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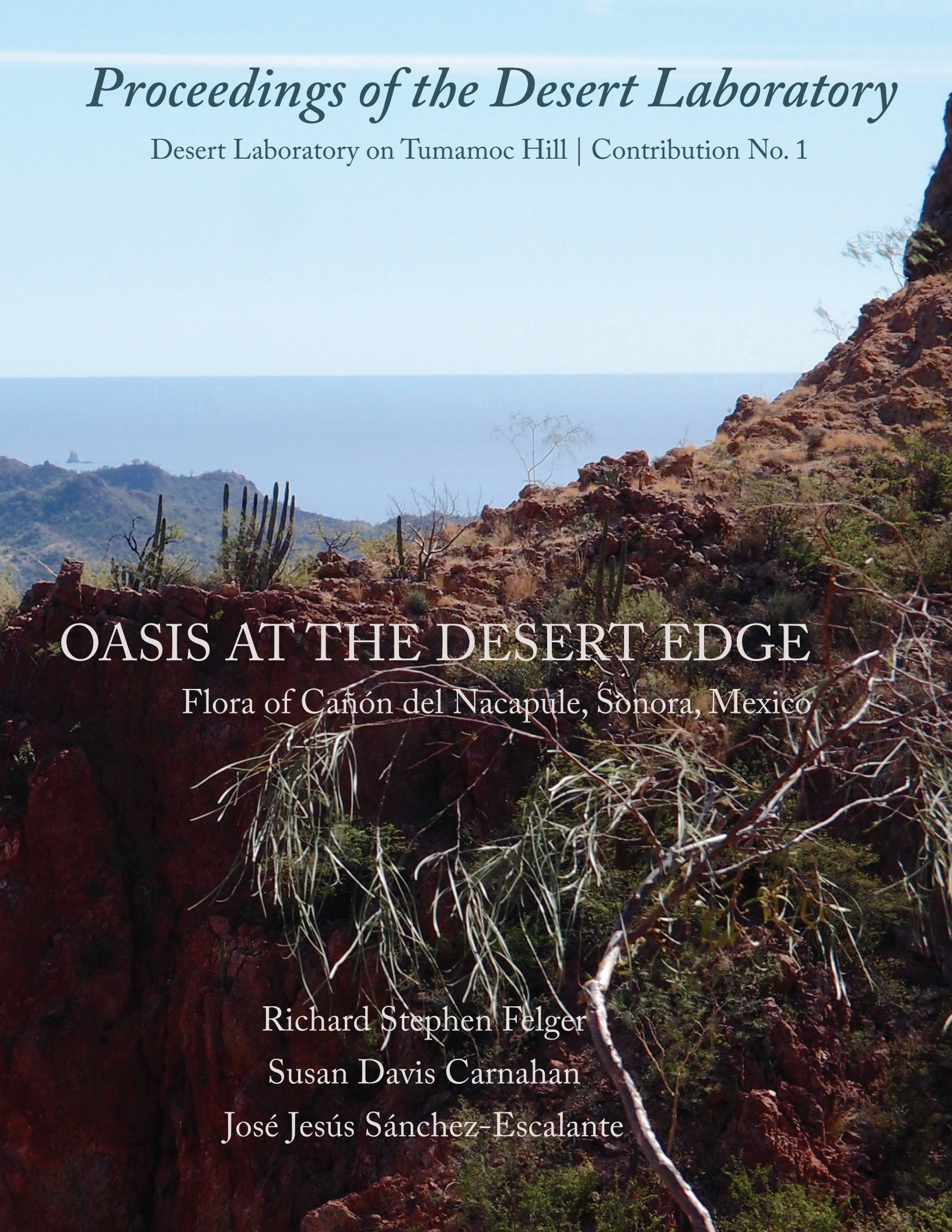

OASIS AT THE DESERT EDGE

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Tucson, AZ
Published by the Desert Laboratory on Tumamoc Hill
2017

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Images by Susan Davis Carnahan unless otherwise stated; all images © the respective photographers.
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A digital version of this publication is available at:
www.tumamoc.arizona.edu

ISBN 978-0-9997029-0-1

Published by: The Desert Laboratory on Tumamoc Hill, University of Arizona

Felger, R.S., S.D. Carnahan, J.J. Sánchez-Escalante. 2017. Oasis at the Desert Edge: Flora of Cañón del Nacapule, Sonora, Mexico. *Proceedings of the Desert Laboratory*, Contribution No. 1:1–220.

