyllus (Hooker & Arnott)
 Payson
 var. *lasiophyllus*
Lepidium virginicum L.
 var. *medium* (Greene) C. L. Hitchcock
 **Sisymbrium irio* L.
Thysanocarpus curvipes Hooker

Cactaceae

Carnegia gigantea (Engelmann) Britton &
 Rose

Echinocereus fendleri Engelman var.
fasciculatus
Echinocereus fendleri (Engelmann)
Engelmann
var. *fendleri*
Escobaria vivipara var. *bisbeeana* (Orcutt)
D.R. Hunt
Ferocactus wislizenii (Engelmann) Britton &
Rose
Mammillaria grahamii Engelman
var. *oliviae* (Orcutt) Benson
Mammillaria heyderi Muhl.
var. *macdougallii* (Rose) L. Benson
Opuntia arbuscula Engelman
Opuntia bigelovii Engelman
Opuntia chlorotica Engelman & Bigelow
Opuntia engelmannii Salm-Dyck
Opuntia engelmannii var. *engelmannii* Salm-
Dyck
*+*Opuntia ficus-indica* (L.) Mill.
Opuntia fulgida Engelman var. *fulgida*
Opuntia fulgida Engelman
var. *mammillata* (Schott) Coulter
Opuntia leptocaulis DC.
Opuntia phaeacantha Engelman
var. *major* (Engelman)
Opuntia spinosior (Engelman) Toumey
Opuntia versicolor Engelman ex Coulter

Campanulaceae

Triodanis perfoliata (L.) Nieuwland
var. *biflora* (Ruiz & Pavón) Bradley
Triodanis perfoliata (L.) Nieuwland var.
perfoliata

Caryophyllaceae

**Cerastium gracile* Dufour
Cerastium texanum Britton
Silene antirrhina L.

Chenopodiaceae

Atriplex canescens (Pursh) Nuttall

Commelinaceae

Commelina erecta L.
Tradescantia occidentalis (Britton) Smythe

Convolvulaceae

Evolvulus alsinoides (L.) L.
Evolvulus arizonicus Gray
Ipomoea barbatisepala Gray
Ipomoea costellata Torrey
Jacquemontia pringlei Gray

Crassulaceae

Sedum cockerellii Britton

Crossosomataceae

Crossosoma bigelovii S. Watson

Cucurbitaceae

Cucurbita digitata Gray
Echinopepon wrightii (Gray) S. Watson
Marah gilensis Greene

Cupressaceae

Juniperus deppeana Steudel

Cyperaceae

+*Bulbostylus cf. funckii* (Steudel) C. D.
Clarke
Carex chihuahuensis Mackenzie
**Cyperus esculentus* L.
+*Cyperus cf. parishii* Britton
Cyperus pringlei Britton
Cyperus squarrosus L.
Cyperus wrightii Britton

Dryopteridaceae

Woodsia cochisensis Windham

Ephedraceae

Ephedra trifurca Torrey ex Watson

Ericaceae

Arctostaphylos pungens Kunth

Euphorbiaceae

Acalypha neomexicana Mueller-Argoviensis
Argythamnia neomexicana Mueller-Argoviensis
Chamaesyce florida (Engelmann) Millspaugh
Chamaesyce hyssopifolia (L.) Standley
Chamaesyce melanadenia (Torrey) Millspaugh
Euphorbia heterophylla L.
Jatropha cardiophylla (Torrey) Mueller-Argoviensis
Tragia nepetifolia Cavanilles

Fabaceae

Acacia angustissima (Millspaugh) Kuntze

Acacia constricta Benth
Acacia greggii Gray
Amorpha fruticosa L.
Astragalus nothoxys Gray
Calliandra eriophylla Benth
Chamaecrista nictitans (L.) Moench
 var. *leptadenia* Gandhi & Hatch
Cologania angustifolia Kunth
Coursetia glandulosa Gray
Crotalaria pumila Ortega
Crotalaria sagittalis L.
Dalea albiflora Gray
Dalea filiformis Gray
Dalea pringlei Gray
Dalea pulchra Gentry
Desmodium batocaulon Gray
Desmodium rosei Schubert
Galactia wrightii Gray
Lathyrus graminifolius (S. Watson) White
Lotus humistratus Greene
Lotus plebeius (Brand) Bradley
Lotus rigidus (Benth) Greene
Lupinus concinnus Agardh.
 ssp. *orcuttii* (S. Watson) Dunn
Lysiloma watsoni Rose
Macroptilium gibbosifolium (Ortega) A. Delgado
Mimosa aculeaticarpa Ortega
 var. *biuncifera* (Benth) Barneby

Nissolia schottii (Torrey) Gray
Parkinsonia microphylla Torrey
Phaseolus acutifolius Gray
Prosopis velutina Wooton
Tephrosia tenella Gray
Vicia americana Muhl. ex Willdenow ssp. *americana*
Vicia ludoviciana Nuttall

Fagaceae

Quercus arizonica Sargent
Quercus emoryi Torrey
Quercus oblongifolia Torrey
Quercus turbinella Greene

Fouquieriaceae

Fouquieria splendens Engelmann

Garryaceae

Garrya wrightii Torrey

Gentianaceae

Centaurium nudicaule (Engelmann) B. L. Robinson

Hydrophyllaceae

Eucrypta chrysanthemifolia (Benth) Greene
 var. *bipinnatifida* (Torrey) Constance
Nama hispidum Gray
Phacelia distans Benth

Iridaceae

Sisyrinchium cernuum (Bicknell) Kearney

Juglandaceae

Juglans major (Torrey) Heller

Juncaceae

Juncus ensifolius Wiks.
Juncus tenuis Willdenow
Juncus sp.

Lamiaceae

Hedeoma nana (Torrey) Briquet ssp. *nana*
Hyptis emoryi Torrey
Salvia columbariae Benth
Stachys coccinea Jacquin

Liliaceae

Dichelostemma capitatum (Benth) Wood

Loasaceae

Mentzelia albicaulis (Douglas ex Hooker)
Torrey & Gray

Lythraceae

Cuphea wrightii Gray

Malpighiaceae

Janusia gracilis Gray

Malvaceae

Abutilon abutiloides (Jacquin) Garcke
ex Britton & Wilson
Abutilon incanum (Link.) Sweet
Abutilon mollicomum (Willdenow) Sweet
Abutilon reventum S. Watson
Anoda abutiloides Gray
Anoda cristata (L.) Schlechtendal
Gossypium thurberi Todaro
Herissantia crispa (L.) Brizicky
Hibiscus coulteri Harvey ex Gray
Rhynchosida physocalyx (Gray) Fryxell
Sphaeralcea fendleri Gray
Sphaeralcea laxa Wooton & Standley

Molluginaceae

Mollugo verticillata L.

Moraceae

Morus microphylla Buckley

Nyctaginaceae

Allionia incarnata L.
Boerhavia diffusa L.
Boerhavia scandens L.

Mirabilis oblongifolia (Gray) Heimerl.
+*Mirabilis oxybaphoides* (Gray) Gray

Oleaceae

Fraxinus velutina Torrey
Menodora scabra Gray

Onagraceae

Epilobium canum (Greene) Raven
ssp. *latifolium* (Hooker) Raven
Oenothera caespitosa Nuttall

Oxalidaceae

Oxalis albicans Kunth ssp. *pilosa* (Nuttall)
Eiten

Papaveraceae

Corydalis aurea Willdenow

Passifloraceae

Passiflora mexicana Jussieu

Phytolaccaceae

Rivina humilis L.

Pinaceae

Pinus discolor Bailey & Hawksworth

Plantaginaceae

Plantago patagonica Jacquin
Plantago virginica L.

Platanaceae

Platanus wrightii S. Watson

Plumbaginaceae

Plumbago scandens L.

Poaceae

Aristida adscencionis L.
Aristida ternipes var. *hamulosa* (Henr.) Trent
Aristida pupurea Nuttall
var. *longeseta* (Steudel) Vasey
Aristida ternipes Cavanilles
**Avena fatua* L.

Bothriochloa barbinodis (Lagasca) Herter
Bouteloua aristidoides (Kunth) Grisebach
Bouteloua barbata Lagasca
Bouteloua chondrosioides (Kunth)
 Bentham ex Watson
Bouteloua curtispindula (Michaux) Torrey
 +*Bouteloua eludens* Griffiths
Bouteloua hirsuta Lagasca
Bouteloua repens (Kunth) Scribner & Merrill
Bouteloua rothrockii Vasey
Bromus carinatus Hooker & Arnott
 **Bromus madritensis* L.
Chloris virgata Swartz.
 **Cynodon dactylon* (L.) Persoon
Digitaria californica Henrard
Elymus elymoides (Rafinesque) Swezey
Enneapogon desvauxii P. Beauvois
 **Eragrostis cilianensis* (Allard)
 Vignolo-Lutati ex Janchen
Eragrostis intermedia Hitchcock
 **Eragrostis lehmanniana* Nees
Eragrostis pectinacea (Michaux) Nees ex
 Steudel
 var. *pectinacea*
Eragrostis pectinacea (Michaux) Nees
 var. *miserrima* (Fournier) J. Reeder
Eriochloa aristida Vasey
Eriochloa lemmonii Vasey & Scribner
Erioneuron pulchellum (Kunth) Tateoka
Heteropogon contortus (L.) Beauvois
 ex Roemer & Schultes
 **Hordeum murinum* ssp. *leporium* (Link)
 Arcang.
Hordeum pusillum Nuttall ssp. *pusillum*
Leptochloa dubia (Kunth) Nees
Leptochloa fascicularis (Lamarck) Gray
Leptochloa filiformis (Lamarck) P. Beauvois
Lycurus setosus (Nuttall) C. Reeder
Muhlenbergia arizonica Scribner
Muhlenbergia dumosa Scribner
Muhlenbergia emersleyi Vasey
Muhlenbergia minutissima (Steudel) Swallen
Muhlenbergia pauciflora Buckley
Muhlenbergia porteri Scribner
Muhlenbergia rigens (Bentham) Hitchcock

Muhlenbergia sinuosa Swallen
Muhlenbergia tenuifolia (Kunth) Trin.
Panicum bulbosum Kunth
Panicum capillare L.
 +*Panicum lepidum* Hitchcock & Chase
 +**Pennisetum ciliare* (L.) Link
 **Pennisetum setaceum* (Forsk.) Chiov.
Phalaris caroliniana Walt.
Piptochaetium fimbriatum (Kunth) Hitchcock
 **Poa pratensis* L.
 **Polypogon monspeliensis* (L.) Desfontaines
 **Rhynchelytrum repens* (Willdenow) C.E.
 Hubbard
 **Schismus barbarus* (L.) Pearson
Schizachyrium cirratum (Hackel) Wootton &
 Standley
Schizachyrium sanguineum (Retzius) Alston
Setaria macrostachya Kunth
 **Sorghum halapense* (L.) Persoon
Sporobolus contractus A.S. Hitchcock
Sporobolus wrightii Munro ex Scribner
Stipa sp.
Vulpia microstachys (Nuttall) Bentham
 var. *pauciflora* (Scribner) Lonard &
 Gould
Vulpia octoflora (Walter) Rydberg
 var. *hirtella* (Piper) Henr.
Vulpia octoflora (Walter) Rydberg var.
octoflora

Polemoniaceae

Eriastrum diffusum (Gray) Mason
Ipomopsis multiflora (Nuttall) V. Grant
Linanthus aureus (Nuttall) Greene
Phlox tenuifolia E. Nelson

Polygonaceae

Eriogonum pharmaceoides Torrey
 var. *pharmaceoides*
Eriogonum polycladon Bentham
Eriogonum thurberi Torrey
Eriogonum wrightii Torrey ex Bentham var.
wrightii
 **Polygonum aviculare* L.
 **Rumex crispus* L.