This publication was supported by the Agnese Nelms Haury Program in Environment and Social Justice

December, 2017

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OASIS AT THE DESERT EDGE

Flora of Cañón del Nacapule, Sonora, Mexico

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ABSTRACT

Cañón del Nacapule cuts into the southeastern flank of the Sierra El Aguaje, a rugged volcanic range about 20 kilometers northwest of Guaymas. Nacapule is included in the Sonoran segment of the Gulf Coast subdivision of the Sonoran Desert. The bi-seasonal (summer and winter) rainfall is highly variable. Many plants of tropical origin reach their northern limits in this region or do not extend farther north in the arid coastal desert of western Sonora. The vegetation in the canyon resembles tropical thornscrub and approaches the character of tropical deciduous forest in the wetter and shaded habitats, while the steep canyon walls and exposed habitats support desertscrub. The Nacapule flora includes 310 species in 233 genera and 72 families. The most diverse families are Fabaceae, Asteraceae, Poaceae, Malvaceae, Euphorbiaceae, and Cactaceae. Brief species accounts and identification keys as well as over 300 color photos are provided for the flora known from the canyon, nearby Nacapule Spring, and within 500 meters of the canyon mouth. *Verbesina felgeri* is endemic to the Sierra El Aguaje, and geographically isolated populations of tropical genera such as *Aphanosperma*, *Briquetia*, *Coccoloba*, and *Ficus* occur in the canyon. Plants not native to the Guaymas region, mostly Old World weeds, are represented by 19 species, three of which are not established as reproducing populations, including *Corchorus olitorius*, a new record for the state of Sonora. The canyon is managed for ecotourism by the local property owners, restoring earlier habitat degradation. Cañón del Nacapule, with 291 native species, provides conservation for 42% of the total native flora (ca. 700 taxa) of the 532,000 hectares (5320 km^2) of the greater Guaymas region.

RESUMEN

El Cañón del Nacapule se introduce en el flanco sureste de la Sierra El Aguaje, una accidentada cordillera volcánica a 20 kilómetros al noroeste de Guaymas. Nacapule está incluido en el segmento Sonorense de la Costa Central del Golfo, una subdivisión del Desierto Sonorense. La precipitación bi-estacional (verano e invierno) es altamente variable. Muchas plantas de origen tropical alcanzan sus límites norteños en esta región o no se extienden mas al norte en el oeste árido de Sonora. La vegetación en el cañón se asemeja al matorral espinoso tropical y se aproxima a la selva baja caducifolia en los habitats más húmedos y sombreados y al matorral desértico en las paredes empinadas del cañón y en los habitats más expuestos. La flora del Nacapule incluye 310 especies en 233 géneros y 72 familias. Las familias más diversas son Fabaceae, Asteraceae, Poaceae, Malvaceae, Euphorbiaceae, y Cactaceae. Se proporciona un breve conteo de especies, claves de identificación y más de 300 fotos para la flora conocida del cañón, así como para el Aguaje del Nacapule cercano, y hasta 500 metros (m) hacia afuera del cañón. *Verbesina felgeri* es endémica a los cañones de la Sierra El Aguaje. Poblaciones de géneros tropicales, aisladas geográficamente, como *Aphanosperma*, *Briquetia*, *Coccoloba*, y *Ficus* ocurren en el cañón. Plantas no nativas a la Región de Guaymas, en su mayoría malezas del Viejo Mundo, están representadas por 19 especies, tres de ellas no establecidas como poblaciones reproductoras, incluyendo *Corchorus olitorius*, un registro nuevo para el estado de Sonora. El cañón es manejado para ecoturismo por los propietarios locales, quienes han restaurado la degradación reciente del habitat. El Cañón del Nacapule, con sus 291 especies nativas, sirve para conservar el 42% de toda la flora nativa (ca. 700 taxa) en las 532 mil hectáreas (5320 km^2) de la grandiosa Región de Guaymas.

INTRODUCTION

FIGURE 1. View southward to Cañón del Nacapule, with trailhead and parking lot in foreground, and San Carlos, Cerro Tetas de Cabra, and Gulf of California in background; 4 Sep 2015. The canyon entrance is at 28º00'56"N, 111º02'58"W (WGS 84) and 122 m elevation. Photo courtesy of Juan Ezequiel Nuñez, © Cheque's Films Producciones, Guaymas.

Cañón del Nacapule is floristically rich with 310 species and an extensive history of botanical collections beginning with Edward Palmer in 1897. This desert-bounded tropical canyon is 6 km north of the beach resort town of San Carlos, approximately 20 km northwest of Guaymas. The canyon, about 50 hectares, slices into the southeastern flank of the Sierra El Aguaje (Figures 1 and 2). The red and yellow volcanic slopes of this range rise steep and ragged from the bajada plain to a peak elevation of ca. 860 m. This study includes the canyon, its immediate slopes, and open desert within about 500 m of the canyon entrance, as well as the nearby Nacapule Spring, known locally as Aguaje de Nacapule, located 0.83 km north (353º) of the canyon entrance on an east-facing slope (Figure 2). *Nacapule* is the Yoeme (Yaqui) and local name for a large native fig tree, *Ficus pertusa*.

Parts of this publication first appeared in the Proceedings of the San Diego Society of Natural History (Felger 1999) and are included here with permission granted by the San Diego Society of Natural History. The earlier report on the Nacapule flora included 285 species in 215 genera and 65 families. Our revised flora of Nacapule includes 310 species in 233 genera and 72 families, and provides new information from additional collections and fieldwork as well as revised keys and descriptions, updated

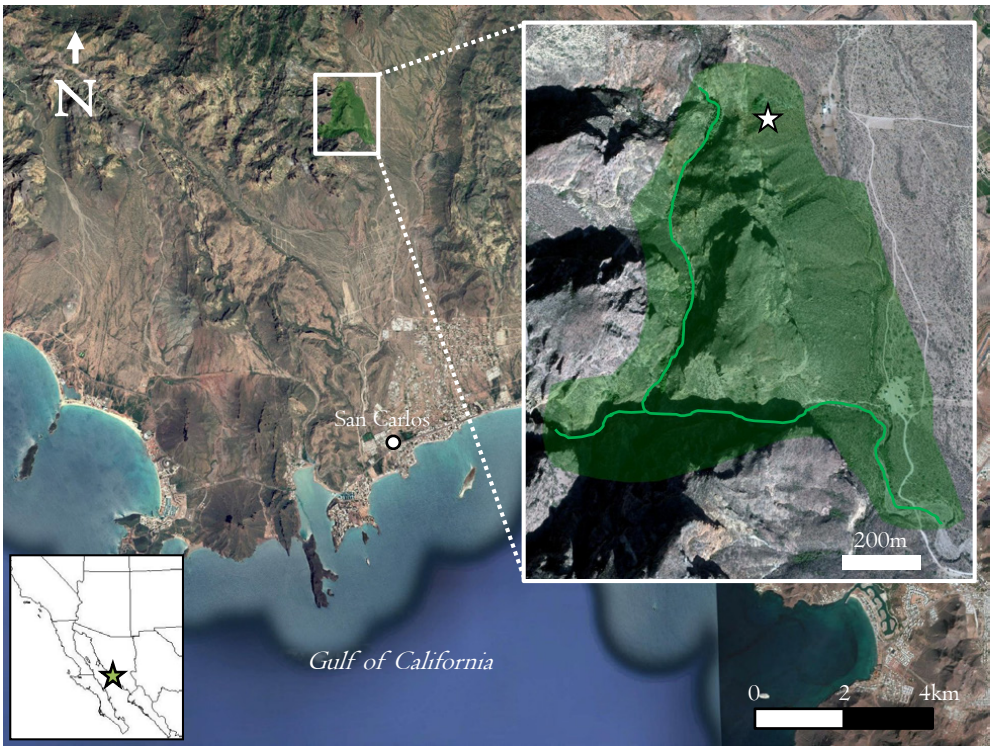


FIGURE 2. Satellite image of Cañón del Nacapule and surrounding area. The shaded area, approximately 0.8 km² (80 ha), is the flora area of Cañón del Nacapule; the green line indicates the canyon bottom. The star marks the location of Nacapule Spring. Note the winter shadow on north-facing areas of the canyon. Map by Michael Bogan; map data: Google, DigitalGlobe, 27 Dec 2014.

taxonomy, natural history, and illustrations. All photographs are by Sue Carnahan unless otherwise indicated.

Richard Felger writes: On my first trip to the area when I was 18 years old, I camped beneath a lone *Sabal* palm on the cobble beach by the yet undeveloped Bahía San Carlos. Jesús Ortega, a cowboy from a nearby ranchito, took me by horse to see the cool, green canyon. He said it was named for the huge *nacapule* tree at the spring just north of the canyon mouth. We drank from the water and saw two boa constrictors mating among the dry, crackling leaves of *chalate* trees. Cattle had muddied the ground around the wooden water trough. We rode into the deep canyon, green like the tropics, shaded in the late afternoon of a hot summer day. Palms overtopped the trees and marched up rugged rhyolite walls and fig trees hung from cliff faces. We stopped to roll cigarettes. Jesús was proud of the mystic gorge turning purple in the hazy dusk.