Rumex hymenosepalus Torrey

Portulacaceae

Claytonia perfoliata Donn ex Willdenow

Portulaca suffrutescens Engelman

Talinum paniculatum (Jacquin) Gaertner

Primulaceae

Androsace occidentalis Pursh

Ranunculaceae

Anemone tuberosa Rydberg

Clematis ligusticifolia Nuttall

Delphinium scaposum Greene

Rhamnaceae

Condalia warnockii M.C. Johnston

Rhamnus crocea Nuttall

ssp. *ilicifolia* (Kellogg) C.B. Wolf

Ziziphus obtusifolia (Hooker ex Torrey & Gray) Gray

Rosaceae

Vauquelinia californica (Torrey) Sargent

Rubiaceae

Bouvardia ternifolia (Cavanilles)

Schlechtendal

**Galium aparine* L.

Galium microphyllum Gray

Galium wrightii Gray

Salicaceae

Populus fremontii S. Watson

Salix exigua Nuttall

Salix gooddingii Ball

Sapindaceae

Dodonea viscosa (L.) Jacquin

Sapindus saponaria

var. *drummondii* L. (Hooker & Arnott) L.

Benson

Sapotaceae

Sideroxylon lanuginosum Michaux

Saxifragaceae

Heuchera sanguinea Engelman

Scrophulariaceae

Castilleja austromontana Standley & Blumer

Castilleja tenuiflora Benth

Maurandella antirrhiniflora

(Humboldt & Bonpland ex Willdenow)

Rothm.

Mecardonia procumbens (P. Mill.) Small

Mimulus guttatus DC.

Nuttallanthus texanus (Scheele) D.A. Sutton

Penstemon barbatus (Cavanilles) Roth

Penstemon parryi (Gray) Gray

Stemodia durantifolia (L.) Swartz

Veronica peregrina L.

ssp. *xalapensis* (Kunth) Pennell

Solanaceae

Datura discolor Bernh.

Lycium berlandieri Dunal

Lycium exsertum Gray

Nicotiana trigonophylla Dunal

Physalis crassifolia Benth

var. *versicolor* (Rydberg) Waterfall

Physalis cf. hederifolia Gray

Solanum douglasii Dunal

Sterculiaceae

Ayenia compacta Rose

Ayenia microphylla Gray

Typhaceae

Typha cf. domingensis Persoon

Ulmaceae

Celtis pallida Torrey

Celtis laevigata Willdenow

var. *reticulata* (Torrey) L. Benson

Urticaceae

Parietaria hespera Hinton

Valerianaceae

Plectritis ciliosa (Greene) Jepson
ssp. *insignis* (Suksdorff) Morey

Verbenaceae

Aloysia wrightii A.A. Heller ex Abrams
Glandularia bipinnatifida (Nuttall) Nuttall
var. *bipinnatifida*

Viscaceae

Phoradendron californicum Nuttall

Phoradendron villosum ssp. *coryae*
(Trelease) Wiens
+*Phoradendron juniperinum* Engelman

Vitaceae

Vitis arizonica Engelman

Zygophyllaceae

Larrea tridentata (Sesse & Mocino ex DC.)
Coville

Chimenea and Madrona Canyons (Rincon Mountain District)

Surveys of Chimenea Canyon, within the Rincon Mountain District of Saguaro National Park, were conducted during April, May, and October of 1994. The Madrona Canyon surveys were conducted in October 1995. Portions of the two canyons form a Protected Natural Area in the park on the west slope of the Rincon Mountains. As shown in Figure 2, the drainages run parallel to one another, heading southwest in the upper reaches then turning south at lower elevation. Elevation drops from approximately 1600 m to 1150 m (5200 ft to 3800 ft) within the study areas.

The species lists for Chimenea and Madrona Canyons were compiled by walking selected transects and recording all species encountered. Workers collected voucher specimens for all species. A complete set of specimens was deposited in the University of Arizona herbarium. Vouchers for species new to Saguaro National Park were brought to the park herbarium. The team was particularly interested in documenting the presence of alien species in the two canyons.

Chimenea Canyon Results

Mark Fishbein, Shelley McMahon, George Ferguson, Victor Steinmann, and Amy Johnson conducted the research in Chimenea Canyon; [Table 3](#) is the plant list resulting from the 1994 surveys. Surveyors counted 393 species representing 84 families. Nine species not listed in the Bowers and McLaughlin (1987) Rincon Mountains flora were observed, and thirteen alien species were recorded. Nine of the aliens were members of the grass family: *Agrostis stolonifera*, *Avena fatua* (wild oat), *Bromus madritensis* (red brome), *Cynodon dactylon* (Bermuda grass), *Echinochloa colona*, *Eragrostis curvula* var. *conferta*, *E. lehmanniana* (Lehmann lovegrass), *Hordeum leporinum* (barley), and *Rhynchelytrum repens*. Neither *Pennisetum ciliare* (buffel grass) nor *P. setaceum* (fountain grass) were encountered in Chimenea Canyon at the time of these studies. Other non-natives included *Sonchus asper* and *S. oleraceus* (Asteraceae), *Cyperus esculentus* (Cyperaceae), and *Marrubium vulgare* (Lamiaceae).

Madrona Canyon Results

[Table 4](#) is the plant list for Madrona Canyon put together by Mark Fishbein. In this canyon, 290 species from 68 families were counted. “New” and non-native listings numbered ten each, with seven grasses in the non-native category. Unlike nearby Chimenea Canyon, Madrona Canyon hosted both buffel grass and fountain grass, non-natives recommended for removal by the Box Canyon study.

Table 3. Chimenea Canyon Checklist of Vascular Plants. Chimenea Canyon lies within a Protected Natural Area within the Rincon Mountain District of Saguaro National Park. This list was compiled in 1994 by Mark Fishbein, Shelley McMahon, George Ferguson, Victor Steinmann, and Amy Johnson. Plant names follow Kartesz (1994).

+ = New addition to the flora of the Rincon Mountains of Bowers and McLaughlin (1987)

* = Introduced species

Acanthaceae

Anisacanthus thurberi (Torrey) Gray
Carlowrightia arizonica Gray
Siphonoglossa longiflora (Torrey) Gray
Tetramerium nervosum Nees

Agavaceae

Agave cf. palmeri Engelman
Agave schottii Engelman var. *schottii*
Yucca schottii Engelman

Amaranthaceae

Amaranthus albus L.
Gomphrena nitida Rothrock
Gomphrena sonora Torrey
Iresine heterophylla Standley

Amaryllidaceae

Zephyranthes longifolia Hemsley

Anacardiaceae

Rhus trilobata Nuttall
Toxicodendron rydbergii (Small ex Rehder)
 Greene

Apiaceae

Daucus pusillus Michaux
Spermolepis echinata (Nuttall ex DC.) Heller

Apocynaceae

Apocynum sp.
Haplophyton cimidum DC.

Araliaceae

Aralia humilis Cavanilles

Aristolochiaceae

Aristolochia watsonii Wooton & Standley

Asclepiadaceae

Asclepias linaria Cavanilles
Asclepias nyctaginifolia Gray
Asclepias tuberosa L. ssp. *interior* Woodson
Cynanchum arizonicum (Gray) Shinnars
Matelea arizonica (Gray) Shinnars
Sarcostemma cynanchoides Decaisne
 ssp. *hartwegii* (Vail) R. Holm

Aspleniaceae

Woodsia cochisensis Windham

Asteraceae

Acourtia nana (Gray) Reveal & King
Acourtia thurberi (Gray) Reveal & King
Acourtia wrightii (Gray) Reveal & King
Ageratina paupercula (Gray) King &
 Robinson
Ambrosia ambrosioides (Cavanilles) Payne
Ambrosia confertiflora DC.
Artemisia ludoviciana Nuttall
 ssp. *albula* (Wooton) Keck
Baccharis brachyphylla Gray
Baccharis salicifolia (Ruiz & Pavón) Persoon
Baccharis sarothroides A. Gray
Baccharis thesioides Kunth
Bahia absinthifolia Bentham
 var. *dealbata* (Gray) Gray
Bidens aurea (Aiton) Sherff
Bidens leptocephala Sherff
Brickellia amplexicaulis B.L. Robinson
Brickellia betonicifolia Gray
Brickellia californica (Torrey & Gray) Gray
Brickellia coulteri Gray

Brickellia venosa (Wooton & Standley) B.L. Robinson
Carminatia tenuiflora DC.
Cirsium neomexicanum Gray
Conyza canadensis (L.) Cronquist
Coreocarpus arizonicus (Gray) Blake
Cosmos parviflorus (Jacquin) Persoon
Encelia farinosa Gray ex Torrey
Ericameria laricifolia (Gray) Shinnery
+*Erigeron colomexicanus* A. Nelson
Erigeron divergens Torrey & Gray
+*Erigeron neomexicanus* Gray
Eupatorium solidaginifolium Gray
Gamochaeta purpurea (L.) Cabrera
Gnaphalium canescens DC.
Guardiola platyphylla Gray
Gymnosperma glutinosum (Sprengel) Lessing
Heliomeris longifolia var. *annua* (Jones) Yates
Heterotheca subaxillaris (Lamarck) Britton & Rusby
Hieracium fendleri Schultz-Bipontinus
Hymenoclea monogyra Torrey & Gray ex Gray
Hymenothrix wrightii A. Gray
Isocoma tenuisecta Greene
Lactuca serriola L.
Lasthenia californica DC. ex Lindley
Machaeranthera asteroides (Torrey) Greene
Machaeranthera gracilis (Nuttall) Shinnery
Machaeranthera pinnatifida (Hooker) Shinnery ssp. *pinnatifida* var. *pinnatifida*
Machaeranthera tagetina Greene
Microseris lindleyi (DC.) A. Gray
Pectis filipes Harvard & Gray var. *subnuda* Fernald
Perityle lemmonii (Gray) Macbride
Porophyllum gracile Benth
Porophyllum ruderale (Jacquin) Cassini ssp. *macrocephalum* (DC.) R.R. Johnson
Psilostrophe cooperi (Gray) Greene
Rafinesquia neomexicana Gray
Sanvitalia aberti Gray
Senecio lemmonii Gray

Senecio neomexicanus Gray
Solidago velutina DC.
**Sonchus asper* (L.) Hill
**Sonchus oleraceus* L.
Stephanomeria pauciflora (Torrey) A. Nelson
Tagetes lemmonii Gray
Tagetes micrantha Cavanilles
Trixis californica Kellogg
Viguiera dentata (Cavanilles) Sprengel var. *lancifolia* Blake
Zinnia acerosa (DC.) Gray