Over the years I visited the canyon whenever possible, and in 1999 I published a flora of the canyon. Now it is time to offer a revised, open-access account of this special place.

Sue Carnahan writes: I first came to the San Carlos area for birding and kayaking, but the shapes and textures of the landscape kept capturing my attention: the swollen *torote* trunks, weedy but ornate passionflowers, palms clinging to cliffs or crowded into canyons. A visit to Nacapule Canyon in December 2011 was probably the turning point. Nearing the canyon mouth, I stopped the car to photograph a gingko-leaved shrub with bunches of brilliant yellow flowers. Entering the canyon proper, I soon plunged into the near-permanent shade of the high south wall, and the hat that only moments before had shielded my eyes from the sun became a head-warmer. Lush, unfamiliar plants lined the path or clung to the slopes and cliffs, but I wouldn't know any of their names until later.

The gingko-like shrub? *Haematoxylum brasiletto*. A shrubby sea grape with strings of tiny green pearls? *Coccoloba goldmanii*. Ghostly tree trunks with peeling bark: *Mariosousa* (*Acacia*) *willardiana*. Clambering vines bearing "mangos": *Marsdenia edulis*. Flowers that opened like fringed clamshells: *Dalechampia scandens*. I was puzzled, intrigued, and determined to learn everything I could about this bizarre tropical-desert flora only a few kilometers from the sea. On subsequent visits, armed with Richard's 1999 Nacapule flora, I set about photographing and identifying the plants of the canyon as well as the surrounding desert. That quest continues and, even as I explore more of the Sierra El Aguaje and parts of the region, Nacapule maintains a special hold on me.

We drank from the water and saw two boa constrictors mating among the dry, crackling leaves of *chalate* trees.

Richard Felger

Jesús Sánchez escribe: En junio de 1999, después de invitar a Richard Felger a colaborar en un proyecto bajo mi responsabilidad y acompañado por cuatro estudiantes de la licenciatura en ecología del Centro de Estudios Superiores del Estado de Sonora, hice un viaje de campo al Aguaje de Robinson y al Cañón Los Anegados, comenzando así mis primeras exploraciones botánicas. Curiosamente, en ese mismo año, Richard publicó *The Flora of Cañón de Nacapule: A Desert-bounded Tropical Canyon Near Guaymas, Sonora, Mexico*, que vino a ser la referencia obligada para identificar nuestros primeros ejemplares botánicos recolectados en esta región.

Durante los dos años siguientes, hicimos varios viajes de campo a estos sitios y a otros cañones de la Sierra El Aguaje como La Balandrona y Las Pirinolas. En septiembre de 2004, durante una de las primeras excursiones de la Asociación para las Plantas Nativas de Sonora, A.C., visité por primera vez el Cañón del Nacapule, impactándome la belleza del lugar. Contrariamente al buen estado de conservación que yo había observado en otros cañones de la Sierra, me decepcionó encontrar a lo largo del cañón indicios de perturbación antropogénica como basura, árboles quemados de *Ficus* y de palmas, y la ausencia de *Psilotum nudum* el cual aparentemente había desaparecido por completo del cañón debido a la sequía. El conocimiento que adquirí sobre las plantas recolectando en otras localidades de la región, me permitió enseñarle al grupo de excursionistas las especies de arbustos y árboles que dominan el lugar como *Coccoloba goldmanii*, *Vallesia laciniata*, *Acalypha californica*, *Ficus insipida*, *Ficus pertusa*, *Ficus palmeri*, así como las tres especies de palmas de la Región de Guaymas: *Brahea brandegeei*, *Washingtonia robusta* y *Sabal uresana*. En los años recientes he realizado más visitas al Cañón del Nacapule, llevando grupos de estudiantes de la carrera de biología de la Universidad de Sonora, para sus prácticas de campo. Con respecto al futuro próximo del Cañón del Nacapule, en verdad quisiera tener una opinión más optimista

en relación a su conservación; sin embargo, pienso que el futuro es incierto debido a varias amenazas que ya se han hecho presentes como: el rápido crecimiento inmobiliario de San Carlos hacia el norte, el fácil acceso al lugar, la incertidumbre de sostener una administración adecuada y la ausencia de un plan de manejo del sitio, el peligro de derrumbes debido a la actividad sísmica frecuente de la zona y la infestación reciente de especies invasoras como zacate rosado (*Melinis repens*), todos estos son factores que harán difícil asegurar la condición natural del lugar en el largo plazo.