Berberidaceae

Berberis wilcoxii Kearney

Betulaceae

Alnus oblongifolia Torrey

Boraginaceae

Cryptantha barbigera (Gray) Greene
Cryptantha micrantha (Torrey) I.M. Johnston
Cryptantha muricata (Hooker & Arnott) Nelson & Macbride var. *denticulata* (Greene) I.M. Johnston
Cryptantha nevadensis A. Nelson & Kennedy
Harpogonella palmeri Gray
Pectocarya platycarpa (Munz & Johnston) Munz & Johnston
Pectocarya recurvata I.M. Johnston
Plagiobothrys arizonicus (Gray) Greene ex Gray

Brassicaceae

Arabis perennans S. Watson
Descurainia pinnata (Walter) Britton
Lepidium virginicum L. var. *medium* (Greene) C.L. Hitchcock
Lesquerella gordonii (Gray) S. Watson

Schoenocrambe linearifolia (Gray) Rollins
Thysanocarpus curvipes Hooker

Cactaceae

Carnegia gigantea (Engelmann) Britton & Rose
Echinocereus coccineus Engelmann
Echinocereus fasciculatus (Engelmann) L. Benson
var. *fasciculatus* [probably *E. fendleri* (Engelmann) F. Seitz var. *fasciculatus* (Engelmann ex B.D. Jackson) N. P. Taylor]
Echinocereus rigidissimus (Engelmann) Haage f.
Ferocactus wislizenii (Engelmann) Britton & Rose
Mammillaria grahamii Engelmann
[incl. *M. g.* var. *oliviae* (Orcutt) Benson, *M. microcarpa* Engelmann]
Mammillaria viridiflora (Britton & Rose) Böcker
Opuntia bigelovii Engelmann
Opuntia chlorotica Engelmann & Bigelow
Opuntia engelmannii Salm-Dyck
Opuntia fulgida Engelmann var. *fulgida*
Opuntia fulgida Engelmann
var. *mammillata* (Schott) Coulter
Opuntia phaeacantha Engelmann
Opuntia spinosior (Engelmann) Toumey
Opuntia versicolor Engelmann

Campanulaceae

Triodanis perfoliata (L.) Nieuwland
var. *biflora* (Ruiz & Pavón)
Triodanis perfoliata (L.) Nieuwland

Caprifoliaceae

Symphoricarpos oreophilus A. Gray

Caryophyllaceae

Cerastium texanum Britton
Drymaria molluginea (Lagasca) Didrichsen
Silene antirrhina L.

Chenopodiaceae

Atriplex canescens (Pursh) Nuttall
+*Chenopodium neomexicanum* Standley

Commelinaceae

Commelina dianthifolia Delile
Commelina erecta L.

Convolvulaceae

Evolvulus alsinoides (L.) L.
Ipomoea barbatisepala A. Gray
Ipomoea costellata Torrey
Ipomoea cristulata H. Hallier
Ipomoea purpurea (L.) Roth

Crassulaceae

Crassula erecta (Hooker & Arnott) Berger

Crossosomataceae

Crossosoma bigelovii S. Watson

Cucurbitaceae

Marah gilensis Greene

Cupressaceae

Juniperus deppeana Steudel

Cyperaceae

Carex chihuahuensis Mackenzie
Carex senta Boott
Cyperus dipsaceus Liebmann
**Cyperus esculentus* L.
Cyperus mutisii (Kunth) Grisebach
[incl. *C. pringlei* Britton]
Cyperus pallidicolor (Kükenthal) G.C. Tucker
[*C. flavus* (Vahl) Nees, misapplied]
Cyperus squarrosus L.]
Eleocharis montevidensis Kunth
Lipocarpha micrantha (Vahl) G. Tucker

Ericaceae

Arbutus arizonica (A. Gray) Sargent
Arctostaphylos pungens H.B.K.

Euphorbiaceae

Acalypha neomexicana Mueller-Argoviensis
Ditaxis neomexicana (Mueller-Argoviensis)
Heller
Chamaesyce capitellata (Engelmann)
Millsaugh
Euphorbia heterophylla L.
Euphorbia hyssopifolia L.
Euphorbia melanadenia Torrey
Euphorbia pediculifera Engelmann
Jatropha cardiophylla (Torrey) Mueller-
Argoviensis
Tragia nepetifolia Cavanilles

Fabaceae

Acacia angustissima (Millsaugh) Kuntze
Acacia greggii A. Gray
Amorpha fruticosa L.
Astragalus allochrous A. Gray
Astragalus arizonicus A. Gray
Astragalus nuttallianus A. DC.
Calliandra eriophylla Benth
Calliandra humilis Benth
Coursetia caribaea (Jacquin) Lavin
var. *sericea* Gray) Lavin
Coursetia glandulosa A. Gray
Crotalaria pumila Ortega
Dalea albiflora A. Gray
Dalea pringlei A. Gray
Dalea pulchra Gentry
Dalea versicolor Zuccarini ssp. *versicolor*
var. *sessilis* (A. Gray) Barneby
Desmodium batocaulon A. Gray
Desmodium cinerascens A. Gray
Desmodium rosei Schubert
Erythrina flabelliformis Kearney
Eysenhardtia orthocarpa (A. Gray) S.
Watson
Galactia wrightii A. Gray
Lotus greenei Ottley ex Kearney & Peebles
Lotus humistratus Greene
Lotus oroboides (Kunth) Ottley
var. *nanus* (A. Gray) Isely
Lotus oroboides (Kunth) Ottley var.
oroboides

Lupinus concinnus Agardh
Lupinus sparsiflorus Benth
Lysiloma watsoni Rose
Macroptilium gibbosifolium (Ortega) A.
Delgado
Mimosa aculeaticarpa Ortega
var. *biuncifera* (Benth) Barneby
Parkinsonia florida (Benth ex A. Gray) S.
Watson
Parkinsonia microphylla Torrey
Phaseolus acutifolius A. Gray
Prosopis velutina Wooton
Robinia neomexicana A. Gray
Tephrosia leiocarpa A. Gray
Tephrosia vicioides Schlechtendal [*T. tenella*
A. Gray]
Vicia ludoviciana Nuttall

Fagaceae

Quercus arizonica Sargent
Quercus emoryi Torrey
Quercus hypoleucoides Camus
Quercus oblongifolia Torrey

Fouquieriaceae

Fouquieria splendens Engelmann ssp.
splendens

Garryaceae

Garrya wrightii Torrey

Geraniaceae

Erodium cicutarium (L.) Héritier
Geranium caespitosum James
Geranium carolinianum L.

Hydrophyllaceae

Phacelia distans Benth
Phacelia sp.

Iridaceae

Sisyrinchium cernuum (Bicknell) Kearney

Juncaceae

Juncus acuminatus Michaux
Juncus bufonius L.

Juncus marginatus Rostkovius
Juncus tenuis Willdenow [*J. interior* Wieg.]

Juglandaceae

Juglans major (Torrey) Heller

Krameriaceae

Krameria grayi Rose & Painter ?
{*K. parvifolia* Benth. ?}

Lamiaceae

Hedeoma nana (Torrey) Briquet ssp. *nana*
Hyptis emoryi Torrey
**Marrubium vulgare* L.
Monarda citriodora Cervantes ex Lagasca
ssp. *austromontana* (Epling) Scora
Stachys coccinea Jacquin

Liliaceae

Dichelostemma pulchellum (Salisbury) Heller

Loasaceae

Mentzelia asperula Wooton & Standley

Lythraceae

Cuphea wrightii A. Gray

Malpighiaceae

Janusia gracilis A. Gray

Malvaceae

Abutilon abutiloides (Jacquin) Garcke
Abutilon incanum (Link) Sweet
Abutilon mollicomum (Willdenow) Sweet
Anoda abutiloides A. Gray
Anoda cristata (L.) Schlechtendal
Gossypium thurberi Todaro
Herissantia crispa (L.) Brizicky
Hibiscus coulteri Harvey
Hibiscus denudatus Benth. & Hooker
Rhynchosida physocalyx (A. Gray) Fryxell
Sphaeralcea fendleri A. Gray
Sphaeralcea laxa Wooton & Standley

Moraceae

Morus microphylla Buckley

Nolinaceae

Dasyllirion wheeleri S. Watson
Nolina microcarpa S. Watson

Nyctaginaceae

Allionia incarnata L.
Boerhaavia diffusa L.
Boerhaavia scandens L.
Mirabilis coccineus (Torrey) Benth. & Hooker f.
Mirabilis longiflora L.
Mirabilis oblongifolia (A. Gray) Heimerl

Oleaceae

Fraxinus velutina Torrey
Menodora scabra (Engelmann) A. Gray

Onagraceae

Epilobium canum (Greene) Raven
ssp. *latifolium* (Hooker) Raven
Oenothera elata Kunth. ssp. *hirsutissima*
(Gray ex. S. Wats.)

Oxalidaceae

Oxalis albicans H.B.K. ssp. *pilosa* (Nuttall)
Eiten
Oxalis alpina (Rose) Knuth

Papaveraceae

Corydalis aurea Willdenow

Phytolaccaceae

Rivina humilis L.

Pinaceae

Pinus cembroides Zuccarini
Pinus leiophylla Schiede & Deppe
var. *chihuahuana* (Engelmann) Shaw
Pinus ponderosa P & C
var. *scopulorum* Engelmann

Plantaginaceae

Plantago patagonica Jacquin
Plantago virginica L.

Platanaceae

Platanus wrightii S. Watson

Plumbaginaceae

Plumbago scandens L.

Poaceae

+*Aegopogon tenellus* (DC.) Trinius
 **Agrostis stolonifera* L.
Aristida adscencionis L.
Aristida havardii Vasey
Aristida ternipes Cavanilles var. *ternipes*
 **Avena fatua* L.
Bothriochloa barbinodis (Lagasca) Herter
Bouteloua aristidoides (H.B.K.) Grisebach
Bouteloua barbata Lagasca
Bouteloua curtipendula (Michaux) Torrey
Bouteloua hirsuta Lagasca
Bouteloua repens (H.B.K.) Scribner & Merrill
Bouteloua rothrockii Vasey
Bromus carinatus Hooker & Arnott
 **Bromus madritensis* L.
 **Cynodon dactylon* (L.) Persoon
Digitaria californica Henrard
 **Echinochloa colona* (L.) Link
Elymus elymoides (Rafinesque) Swezey
Elyonurus barbiculmis Hackel
 **Eragrostis cilianensis* (All.) Vignolo-Lutati ex Janchen
 *+*Eragrostis curvula* (Schrad.) Nees var. *conferta* Stapf.
Eragrostis intermedia Hitchcock
 **Eragrostis lehmanniana* Nees
Eragrostis mexicana (Hornemann) Link ssp. *mexicana*
Eragrostis pectinacea (Michaux) Nees var. *pectinacea*
Eragrostis pectinacea (Michaux) Nees var. *miserrima* (Fournier) J. Reeder
Eriochloa acuminata (Presl) Kunth

var. *acuminata*

Eriochloa aristata Vasey
Erioneuron pulchellum (H.B.K.) Tateoka
Heteropogon contortus (L.) Beauvois ex Roemer & Schultes
Heteropogon melanocarpus (Elliot) Elliot ex Bentham
Hilaria belangeri (Steudel) Nash
 **Hordeum murinum* L. ssp. *leporinum* (Link) Arcang.
Leptochloa dubia (H.B.K.) Nees
Lycurus setosus (Nuttall) C. Reeder
Muhlenbergia emersleyi Vasey
Muhlenbergia minutissima (Steudel) Swallen
Muhlenbergia pauciflora Buckley
Muhlenbergia porteri Scribner
Muhlenbergia rigens (Bentham) Hitchcock
Muhlenbergia sinuosa Swallen
Muhlenbergia texana Buckley
Panicum bulbosum H.B.K.
Panicum hirticaule Presl
Dicanthelium oligosanthes (Schultes) Gould var. *scriberianum* (Nash) Gould
Piptochaetium fimbriatum (Kunth) Hitchcock
Polypogon monspeliensis (L.) Desfontaines
 **Rhynchelytrum repens* (Willdenow) C.E. Hubbard
Schizachyrium cirratum (Hackel) Wootton & Standley
Schizachyrium sanguineum (Retzius) Alston
Setaria grisebachii Fournier
Sporobolus contractus A.S. Hitchcock
Trachypogon secundus (Presl.) Scribner
Tridens muticus (Torrey) Nash
Vulpia microstachys (Nuttall) Munro var. *ciliata* (Beal) Lonard & Gould
Vulpia octoflora (Walter) Rydberg var. *octoflora*

Polemoniaceae

Eriastrum diffusum (A. Gray) Mason
Ipomopsis multiflora (Nuttall) V. Grant
Linanthus aureus (Nuttall) Greene

Polygalaceae

Monnina wrightii A. Gray
Polygala alba Nuttall
Polygala obscura Bentham

Polygonaceae

Eriogonum wrightii Torrey var. *wrightii*
Rumex crispus L.