Over the past 120 years Nacapule Canyon has been a favorite destination for botanists and others interested in natural history when visiting or researching in the Guaymas region. The earliest documented collections are by Edward Palmer on Oct 12, 1897 (Johnston 1924: 1127 and McVaugh 1956). McVaugh (page 220) reported: "Nacapule, Sonora. 1897. Nos. 255–60 collected here October 12. Not located, but said by Palmer to be a 'locality in the Rancho de Represo about 15 miles west of San José de Guaymas.'" Palmer's number 256 in 1897 is *Asclepias leptopus*, and number 260 is *Passiflora mexicana*, both of which are still present in the canyon.

> I was puzzled, intrigued, and determined to learn everything I could about this bizarre tropical-desert flora only a few kilometers from the sea.
>
> *Sue Carnahan*

GEOLOGY

CONTRIBUTED BY SCOTT E.K. BENNETT

The rocks of Cañón del Nacapule preserve millions of years of geologic history related to the collision of tectonic plates and volcanic activity, followed by the fragmentation of the North American continent that led to the formation of the Gulf of California. Cañón del Nacapule and the Sierra El Aguaje are located on the western edge of the North American tectonic plate. This region was host to a subduction zone during much of Cenozoic time, when oceanic plates collided with and sank beneath North America, causing melting deep beneath the continent. This molten rock (magma) rose buoyantly toward Earth's surface, forming a chain of volcanoes that produced numerous eruptions that blanketed the region with volcanic rocks. In Cañón del Nacapule, erosion has carved dramatic cliffs into these resistant Miocene-age volcanic rocks (Gans et al. 2013). The canyon walls contain exposures of this ancient volcanic landscape, including lava flows, lava domes, tuffs, dikes, and volcaniclastic deposits (Wilson 1978). Hiking up Cañón del Nacapule, one can see the burgundy and orange layering of lava flows and the tan and yellow deposits of volcaniclastic conglomerate. Other visible patterns include the irregular fracturing and foliation related to the cooling and flow banding of ancient lava flows. The basal portions of some lava flows exhibit

a black vitrophyre, which consists of glass that formed as the flow rapidly cooled when it came into contact with the cold ground surface.

Beginning ~12 million years ago, plate tectonic forces shifted and Baja California began to wrench itself toward the northwest, rifting obliquely away from mainland Mexico (Atwater & Stock 1998). After several million years of continental stretching and shearing (transtension), Earth's surface was lowered below sea level, allowing the narrow Gulf of California seaway to progressively flood northwards to at least Yuma, Arizona, between 8 and 6.3 million years ago (Bennett et al. 2015; Oskin & Stock 2003). During the rifting and stretching process, fragments of the dismembered continent broke off and were left in the wake of Baja California; today those fragments comprise the large Midriff Islands (e.g., Ángel de la Guarda, San Lorenzo, Tiburón). As rifting forces concentrated into the core of the Gulf of California, the flanking margins of the rift were modestly stretched and sheared as well, forming tilted fault blocks and zones of normal faulting and strike-slip faulting (e.g., Bennett et al. 2013; Bennett et al. 2016; Darin et al. 2016; Johnpeer 1977; Wilson 1978). The Sierra El Aguaje contains numerous tilted fault blocks and paleomagnetic evidence of clockwise vertical-axis block rotation due to transtension (Herman 2013). In Cañón del Nacapule, volcanic layers are tilted about 25–30° down-to-the-east due to this stretching and block tilting. With a watchful eye, one can see several minor faults in the Nacapule cliffs that offset the layered lava flows by a few meters (Figure 3). Two major north-south trending normal faults cut perpendicular to the east-west trending Cañón del Nacapule (Figure 4). The Nacapule Spring (see circle on Figure 4) occurs along the eastern of these two faults, where the highly fractured

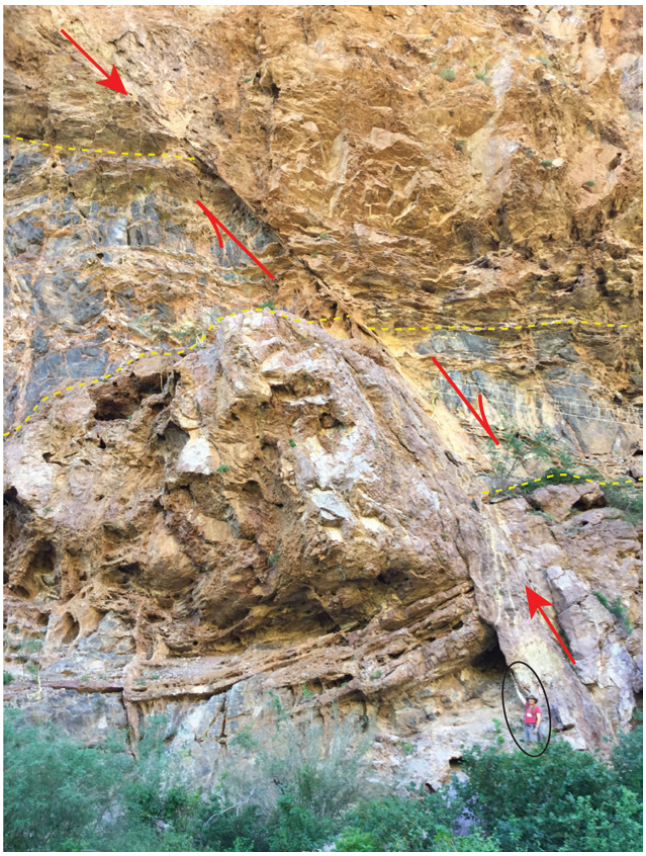


FIGURE 3. Looking south at faulted volcanic rocks exposed in the north-facing cliff of Cañón del Nacapule. Location is ~100 meters west of trailhead. A west-dipping normal fault (red arrows) has offset the basal black vitrophyre of a rhyolite flow (bracketed by dashed yellow lines) ~5–10 meters down-to-the-west. Geologist, Scott E.K. Bennett, for scale. Contributed by Scott E.K. Bennett. Photo by Michael H. Darin, 28 Oct 2015.

fault zone serves as a permeable conduit for water flow up to the surface. Other springs and pools occur along the western normal fault as well. Erosion of weak and shattered rocks (fault breccia) along the western fault zone has carved rugged south- and north-flowing tributary canyons that intersect the main Cañón del Nacapule ~0.3 km west of the trailhead. Thus, the geologic history of volcanism and faulting strongly controls the modern-day topographic and hydrologic setting for the unique botanical diversity within Cañón del Nacapule.

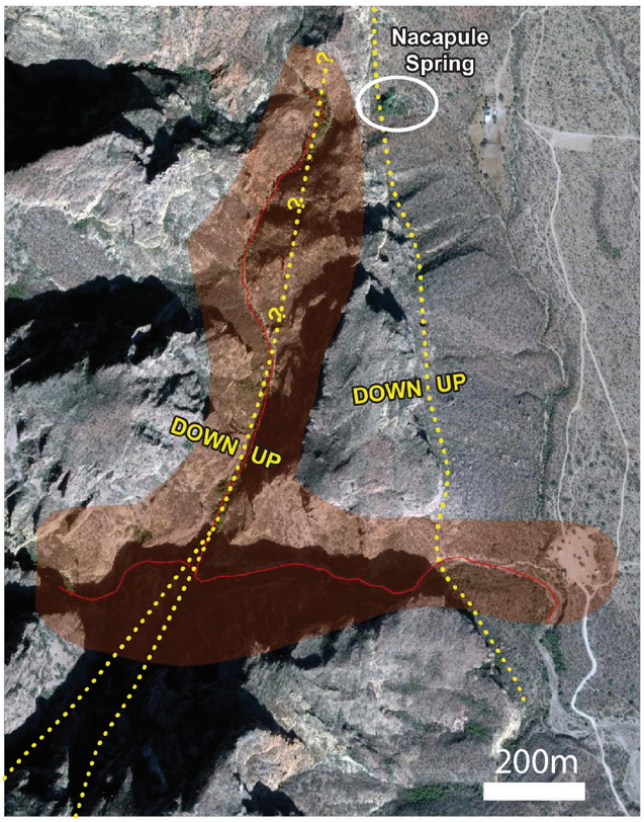


FIGURE 4. Normal faults are indicated by dashed yellow lines. Relative fault motion is shown by UP and DOWN labels. Nacapule Spring (circled) is located along a normal fault that runs along the base of the steep rocky cliffs that are visible from the parking lot (see Figure 1 for oblique view). The red line indicates the canyon bottom. Contributed by Scott E.K. Bennett. Map data: Google, DigitalGlobe.