Portulacaceae

Calandrinia ciliata (Ruiz & Pavon) DC.
Portulaca suffrutescens Engelm
Portulaca umbraticola Kunth
 ssp. *lanceolata* (Engelm) Matthews &
 Ketron
Talinum paniculatum (Jacquin) Gaertner

Primulaceae

+*Centunculus minimus* L.

Psilotaceae

+*Psilotum nudum* (L.) Beauvois

Pteridaceae

Astrolepis cochisensis (Goodding) Benham
 &
 Windham [*Notholaena cochisensis*
 Goodding]
Astrolepis sinuata (Lagasca) Benham &
 Windham
 [*Notholaena sinuata* (Lagasca) Kaulfuss]
Bommeria hispida (Metternich) Underwood
Cheilanthes bonariensis (Willdenow) Proctor
 [*Notholaena aurea* (Poiret) Desvaux]
 +*Cheilanthes covillei* Maxon
Cheilanthes lindheimeri Hooker
Cheilanthes wrightii Hooker
Notholaena lemmonii D.C. Eaton
Notholaena standleyi Maxon
Pellaea truncata Goodding
Pellaea wrightiana Hooker
Pentagramma triangularis (Kaulfuss)
 Yatskievich,
 Windham & Wollenweber ssp. *maxonii*
 (Weatherby) Yatskievich, Windham &

Wollenweber [*Pityrogramma*
triangularis (Kaulfuss) Maxon var.
maxonii Weatherby]

Ranunculaceae

Anemone tuberosa Rydberg
Aquilegia chrysantha Gray
Delphinium scaposum Greene

Rhamnaceae

Condalia correllii M.C. Johnston
Condalia warnockii M.C. Johnston
 var. *kearneyana* M.C. Johnston
Rhamnus californica Eschscholtz
Rhamnus crocea Nuttall
 ssp. *ilicifolia* (Kellogg) C.B. Wolf
Ziziphus obtusifolia (Hooker) A. Gray
 Rosaceae
Prunus serotina Ehrhardt
 ssp. *virens* (Wooton & Standley)
 McVaugh
Vauquelinia californica (Torrey) Sargent

Rubiaceae

Bouvardia ternifolia (Cavanilles)
 Schlechtendal
Galium aparine L.
Galium mexicanum Kunth
 ssp. *asperrimum* (Gray) Dempster
Galium microphyllum Gray
Galium proliferum Gray
Galium wrightii A. Gray

Salicaceae

Populus fremontii S. Watson ssp. *fremontii*
Salix exigua Nuttall
Salix gooddingii Ball

Santalaceae

Commandra umbellata (L.) Nuttall

Sapindaceae

Dodonea viscosa (L.) Jacquin
Sapindus drummondii Hooker & Arnott

Sapotaceae

Sideroxylon lanuginosa Michaux [*Bumelia lanuginosa*
(Michaux) Persoon var. *rigida* A. Gray]

Saxifragaceae

Heuchera sanguinea Engelm

Scrophulariaceae

Antirrhinum nuttallianum Benth
Brachystigma wrightii (Gray) Pennell
Castilleja minor (Gray) Gray
Castilleja tenuiflora Benth
Linaria texana Scheele
Maurandya antirrhiniflora Humboldt &
Bonpland
ex Willdenow
Mecardonia vandellioides (H.B.K.) Pennell
Mimulus guttatus DC.
Mimulus nasutus Greene
Penstemon parryi (A. Gray) A. Gray
Veronica peregrina L.

Selaginellaceae

Selaginella rupincola Underwood

Solanaceae

Lycium berlandieri Dunal
Lycium exsertum Gray
Nicotiana trigonophylla Dunal
Physalis cf. *hederaefolia* Gray
Solanum eleagnifolium Cavanilles

Sterculiaceae

Ayenia compacta Rose

Typhaceae

Typha domingensis Persoon

Ulmaceae

Celtis pallida Torrey
Celtis reticulata Torrey

Urticaceae

Parietaria hespera Hinton

Verbenaceae

Aloysia wrightii A.A. Heller ex Abrams
Glandularia bipinnatifida (Nuttall) Nuttall
var. *bipinnatifida*

Viscaceae

Phoradendron californicum Nuttall
Phoradendron coryae Trelease [*P. villosum*
(Nuttall)
Nuttall ssp. *coryae* (Trelease) Wiens]
+*Phoradendron juniperinum* Engelm
Phoradendron macrophyllum (Engelm)
Cockerell

Vitaceae

Vitis arizonica Engelm

Table 4. Madrona Canyon Checklist of Vascular Plants. Madrona Canyon lies within a Protected Natural Area within the Rincon Mountain District of Saguaro National Park. This list was compiled in 1995 by Mark Fishbein. Plant names follow Kartesz (1994).

+ = New addition to the flora of the Rincon Mountains of Bowers and McLaughlin (1987)

* = Introduced species

Acanthaceae

Anisacanthus thurberi (Torrey) A. Gray
Siphonoglossa longiflora (Torrey) A. Gray
Tetramerium nervosum Nees

Agavaceae

Agave chrysantha Peebles
Agave schottii Engelman
Yucca schottii Engelman

Amaranthaceae

Amaranthus albus L.
Gomphrena sonora Torrey
Iresine heterophylla Standley

Anacardiaceae

Toxicodendron rydbergii (Small ex Rydberg) Greene

Apiaceae

Daucus pusillus Michaux
Spermolepis echinata (Nuttall) Heller

Apocynaceae

Haplophyton crooksii L.

Araliaceae

Aralia humilis Cavanilles

Aristolochiaceae

Aristolochia watsonii Wooton & Standley

Asclepiadaceae

Asclepias glaucescens Kunth
Asclepias linaria Cavanilles
Gonolobus arizonicus (Gray) Woodson
Sarcostemma cynanchoides Decaisne

ssp. hartwegii (Vail) R. Holm

Asteraceae

Acourtia thurberi (A. Gray) Reveal & King
Ageratina paupercula (A. Gray) King & Robinson
Ambrosia ambrosioides (Cavanilles) Payne
Ambrosia confertiflora DC.
Artemisia ludoviciana Nuttall
Baccharis salicifolia (Ruiz & Pavon) Persoon
Baccharis sarothroides A. Gray
Baccharis thesioides H.B.K.
Bebbia juncea (Bentham) Greene
Bidens aurea (Aiton) Sherff
Brickellia amplexicaulis B.L. Robinson
Brickellia betonicifolia A. Gray
Brickellia californica (Torrey & A. Gray) A. Gray
Brickellia coulteri A. Gray var. *coulteri*
Brickellia venosa (Wooton & Standley) B.L. Robinson
Carminatia tenuiflora DC.
Cirsium neomexicanum A. Gray
Coreocarpus arizonicus (A. Gray) Blake
Encelia farinosa A. Gray ex Torrey
Ericameria laricifolia (A. Gray) Shinnars
Erigeron divergens Torrey & A. Gray
Erigeron neomexicanus A. Gray
Eupatorium solidaginifolium A. Gray
Gamochaeta purpurea (L.) Cabrera
Gnaphalium leucocephalum A. Gray
Gnaphalium wrightii A. Gray
Guardiola platyphylla A. Gray
Gutierrezia microcephala (DC.) A. Gray
Gymnosperma glutinosum (Sprengel) Lessing
Hymenothrix wrightii A. Gray

Isocoma tenuisecta Greene
Lasiantha podocephala (A. Gray) K. Becker
 [Zexmenia podocephala A. Gray]
Machaeranthera asteroides (Torrey) Greene
 [M. tephrodes (A. Gray) Greene]
Machaeranthera gracilis (Nuttall) Shinnars
Machaeranthera tagetina Greene
 +*Melampodium longicorne* A. Gray
 +*Pectis cylindrica* (Fernald) Rydberg
Perityle lemmonii (A. Gray) Macbride
Porophyllum macrocephalum DC. [*P. ruderale* (Jacq.) Cass. ssp. *macrocephalum* (DC.) R.R. Johnson]
Sanvitalia abertii A. Gray
Solidago velutina DC.
 **Sonchus oleraceus* L.
Stephanomeria pauciflora (Torrey) A. Nelson
Trixis californica Kellogg
Viguiera annua (Jones) Blake
Viguiera dentata (Cavanilles) Sprengel
 var. *lancifolia* Blake
Zinnia acerosa (DC.) A. Gray

Betulaceae

Alnus oblongifolia Torrey

Bignoniaceae

Tecoma stans (L.) Juss. ex Kunth

Brassicaceae

Schoenocrambe linearifolia (A. Gray) Rollins

Cactaceae

Carnegia gigantea (Engelmann) Britton & Rose
Echinocereus coccineus Engelmann
Echinocereus fasciculatus (Engelmann) L. Benson
 var. *fasciculatus* [probably *E. fendleri* (Engelmann) F. Seitz var. *fasciculatus*

(Engelmann ex B.D. Jackson) N. P. Taylor]
Echinocereus rigidissimus (Engelmann) Haage f.
Ferocactus wislizenii (Engelmann) Britton & Rose
Mammillaria grahamii Engelmann [incl. var. *oliviae* (Orcutt) Benson, *M. microcarpa* Engelmann]
Opuntia chlorotica Engelmann & Bigelow
Opuntia engelmannii Salm-Dyck
 [*O. phaeacantha* Engelmann var. *discata* (Griffiths) Benson & Walkington]
Opuntia fulgida Engelmann var. *fulgida*
Opuntia fulgida Engelmann
 var. *mammillata* (Schott) Coulter
Opuntia phaeacantha Engelmann
 [*O. p.* var. *major* Engelmann]
Opuntia spinosior (Engelmann) Toumey
Opuntia versicolor Engelmann

Campanulaceae

Triodanis sp.