CLIMATE

The climate is arid and the summer season long and hot (Figure 5). The hot weather and seasonal drought of late spring and early summer are severely limiting to the plant life. Mean monthly temperature is above 23°C (73°F), and the four summer months are above 28°C (82°F). Winters are mild and warm, and most of the region, and presumably the canyon, is frost free or essentially so. Rainfall is bi-seasonal, highly variable, and the most limiting factor to plant survival and growth. With supplemental irrigation, coconut palms and many other cultivated tropical plants flourish in nearby San Carlos and Guaymas. Average annual rainfall in San Carlos is less than 25 cm (10 inches). More than 80% of rainfall is concentrated from July to September. Rainfall is rare between March and June (Figure 5; also see Comisión Nacional del Agua 2016; Gutiérrez-Ruacho et al. 2010). Summer rains result from an abbreviated monsoon of tropical origin that often brings violent thunderstorms with high winds, dramatic lightning, and heavy rainfall of brief duration (Adams & Combrie 1997). These sporadic rains, often highly localized, may commence after summer solstice and continue into September (Xu et al. 2004). Tropical storms, or *chubascos*, in late summer–early fall sometimes bring large amounts of rain. These occasional, hurricane-fringe storms can result in scouring flash floods and spectacular growth of many perennials as well as ephemerals. For example, the aftermath of Hurricane Jimena in September 2009 brought more than 710 mm (28 inches) of rainfall in 36 hours to Guaymas and produced extensive regional flooding (Figure 6). This flooding scoured the majority of the lush tropical palm canyons of the Sierra El Aguaje, including Cañón del Nacapule, re-setting the ecological succession. Tracking the changes from 2009 into the future will provide insight into the ecological dynamics of these canyons; the flora presented here and in Felger (1999) will serve as a baseline for these efforts.

Winter-spring rains, derived from Pacific frontal storms, can deliver light rains or drizzle over many hours. In some years either the summer or the winter rains may be scant or fail entirely. However, given the proximity of the sea, the winter precipitation may occasionally be supplemented by dew.