Caryophyllaceae

Drymaria molluginea (Lagasca) Didrichsen
Silene antirrhina L.

Chenopodiaceae

Atriplex canescens (Pursh) Nuttall
Chenopodium neomexicanum Standley
 [*C. palmeri* Standley]

Cochlospermaceae

Amoreuxia palmatifida Moçino & Sessé

Commelinaceae

Commelina dianthifolia Delile
Commelina erecta L.

Convolvulaceae

Evolvulus alsinoides (L.) L. var. *angustifolius*
 Torrey
Evolvulus arizonicus A. Gray
Ipomoea barbatisepala A. Gray
Ipomoea costellata Torrey
Ipomoea cristulata H. Hallier f.
Ipomoea leptotoma Torrey

Crossosomataceae

Crossosoma bigelovii S. Watson

Cucurbitaceae

Echinopepon wrightii (A. Gray) S. Watson

Cupressaceae

Juniperus deppeana Steudel

Cyperaceae

+*Bulbostylis funckii* (Steudel) C.B. Clarke
 **Cyperus esculentus* L.
Cyperus mutisii (H.B.K.) Grisebach
 [incl. *C. pringlei* Britton]
Cyperus pallidicolor (Kükenthal) G. Tucker
 [*C. flavus* (Vahl) Nees, misapplied]
Cyperus squarrosus L. [*C. aristatus* Rottbøll]
Lipocarpha micrantha (Vahl) G. Tucker
 [*Hemicarpha micrantha* (Vahl) Britton]

Dryopteridaceae

Woodsia cochisensis Windham
 [*W. plummerae* Lemmon, in part]

Euphorbiaceae

Acalypha neomexicana Mueller-Argoviensis
Chamaesyce florida (Engelmann) Millspaugh
Euphorbia heterophylla L.
Chamaesyce hyssopifolia (L.) Standley
Chamaesyce melanadenia (Torrey)
 Millspaugh
Chamaesyce pediculifera (Engelmann)

Rose & Standley

Jatropha cardiophylla (Torrey) Mueller-Argoviensis
Tragia nepetifolia Cavanilles

Fabaceae

Acacia angustissima (Miller) Kuntze
Acacia greggii A. Gray
Amorpha fruticosa L.
Astragalus nothoxys Gray
Calliandra eriophylla Benth
Chamaecrista nictitans (L.) Greene
 var. *mensalis* (Greenman) Irwin & Barneby
Cologania angustifolia H.B.K.
Coursetia caribaea (Jacquin) Lavin
 var. *sericea* (Gray) Lavin
Coursetia glandulosa Gray
Crotalaria pumila Ortega
Dalea albiflora Gray
Dalea pringlei Gray
Dalea filiformis Gray
Desmodium batocaulon Gray
Desmodium cinerascens Gray
Desmodium grahamii Gray
Desmodium procumbens (Miller) A.S. Hitchcock
 var. *exiguum* (Gray) Schubert
Erythrina flabelliformis Kearney
Eysenhardtia orthocarpa (Gray) S. Watson
Galactia wrightii Gray
Lathyrus graminifolius (S. Watson) White
Lysiloma watsoni Rose
Macroptilium gibbosifolium (Ortega) Delgado
Mimosa aculeaticarpa Ortega
 var. *biuncifera* (Benth) Barneby
Parkinsonia florida (Benth ex Gray) S. Watson
Phaseolus acutifolius Gray
Phaseolus maculatus Scheele
Prosopis velutina Wooton
Senna covesii (Gray) Irwin & Barneby
Senna hirsuta (L.) Irwin & Barneby

var *glaberrima* (M.E. Jones) Irwin &
Barneby
Tephrosia leiocarpa Gray

Fagaceae

Quercus arizonica Sargent
Quercus emoryi Torrey
Quercus hypoleucoides Camus
Quercus oblongifolia Torrey

Fouquieriaceae

Fouquieria splendens Engelm. ssp.
splendens

Hydrangeaceae

Philadelphus microphyllus A. Gray
[*Philadelphus argenteus* Rydberg]

Juncaceae

Juncus acuminatus Michaux
+*Juncus balticus* Willdenow
Juncus tenuis Willdenow [*J. interior* Wieg.]

Juglandaceae

Juglans major (Torrey) Heller

Lamiaceae

Hedeoma dentata Torrey
Hyptis emoryi Torrey
+*Salvia reflexa* Hornemann
Stachys coccinea Jacquin

Loasaceae

Mentzelia asperula Wooton & Standley

Malpighiaceae

Janusia gracilis A. Gray

Malvaceae

Abutilon abutiloides (Jacquin) Garcke
[*A. californicum* Benth.]
Abutilon incanum (Link) Sweet

Abutilon mollicomum (Willdenow) Sweet
[*A. sonora* A. Gray]

Anoda abutiloides A. Gray
Anoda cristata (L.) Schlechtendal
Gossypium thurberi Todaro
Hibiscus coulteri Harvey

Martyniaceae

Proboscidea parviflora (Wooton) Wooton &
Standley
var. *parviflora*

Moraceae

Morus microphylla Buckley

Nolinaceae

Dasyllirion wheeleri S. Watson
Nolina microcarpa S. Watson

Nyctaginaceae

Allionia incarnata L.
Boerhavia diffusa L.
Boerhavia scandens L.
Mirabilis coccinea (Torrey) Benth. &
Hooker
Mirabilis longiflora L.

Oleaceae

Fraxinus velutina Torrey

Onagraceae

Epilobium canum (Greene) Raven
ssp. *latifolium* (Hooker) Raven
Oenothera elata H.B.K. ssp. *hirsutissima*
(A. Gray) Dietrich [*Oe. hookeri* Torrey &
A. Gray]

Oxalidaceae

Oxalis albicans Kunth ssp. *pilosa* (Nuttall)
Eiten
Oxalis alpina (Rose) Knuth

Phytolaccaceae

Rivina humilis L.

Pinaceae

Pinus cembroides Zuccarini
Pinus leiophylla Schiede & Deppe

var. *chihuahuana* (Engelmann) Shaw

Plantaginaceae

Plantago virginica L.

Plumbaginaceae

Plumbago scandens L.

Poaceae

(Verified J.R. & C.R. Reeder)

+*Aegopogon tenellus* (DC.) Trinius

Agrostis scabra Willdenow

Aristida adscencionis L.

Aristida schiedeana Trinius & Ruprecht

var. *orcuttiana* (Vasey) Allred & Valdes
R.

Aristida ternipes Cavanilles var. *ternipes*

Bothriochloa barbinodis (Lagasca) Herter

Bouteloua aristidoides (H.B.K.) Grisebach

Bouteloua barbata Lagasca

Bouteloua curtispindula (Michaux) Torrey

Bouteloua hirsuta Lagasca

Bouteloua repens (H.B.K.) Scribner &
Merrill

Brachiaria arizonica (Scribner & Merrill)
S.T. Blake

**Bromus madritensis* L.

**Cynodon dactylon* (L.) Persoon

Digitaria californica Henrard

+**Echinochloa crusgalli* (L.) Beauvois

Elyonurus barbiculmis Hackel

Eragrostis intermedia Hitchcock

**Eragrostis lehmanniana* Nees

Eragrostis mexicana (Hornemann) Link ssp.
mexicana

Eragrostis pectinacea (Michaux) Nees var.
pectinacea

Eriochloa aristata Vasey

Heteropogon contortus (L.) Beauvois
ex Roemer & Schultes

Heteropogon melanocarpus (Elliot) Elliot ex
Bentham

Leptochloa dubia (Kunth) Nees

Leptochloa mucronata (Michaux) Kunth

Lycurus setosus (Nuttall) C. Reeder

Muhlenbergia dumosa Scribner

Muhlenbergia emersleyi Vasey

Muhlenbergia fragilis Swallen

Muhlenbergia monticola Buckley

Muhlenbergia pauciflora Buckley

Muhlenbergia porteri Scribner

Muhlenbergia rigens (Bentham) Hitchcock

Muhlenbergia sinuosa Swallen

Panicum bulbosum Kunth

Panicum hirticaule J. Presl

Dicanthelium oligosanthes (Schult.) Gould

var. *scribnerianum* (Nash) Gould

+**Pennisetum ciliare* (L.) Link

+**Pennisetum setaceum* (Forskål) Chiov.

Piptochaetium fimbriatum (H.B.K.)

Hitchcock

**Rhynchelytrum repens* (Willdenow) C.E.

Hubbard

Schizachyrium sanguineum (Retzius) Alston

Setaria macrostachya Kunth

Trachypogon secundus (J. Presl) Scribner

Polygalaceae

Monnina wrightii A. Gray

Polygala obscura Bentham

Polygonaceae

Eriogonum wrightii Torrey var. *wrightii*

Polygonum hydropiperoides Michaux

**Rumex crispus* L.

Portulacaceae

Portulaca oleracea L. [*P. retusa* Engelmann]

Portulaca suffrutescens Engelmann

Portulaca umbraticola Kunth

ssp. *lanceolata* (Engelmann) Matthews &
Ketrone

Pteridaceae

Astrolepis sinuata (Lagasca) Benham & Windham

[*Notholaena sinuata* (Lagasca) Kaulfuss]

Bommeria hispida (Metternich) Underwood

Cheilanthes bonariensis (Willdenow) Proctor

[*Notholaena aurea* (Poiret) Desvaux]

+*Cheilanthes covillei* Maxon

Cheilanthes lindheimeri Hooker

Cheilanthes wootonii Maxon

Cheilanthes wrightii Hooker

Cheilanthes yavapensis T. Reeves ex Windham

[*C. wootonii* Maxon, in part]

Notholaena grayi Davenport

Notholaena lemmonii D.C. Eaton

Notholaena standleyi Maxon

Pellaea truncata Goodding

Pellaea wrightiana Hooker

Ranunculaceae

Aquilegia chrysantha A. Gray

Clematis ligusticifolia Nuttall

Rhamnaceae

Condalia warnockii M.C. Johnston

var. *kearneyana* M.C. Johnston

Rhamnus crocea Nuttall

ssp. *ilicifolia* (Kellogg) C.B. Wolf

Ziziphus obtusifolia (Hooker) A. Gray

Rosaceae

Vauquelinia californica (Torrey) Sargent

Rubiaceae

Bouvardia ternifolia (Cavanilles)

Schlechtendal

Diodia teres Walter

Galium mexicanum H.B.K.

ssp. *asperrimum* (Gray) Dempster

Galium microphyllum Gray

Galium wrightii Gray

Rutaceae

Ptelea trifoliata L.

Salicaceae

Populus fremontii S. Watson ssp. *fremontii*

Salix exigua Nuttall

Salix gooddingii Ball

Sapindaceae

Sapindus drummondii Hooker & Arnott

Saxifragaceae

Heuchera sanguinea Engelmann

Scrophulariaceae

Castilleja tenuiflora Benthham

Schistophragma intermedia (Gray) Pennell

Mecardonia vandellioides (Kunth) Pennell

Mimulus guttatus DC.

Mimulus nasutus Greene

Penstemon parryi (A. Gray) A. Gray

Stemodia durantifolia (L.) Swartz

Selaginellaceae

Sellaginella rupincola Underwood

Solanaceae

Lycium berlandieri Dunal

Lycium exsertum Gray

Physalis sp.

Sterculiaceae

Ayenia compacta Rose

Typhaceae

Typha dominguensis Persoon

Verbenaceae

Aloysia wrightii A. Heller ex Abrams

Glandularia bipinnatifida (Nuttall) Nuttall

var. *bipinnatifida*

Viscaceae

Phoradendron californicum Nuttall

Phoradendron coryae Trelease

Phoradendron macrophyllum (Engelmann)

Cockrum

Vitaceae

Cissus trifoliata L.

Vitis arizonica Engelmann

Wildhorse Canyon (Rincon Mountain District)

By Renée Rondeau and Rebecca Van Devender

A portion of Wildhorse Canyon, approximately 194 ha (420 ac), as defined by T14S, R16E, SW $\frac{1}{4}$ and S $\frac{1}{2}$ of SE $\frac{1}{4}$ of Section 14, and E $\frac{1}{2}$ of NW $\frac{1}{4}$ and NE $\frac{1}{4}$ of Section 23 has been designated as a Protected Natural Area within the Rincon Mountain District of Saguaro National Park (Figure 2). This unique desert riparian habitat consists of a deep tinaja near the mouth of an ephemeral stream canyon. The tinaja holds an estimated minimum 0.5 acre-feet of water at capacity.

Subsequent to a fire in 1989 the tinaja silted in; at publication time (fall, 2000), the tinaja remains so. However, several smaller basins farther upstream hold enough water to maintain year-round shallow pools. The riparian corridor allows for a remarkably rich flora and makes this a prime wildlife area. Wildlife benefit from the water during drought periods, and park visitors enjoy viewing wildlife and the beauty and tranquility of the area.

A two-mile trail allows easy access to the tinaja by hikers and horseback riders. Presently the horses are allowed to be hitched to the tinaja itself, putting excess burden on a small area. Horses trample the native vegetation, leave wastes in or near the tinaja, and bring seeds of introduced species. Few visitors proceed beyond the tinaja where there is no trail and the canyon becomes choked with vegetation. However, disturbance in the lower part of the canyon has resulted in the migration of exotics upstream.

We conducted a floristic survey of the PNA in the spring (April 16 and 17) and fall (September 25, 26, and 27) of 1992, with a return trip by Van Devender and David Bertelsen on May 13. Figure 2 shows the transects surveyed. Three hundred-sixty species in 72 families were identified (Table 5). An elevational range of approximately 460 m (1500 ft) within the PNA accounts for much of this diversity. However, the canyon itself supports a large number of species. The cool, mesic streambed as well as shady rock shelves and niches in steep canyon walls provide habitat for many plants that would otherwise not be able to grow at such low elevations.

Vegetation

The area supports four vegetation types: 1) Saguaro–Foothills Paloverde Desertscrub, 2) Desert Riparian, 3) Desert-grassland, and 4) Juniper-Oak Woodland.

Saguaro-Foothills Paloverde Desertscrub

This desertscrub is the prevalent association for much of the proposed PNA, occurring approximately 920–1250 m (3000–4100 ft) elevation on slopes and ridges. It is a diverse Arizona Upland community within the Sonoran Desert, characterized by large numbers of cacti and other drought-tolerant trees and shrubs. The dominant overstory plants are saguaro (*Carnegiea gigantea*), foothills paloverde (*Parkinsonia microphylla*), mesquite (*Prosopis velutina*), whitethorn acacia, (*Acacia constricta*), and ocotillo (*Fouquieria splendens*). Terpetine bush (*Ericameria laricifolia*) and fairy duster (*Calliandra eriophylla*) are common subshrubs. Brittle bush (*Encelia farinosa*) is especially common on south slopes while sotol (*Dasyilirion wheeleri*) occurs mostly on north

slopes. Staghorn cholla (*Opuntia versicolor*), prickly pear (*O. phaeacantha*), and fishhook barrel cactus (*Ferocactus wislizenii*) are scattered throughout. Summer rains support a diverse grass flora. The dominant species are sideoats grama (*Bouteloua curtipendula*), slender grama (*B. repens*), curly mesquite (*Hilaria belangeri*), tanglehead (*Heteropogon contortus*), and spidergrass (*Aristida ternipes*).

Desert Riparian

This vegetation type is found in the main drainage, Wildhorse Canyon, and the secondary drainages to the south at approximately 940–1220 m (3100–4000 ft) elevation. In places bush muhly (*Muhlenbergia rigens*) carpets the bottom of the canyon. Dominant woody plants include catclaw acacia (*Acacia greggii*), buttonbush (*Cephalanthus occidentalis*), wait-a-minute bush (*Mimosa biuncifera*), desert hackberry (*Celtis pallida*), canyon ragweed (*Ambrosia ambrosioides*), desert honeysuckle (*Anisacanthus thurberi*), and mesquite (*Prosopis velutina*). Canyon grape (*Vitis arizonica*), seep willow (*Baccharis glutinosa*), Goodding willow (*Salix gooddingii*) and coyote willow (*S. exigua*) are locally common.

Desert-grassland

Desert-grassland occurs from approximately 1220 to 1400 m (4000 to 4600 ft). This variable community intergrades with the saguaro-paloverde desertscrub at its lower edge and the juniper-oak woodland at its upper edge. It is characterized by the presence of numerous perennial grasses which flower largely in response to summer rains. The dominant native grasses are bull grass (*Muhlenbergia emersleyi*), sideoats grama (*Bouteloua curtipendula*), hairy grama (*B. hirsuta*), slender grama (*B. repens*), tanglehead (*Heteropogon contortus*), plains lovegrass (*Eragrostis intermedia*), and cane beardgrass (*Bothriochloa barbinodis*). Ocotillo, turpentine bush, silver indigo bush, (*Dalea pulchra*), and shindagger (*Agave schottii*) are common shrubs. Shindagger forms dense stands in places. Other common but scattered plants are sotol (*Dasyliirion wheeleri*), pine needle milkweed (*Asclepias linaria*), Arizona rosewood (*Vauquelinia californica*), mesquite, wild cotton (*Gossypium thurberi*), staghorn cholla, and prickly pear cactus.

Juniper–Oak Woodland

Juniper-oak woodland is found only on north-facing slopes at the highest elevations in the extreme southeast corner of the PNA (1340–1400 m/4400–4600 ft). These slopes support an open grassy woodland. The scattered trees include alligator bark juniper (*Juniperus deppeana*), Emory oak (*Quercus emoryi*), and Mexican blue oak (*Q. oblongifolia*) with an occasional pinyon pine (*Pinus discolor*). The dominant shrubs are bear grass (*Nolina microcarpa*), manzanita (*Arctostaphylos pungens*), and shindagger. A diverse mixed grass understory is dominated by bullgrass and Texas beardgrass (*Schizachrium cirratum*). The dominant forbs, concentrated on bedrock benches, are spike moss (*Selaginella rupincola*) and bearded lip fern (*Cheilanthes wootoni*).

Introduced Species

Twenty-two introduced species, of which half are grasses, were found in the PNA. They constitute 6% of the local flora and are denoted in the checklist with an asterisk (*). Several of these were common or are known to be especially invasive. Riparian ecosystems are fragile and extremely

susceptible to invasions of exotic plants. Virtually all of the introduced species were found in the main canyon or its side drainages. Some of these also extended up the slopes.

The introduced flora in Wildhorse Canyon varied dramatically from spring to fall as several very common annuals flourished seasonally. Red brome (*Bromus madritensis*) is an opportunistic annual that was abundant throughout the site in the spring due to ample winter rains. It formed dense stands in the lower part of the canyon both above and below the tinaja. Bedstraw (*Galium aparine*), another spring annual, was also abundant in the canyon bottom, particularly along the shady, north-facing wall. In September these species were gone, replaced primarily by common cocklebur (*Xanthium strumarium*), a cosmopolitan summer annual of questionable origin, which formed dense thickets in the canyon bottom extending as far up as 1100 m (3600 ft).

Introduced perennial species were mostly grasses. Several patches of fountain grass (*Pennisetum setaceum*) were observed in the canyon and at least one side drainage. It is an escapee from cultivation and easily invades watercourses, roadways and occasionally hillsides. We expect that it will flourish in the Rincons as it has done elsewhere if measures are not taken to eradicate it. Natal grass (*Rhynchelytrum repens*) was found scattered throughout the PNA, although it was denser in the canyon bottom. It is not nearly as invasive as fountain grass. Lehmann lovegrass (*Eragrostis lehmanniana*), a summer flowering species which spreads rapidly, particularly in disturbed areas, was scattered. It was, however, abundant along Wildhorse trail just north of the PNA. Bermuda grass (*Cynodon dactylon*) was locally common in patches in the canyon bottom, especially in the vicinity of the tinaja. It is a tenacious grass that does well in any mesic, disturbed situation.

Only a few individuals of the strongly invasive tamarisk (*Tamarix ramosissima*) were found at 1100 m (3600 ft) in the canyon bottom. This tree is notorious for spreading along both perennial and intermittent streams in the southwest U.S. and could do well in Wildhorse Canyon. It, too, should be targeted for eradication before it becomes a real problem. The other exotic species were relatively uncommon and none pose a threat to the native vegetation.

Additions to the Flora

Nine species which are denoted in the checklist with a plus sign (+) are new to the Rincon Flora (Bowers and McLaughlin 1987). Five are natives: maidenhair fern (*Adiantum capillus-veneris*), Parish Indian mallow (*Abutilon parishii*), Sonoran bursage (*Ambrosia cordifolia*), stickleaf (*Mentzelia affinis*), and red spiderling (*Boerhavia gracillima*). Maidenhair fern is found in Wildhorse Canyon below shady moist overhangs. Two populations were discovered at 975 m (3200 ft) and 1050 m (3450 ft) in the main canyon. Parish Indian mallow is a summer-flowering perennial herb found among boulders and rock shelves on slopes above the canyon bottom. It is scattered throughout in small numbers. A few shrubs of Sonoran bursage were found among the abundant canyon ragweed in the streambed. These plants were atypical and appeared to be introgressed with the canyon ragweed based on examination of the leaf and fruit morphology. Stickleaf, a spring annual, was locally common in the canyon bottom, especially below the tinaja. Red spiderling, a summer-flowering perennial herb, was uncommon on a west-facing slope in saguaro-paloverde desertscrub.

Three of the introduced species new to the flora are escapes from cultivation: African daisy (*Dimorphotheca sinuata*), a spring annual, was rare (one individual) on the north slope above Wildhorse Canyon. Fountain grass was occasional in the main canyon and a side drainage below the tinaja. A single individual of pampas grass (*Cortaderia sellowana*) was observed at approximately 1100 m (3600 ft) in a very steep part of the canyon. These three exotics are commonly grown ornamentals in the Tucson area. In contrast, weeping lovegrass (*Eragrostis curvula*), a perennial native to Africa, was deliberately introduced by the Soil Conservation Service as a possible range forage grass (Gould 1977). It has since spread throughout the southwest. In Wildhorse Canyon a small population was found only in one narrow side drainage.

Sensitive Species

Parish Indian mallow (*Abutilon parishii*) has a widely scattered distribution in the lower canyons of the Santa Catalina Mountains and is known from a few areas in the Tucson Mountains. The Wildhorse Canyon record is the first for the species from the Rincons. The plant, designated a C2 species before that protection category disappeared, is not considered threatened or endangered at this time. The C2 label (candidate for listing) indicated decline and that more information was needed about the species. On return visits in May 1992, Van Devender and Bertelsen located 63 individuals from 7 sites in both the canyon and its main side drainage, the largest number of plants known to date from a single area. The largest populations were found on southwest-facing rock shelves below the tinaja at about 960 m (3150 ft) elevation (13 plants) and on a shady, east-facing canyon wall at about 1000 m (3200 ft) elevation (19 plants).

Management and Protection Needs

Wildhorse Canyon and its side drainages and slopes support a rich flora. In spite of the small area (approximately 194 ha/420 ac), over one-third of all species (360/986) found in the Rincon Mountains are represented in the Wildhorse PNA. The streambed is an unusual riparian corridor in a desert biome. Water remains throughout the canyon in potholes and basins year-round; it supports aquatic wildlife as well as provides a drinking source for terrestrial animals.

Except for the tinaja area, the PNA is seldom visited by people. Because the trail parallels or crosses the lower streambed several times, and the tinaja is a destination point for hikers and horseback riders, the potential for introducing exotic species is high. The riparian flora in and around the tinaja is strongly altered. As the canyon narrows and the gradient increases upstream introduced species become less common. Intensive seasonal floods provide a natural barrier to plant dispersal. Given enough time, however, exotics may migrate up the entire length of Wildhorse Canyon.

Fountain grass was not known to occur in the Rincon Mountains prior to publication of the Bowers and McLaughlin (1987) flora, but small populations are established in lower Wildhorse Canyon. We predict rapid increase of this species since we have seen explosive invasions in similar canyons in the Santa Catalina and the Tucson Mountains. Pima County Parks and Recreation Department has had some success controlling fountain grass by physically digging up plants along Kinney Road in the Tucson Mountains.

Tamarisk is so scarce in Wildhorse Canyon that it could be easily eradicated. Once it becomes well established little can be done to control this noxious tree that can out-compete all other riparian species.

Common cocklebur is a stout annual that sprouts in response to summer rains. The woody, hooked fruits are easily transported on clothing and animal hair. However, it cannot survive on dry slopes and thus is limited to larger drainages. It might be possible to have mid-summer weeding sessions while the plants are still small and fruits are not ripe. We expect such an effort would have to be repeated for several years to have a significant effect.

Natal grass and Lehmann lovegrass are so scattered and widespread that it will probably take serious research to determine an effective method of elimination. The annual red brome is an even more difficult problem. It seeds prolifically and is abundant in wet years in all habitats. Control of exotics is always a difficult chore that requires constant vigilance. We recommend that the park consult a specialist in eradication of introduced species. It will also be necessary to limit access to the tinaja, especially by horses, in order to reduce the immigration and migration of exotics. We recommend that Wildhorse Canyon be maintained as a Protected Natural Area with use restrictions that could stem the tide of introduced species up the canyon. If such measures are taken, this canyon will continue to be a rare and outstanding habitat in the Rincon Mountains. Otherwise, it will inevitably become a less interesting and less diverse ecosystem.

Table 5. Wildhorse Canyon Checklist of Vascular Plants. Wildhorse Canyon is a Protected Natural Area within the Rincon Mountain District of Saguaro National Park. This list was compiled in 1992 by Renée Rondeau and Rebecca Van Devender. Plant names follow Kartesz (1994).

+ = New addition to the flora of the Rincon Mountains of Bowers and McLaughlin (1987)

* = Introduced species

Acanthaceae

Anisacanthus thurberi (Torrey) Gray
Carlowrightia arizonica Gray
Siphonoglossa longiflora (Torrey) Gray

Adiantaceae

Adiantum capillus-veneris L.
Bommeria hispida (Mett.) Underw.
Cheilanthes bonariensis (Willd.) Proctor
Cheilanthes lindheimeri Hook.
Cheilanthes wootonii Maxon.
Cheilanthes wrightii (Hooker)
Astrolepis sinuata (Lag. ex Sw) Bentham & Windham
 ssp. *sinuata*
Notholaena standleyi Maxon
Pellaea truncata Goodding
Pellaea wrightiana (Hook.)
Pityrogramma triangularis (Kaulf.) Maxon

Agavaceae

Agave cf. palmeri Engelman
Agave schottii Engelman var. *schottii*
Yucca baccata Torrey var. *brevifolia* (Schott ex Torr.)
 L. Benson & Darrow

Amaranthaceae

Amaranthus palmeri S. Watson
Froelichia arizonica Thornber ex Standley
Iresine heterophylla Standl.

Apiaceae

Bowlesia incana Ruiz & Pav.
Daucus pusillus Michx.

Lomatium nevadense (S. Watson) Coulter & Rose

Spermolepis echinata (Nuttall) Heller

Apocynaceae

Haplophyton crooksii L.

Aristolochiaceae

Aristolochia watsonii Wooton & Standley

Asclepiadaceae

Asclepias linaria Cavanilles
Cynanchum arizonicum (Gray) Shinnars
Matelea arizonica (Gray) Shinnars
Sarcostemma cynanchoides Decaisne
 ssp. *hartwegii* (Vail) R. Holm

Asteraceae

Acourtia wrightii (Gray) Reveal & King
Ambrosia ambrosioides (Cavanilles) Payne
Ambrosia confertiflora DC.
+ *Ambrosia cordifolia* (Gray) Payne
Artemisia ludoviciana Nuttall
Antheropeas lanosum (Gray) Rydberg
 [*Eriophyllum lanosum* (Gray) Gray]
Baccharis salicifolia (R. & P.) Persoon
 [*B. glutinosa* Persoon]
Baccharis sarothroides A. Gray
Bahia absinthifolia Bentham
Bahia dissecta (Gray) Britt.
Bidens aurea (Ait.) Sherff
Brickellia amplexicaulis B. L. Rob.
Brickellia californica (Torrey & Gray) Gray
Brickellia coulteri Gray
Brickellia venosa (Wooton & Standley) B.L. Robinson

Calycoseris wrightii Gray
Carphochaete bigelovii Gray
Cirsium neomexicanum Gray
Conyza canadensis (L.) Cronquist
Coreocarpus arizonicus (Gray) Blake
Dyssodia porophylloides Gray
Encelia farinosa Gray
Ericameria laricifolia (Gray) Shinnery
Erigeron colomexicanus (A. Nels.)
Erigeron oreophilus Greenman
Eupatorium solidaginifolium Gray
Gnaphalium chilense Sprengel
Gnaphalium wrightii A. Gray
Gymnosperma glutinosum (Sprengel)
 Lessing
Heterotheca subaxillaris (Lamarck) Britton
 & Rusby
Hymenoxys wrightii A. Gray
Isocoma tenuisecta Greene
 **Lactuca serriola* L.
Machaeranthera pinnatifida (Hooker)
 Shinnery
Machaeranthera tagetina Greene
Machaeranthera tephrodes A. Gray
Malacothrix clevelandii Gray
Microseris lindleyi (DC.) A. Gray
 +**Osteospermum sinuatum* (DC.) Norf.
Porophyllum gracile Bentham
Psilostrophe cooperi (A. Gray) Greene
Rafinesquia neomexicana Gray
Sanvitalia abertii Gray
Senecio douglasii DC. var. *monoensis*
 (Greene) Jepson
Senecio lemmoni A. Gray
Senecio neomexicanus Gray
 **Sonchus asper* (L.) Hill
 **Sonchus oleraceus* L.
Stephanomeria pauciflora (Torrey) A.
 Nelson
Stylocline micropoides Gray
Thymophylla pentachaeta (DC.) Small
 var. *pentachaeta*
Trixis californica Kellogg
Viguiera annua (Jones) Blake
Viguiera dentata (Cavanilles) Sprengel

var. *lancifolia* Blake
 **Xanthium strumarium* L.
Zinnia acerosa (DC.) A. Gray

Bignoniaceae

Tecoma stans (L.) Juss. ex Kunth

Boraginaceae

Amsinckia intermedia Fisch. & Mey.
Cryptantha barbiger (A. Gray) Greene
Cryptantha pterocarya (Torrey) Greene
Harpagonella palmeri Gray
Pectocarya platycarpa (Munz & I. M.
 Johnston)
 Munz & I. M. Johnston
Pectocarya recurvata I. M. Johnston
Plagiobothrys collinus (Phil.) I. M. Johnst.

Brassicaceae

Arabis perennans S. Watson
 **Capsella bursa-pastoris* (L.) Medik.
Descurainia pinnata (Walt.) Bentham
Lepidium lasiocarpum Nuttall
Lepidium virginicum L.
 var. *medium* (Greene) C. L. Hitchcock
 [*L. medium* Greene]
 **Sisymbrium irio* L.
Schoenocrambe linearifolia (Gray) Rollins
Thysanocarpus elegans Fisch. & Mey.

Cactaceae

Carnegia gigantea (Engelmann) Britton &
 Rose
Coryphantha vivipara (Nuttall) Britton &
 Rose
 var. *bisbeeana* (Orcutt) L. Benson
Echinocereus fasciculatus (Engelmann) L.
 Benson
Echinocereus fendleri (Engelmann)
 Engelmann
 ex. Rumpler var. *rectispinus* (Peebles) L.
 Benson
Ferocactus wislizenii (Engelmann) Britton &
 Rose
Mammillaria heyderi Muhl.

var. *macdougalii* (Rose) L. Benson
Mammillaria grahamii Engelman var.
grahamii
Opuntia bigelovii Engelman
Opuntia chlorotica Engelman & Bigelow
Opuntia fulgida Engelman
var. *mammillata* (Schott) Coulter
Opuntia leptocaulis DC.
Opuntia phaeacantha Engelman
Opuntia phaeacantha Engelman
var. *laevis* (Coulter) L. Benson
Opuntia spinosior (Engelman) Toumey
Opuntia versicolor Engelman

Campanulaceae

Triodanis holzingeri McVaugh
Triodanis perfoliata (L.) Nieuwland
var. *biflora* (Ruiz & Pavon) DC.

Capparidaceae

Polanisia dodecandra (L.) DC.
ssp. *tracysperma* (Torrey & Gray) Iltis

Caryophyllaceae

Cerastium gracile Dufour
Silene antirrhina L.

Chenopodiaceae

Atriplex canescens (Pursh) Nuttall
Chenopodium graveolens Willd.
Chenopodium palmeri Standley

Commelinaceae

Commelina erecta L.
Tradescantia occidentalis (Britton) Smythe

Convolvulaceae

Evolvulus alsinoides (L.) L.
Evolvulus arizonicus A. Gray
Ipomoea coccinea L.
Ipomoea costellata Torrey
Ipomoea hederacea (L.) Jacq.
Ipomoea leptotoma (Torrey)
Jacquemontia pringlei A. Gray

Crassulaceae

Crassula connata var. *connata*
Graptopetalum rusbyi (Greene) Rose

Crossosomataceae

Crossosoma bigelovii S. Watson

Cupressaceae

Juniperus deppeana Steudel

Cyperaceae

Cyperus squarosis L.
**Cyperus esculentus* L.
Cyperus fendlerianus Boeckl.
Eleocharis montevidensis Kunth.

Ericaceae

Arctostaphylos pungens H. B. K.

Euphorbiaceae

Acalypha neomexicana Mueller-Argoviensis
Chamaesyce capitellata Engelman)
Millsbaugh
Chamaesyce florida (Engelman) Millsbaugh
Chamaesyce hyssopifolia (L.) Standley
Chamaesyce melanadenia (Torrey)
Millsbaugh
Euphorbia heterophylla L.
Jatropha cardiophylla (Torrey) Mueller-
Argoviensis
Tragia nepetifolia Cavanilles

Fabaceae

Acacia angustissima (Millsbaugh) Kuntze
Acacia constricta Benth
Acacia greggii Gray
Amorpha fruticosa L.
Astragalus nuttallianus DC.
Calliandra eriophylla Benth
Dalea pringlei Gray
Dalea pulchra Gentry

Dalea versicolor Zucc.
 ssp. *versicolor* var. *sessilis* (Gray)
 Barneby
Desmodium cf. *batocaulon* Gray
Desmodium rosei Schubert
Galactia wrightii Gray
Lotus humistratus Greene
Lotus oroboides (Kunth) Ottley var.
oroboides
Lotus rigidus (Benth.) Greene
Lupinus concinnus Agardh.
Lupinus sparsiflorus Benth.
Macroptilium gibbosifolium (Ortega) A.
 Delgado
Marina parryi (Torrey & Gray) Barneby
Mimosa aculeaticarpa Ortega
 var. *biuncifera* (Benth.) Barneby
Nissolia schottii (Torrey) Gray
Parkinsonia florida (Benth.) ex Gray
 Watson
Parkinsonia microphylla Torrey
Phaseolus acutifolius Gray
Prosopis velutina Wooton
Senna covesii (Gray) Irwin & Barneby
Tephrosia tenella Gray
Vicia ludoviciana Nuttall

Fagaceae

Quercus emoryi Torrey
Quercus oblongifolia Torrey

Fouquieriaceae

Fouquieria splendens Engelman ssp.
splendens

Garryaceae

Garrya wrightii Torrey

Gentianaceae

Centaurium calycosum (Buckl.) Fern.

Hydrophyllaceae

Emmenanthe penduliflora Benth.
Eucrypta chrysanthemifolia (Benth.)
 Greene

Phacelia bombycina Wooton & Standley
Phacelia coerulea Greene
Phacelia cryptantha Greene
Phacelia distans Benth.
Phacelia ramosissima Dougl. ex Lehm.

Juncaceae

Juncus bufonius L.
Juncus interior Wieg.
Juncus marginatus Rostk.

Lamiaceae

Hedeoma nana (Torrey) Briquet
Hyptis emoryi Torrey
Stachys coccinea Jacquin

Liliaceae

Calochortus ambiguus (M. E. Jones)
 Ownbey
Calochortus kennedyi Porter
Dichelostemma pulchellum (Salisb.) Heller

Loasaceae

+*Mentzelia affinis* Greene
Mentzelia albicaulis (Douglas) Torrey &
 Gray
Mentzelia asperula Wooton & Standley

Loranthaceae

Phoradendron californicum Nuttall
Phoradendron capitellatum Torrey
Phoradendron villosum (Nuttall) Nuttall
 ssp. *coryae* (Trel.) Wiens

Malpighiaceae

Janusia gracilis A. Gray

Malvaceae

Abutilon abutiloides (Jacquin) Garcke
Abutilon incanum (Link.) Sweet
 +**Abutilon parishii* Watson
Gossypium thurberi Todaro
Herissantia crispa (L.) Brizicky
Hibiscus biseptus S. Wats.
Hibiscus coulteri Harvey

Sphaeralcea emoryi Torrey
Sphaeralcea fendleri Gray
Sphaeralcea laxa Wooton & Standley

Moraceae

Morus microphylla Buckley

Nolinaceae

Dasyllirion wheeleri S. Watson
Nolina microcarpa S. Watson

Nyctaginaceae

Allionia incarnata L.
Boerhavia diffusa L. var. *diffusa*
Boerhavia erecta L.
+*Boerhavia gracillima* Heimerl.
Boerhavia intermedia M. E. Jones
Boerhavia scandens L.
Mirabilis coccineus (Torrey) Bentham &
Hooker

Onagraceae

Camissonia californica
(Nuttall ex Torrey & Gray) Raven
Epilobium canum (Greene) Raven
ssp. *latifolium* (Hooker) Raven
Oenothera primiveris Gray

Papaveraceae

Eschscholtzia californica Cham.
ssp. *mexicana* (Greene) C. Clark
Platystemon californicus Bentham

Phytolaccaceae

Rivina humilis L.

Pinaceae

Pinus cembroides Zuccarini

Plantaginaceae

Plantago insularis Eastw.
Plantago patagonica Jacquin
Plantago virginica L.

Plumbaginaceae

Plumbago scandens L.

Poaceae

Aristida scabra Willd.
Aristida adscencionis L.
Aristida hamulosa Henr.
Aristida parishii Hitchcock.
Aristida ternipes Cavanilles
Bothriochloa barbinodis (Lagasca) Herter
Bouteloua aristidoides (Kunth) Grisebach
Bouteloua chondrosoides (Kunth) Griesbach
Bouteloua curtispindula (Michaux) Torrey
Bouteloua eripoda (Torrey) Torrey
Bouteloua hirsuta Lagasca
Bouteloua radicata (Fourn.) Griffiths
Bouteloua repens (Kunth) Scribner & Merrill
Bromus carinatus Hooker & Arnott
**Bromus madritensis* L.
Chloris virgata Swartz
+**Cortaderia selloana* (JA & JH Schultes)
Asch. & Graebn.
Cottea pappophoroides Kunth
Critesion murinum (L.) Love
ssp. *leporinum* (Link) Love
Critesion pusillum (Nuttall) Love
**Cynodon dactylon* (L.) Persoon
Digitaria californica Henrard
Diplachne dubia (Kunth) Scribn.
Echinochloa colonum (L.) Link
Elymus elymoides (Rafinesque) Swezey
Enneapogon desvauxii P. Beauvois
**Eragrostis cilianensis* (Allard)
Vignolo-Lutati ex Janchen
+**Eragrostis curvula* (Schrad.) Nees
Eragrostis intermedia Hitchcock
**Eragrostis lehmanniana* Nees
Eragrostis pectinacea (Michaux) Nees
Eriochloa aristida Vasey
Eriochloa lemmonii Vasey & Scribner
var. *gracilis* (Fourn.) Gould
Erioneuron pulchellum (Kunth) Tateoka
Heteropogon contortus (L.) Beauvois
ex Roemer & Schultes
Hilaria belangeri (Steud.) Nash

Leptochloa filiformis (Lamarck) P. Beauvois
Lycurus setosus (Nuttall) C. Reeder
Muhlenbergia arizonica Scribner
Muhlenbergia dumosa Scribner
Muhlenbergia emersleyi Vasey
Muhlenbergia microsperma (DC.) Kunth
Muhlenbergia monticola Buckley
Muhlenbergia porteri Scribner
Muhlenbergia rigens (Bentham) Hitchcock
Muhlenbergia sinuosa Swallen
Panicum bulbosum Kunth
Panicum hirticaule Presl.
 +**Pennisetum setaceum* (Forsk.) Chiov.
 **Phalaris canariensis* L.
Poa bigelovii Vasey & Scribner
 **Polypogon monspeliensis* (L.) Desfontaines
 **Rhynchelytrum repens* (Willdenow) C.E.
 Hubbard
Schizachyrium cirratum (Hackel) Wooton &
 Standley
Schizachyrium sanguineum (Retzius) Alston
Setaria macrostachya H. B. K.
Sporobolus wrightii Munro
Tridens muticus (Torrey) Nash
Vulpia microstachys (Nuttall) Munro
Vulpia octoflora (Walter) Rydberg

Polemoniaceae

Eriastrum diffusum (A. Gray) Mason
Gilia flavocincta A. Nels.
 ssp. *australis* (A. & V. Grant) Day &
 Grant
Linanthus bigelovii (Gray) Greene
Microsteris gracilis (Hook.) Greene

Polygonaceae

Eriogonum abertianum Torrey
Eriogonum wrightii Torrey
Pterostegia drymarioides Fisch. & Mey.
Rumex hymenosepalus Torrey

Portulacaceae

Calandrinia ciliata (Ruiz & Pavon) DC.
Claytonia perfoliata Donn
Portulaca suffrutescens Engelm

Talinum paniculatum (Jacquin) Gaertner

Primulaceae

Androsace occidentalis Pursh

Ranunculaceae

Anemone tuberosa Rydberg
Delphinium scaposum Greene
Myosurus culpulatus S. Watson

Rhamnaceae

Rhamnus crocea Nuttall
 ssp. *ilicifolia* (Kellogg) C.B. Wolf
Ziziphus obtusifolia (Hooker) Gray
 var. *canescens* (Gray) M. C. Johnston

Rosaceae

Vauquelinia californica (Torrey) Sargent

Rubiaceae

Bouvardia ternifolia (Cavanilles)
 Schlechtendal
Cephalanthus accidentalis L.
 **Galium aparine* L.
Galium microphyllum Gray
Galium proliferum Gray

Salicaceae

Populus fremontii S. Watson
Salix exigua Nuttall
Salix gooddingii Ball
Salix taxifolia Kunth

Santalaceae

Comandra umbellata (L.) Nuttall
 ssp. *pallida* (DC.) Piehl

Sapindaceae

Dodonea viscosa (L.) Jacquin
Sapindus drummondii Hooker & Arnott

Saxifragaceae

Fendleria rupicola Gray
Heuchera sanguinea Engelm

Scrophulariaceae

Antirrhinum nuttallianum Benth
Castilleja tenuiflora Benth
Linaria texana Scheele
Maurandya antirrhiniflora Humboldt &
Bonpland
Mecardonia vandellioides (H. B. K.) Pennell
Mimulus guttatus DC.
Mimulus nasutus Greene
Penstemon barbatus (Cavanilles) Roth
Penstemon parryi (A. Gray) A. Gray
Stemodia durantifolia (L.) Swartz

Selaginellaceae

Selaginella arizonica Maxon
Selaginella rupicola Underw.

Solanaceae

Lycium berlandieri Dunal
Lycium exsertum A. Gray
Nicotiana trigonophylla Dunal
Physalis crassifolia Benth
Solanum douglasii Dunal

Sterculiaceae

Ayenia compacta Rose

Tamaricaceae

**Tamarix ramosissima* Ledeb.

Typhaceae

Typha domingensis Persoon

Ulmaceae

Celtis pallida Torrey

Urticaceae

Parietaria hespera Hinton

Valerianaceae

Plectritis ciliosa (Greene) Jepson
ssp. *insignis* (Suksdorff) Morey

Verbenaceae

Aloysia wrightii A.A. Heller ex Abrams
Glandularia bipinnatifida (Nuttall) Nuttall
var. *bipinnatifida*

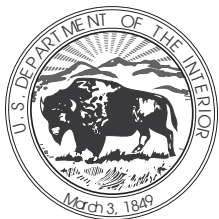
Vitaceae

Vitis arizonica Engelmann

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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.