Washingtonia robusta palms in the canyon. Photo by Rada SC

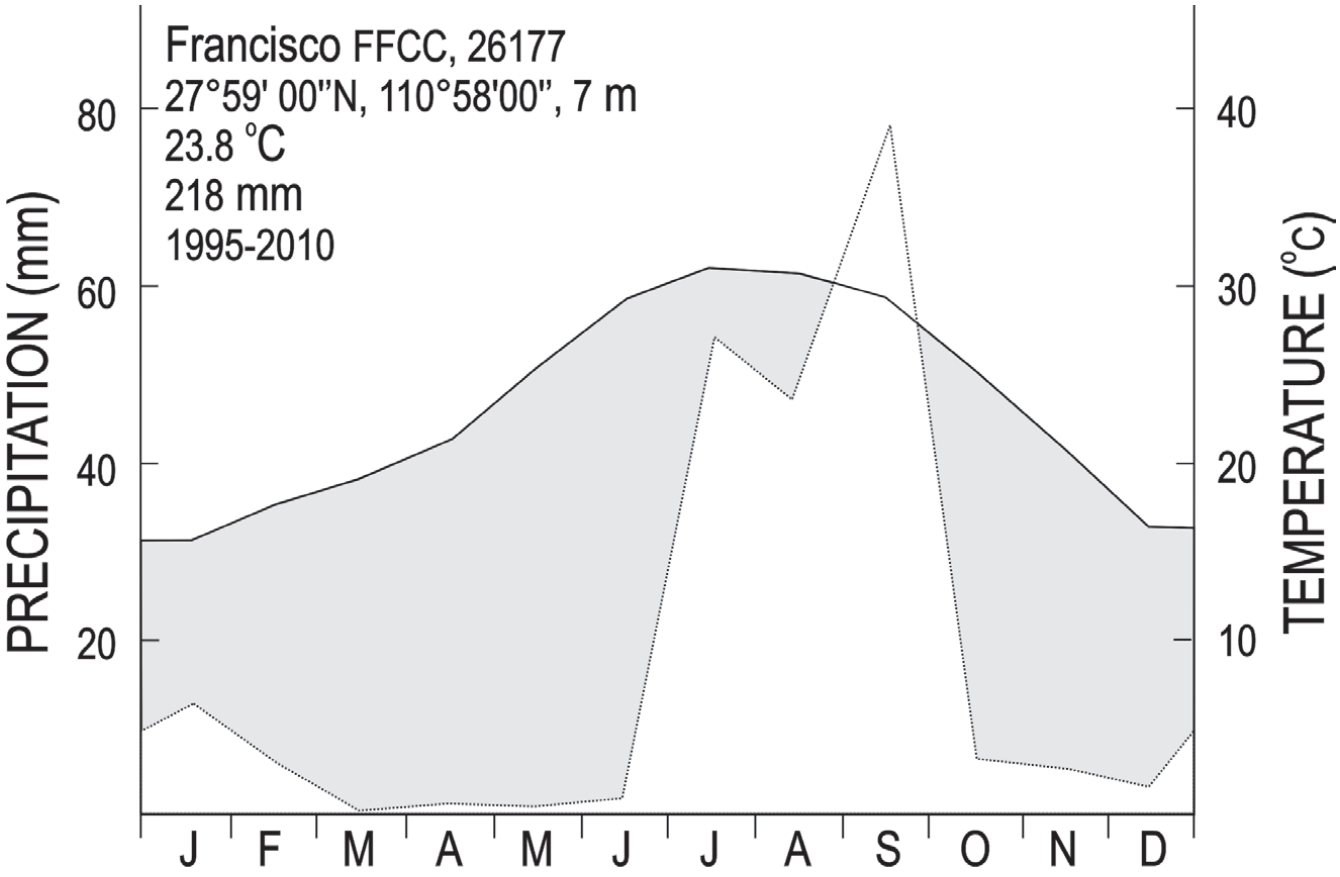


FIGURE 5. Ombrothermal climogram for the Francisco weather station, located at San Carlos 9 km southeast of Nacapule Canyon (Estación Francisco [FFCC] #26177, 27.9833º, -110.9667º, Comisión Nacional del Agua [CONAGUA]; smn.cna.gob.mx). Darker line = mean monthly temperature and lighter gray line = mean monthly rainfall. Rainfall values on left vertical scale, temperature values on right. The gray area indicates period of water deficit. The weather station locality, elevation, mean annual temperature, mean annual rainfall, and years of the weather record are at the upper left corner. Contributed by Alberto Búrquez-Montijo.

BOTANICAL DIVERSITY

Nacapule is one of several biologically rich riparian canyons in the Sierra El Aguaje (the region Howard Scott Gentry [1949] called the Guaymas Monadnoc). These desert-bounded riparian canyons include the great Cañón Las Barajitas on the west side of the Sierra El Aguaje, and La Balandrona, Las Pirinolas, and Los Anegados on the north side of the range (Felger et al. 2016; Sánchez & Felger 2006). These canyons share many of the same plants, e.g., *Coccoloba goldmanii*, *Mandevilla nacapulensis*, *Vallesia laciniata*, *Verbesina felgeri*, and *Zanthoxylum mazatlanum*. Other floristically and biologically similar canyons occur in the Sierra Libre (ca. 55 km north-northeast of Nacapule) and Sierra Bacatete (ca. 60 km south-southeast; Bogan et al. 2014). Despite more than a century of extensive botanical collections in the Guaymas region, the higher elevations of the Sierra El Aguaje, Sierra Bacatete, and Sierra Libre remain botanically unexplored.

Shreve (1951) designated the vegetation of the region as part of the Sonoran segment of the Gulf Coast subdivision of the Sonoran Desert. The higher elevations of the Sierra El Aguaje, especially on north-facing slopes, and many of the riparian habitats support vegetation that can be classified as tropical thornscrub, sometimes approaching tropical deciduous forest in character (Brown 1982; Búrquez et al. 1999; Felger & Lowe 1976; Felger et al. 2001; Felger & Wilder 2012).

Many species of tropical origin reach their northern limits in the Sierra El Aguaje, or they do not extend farther north into the desert of western Sonora, e.g., *Citharexylum flabellifolium, Coccoloba goldmanii, Ficus insipida, F. pertusa*, *Randia sonorensis*, *Sabal uresana*, and *Vitex mollis*. Sonoran Desert plants reaching their southern limits in Sonora include *Abutilon parishii*, *Colubrina californica*, and *Fouquieria splendens*. Species with geographically isolated populations in the regional riparian canyons include *Aphanosperma sinaloensis, Briquetia sonorae, Dasylirion gentryi, Psilotum nudum*, *Vallesia laciniata*, and *Zanthoxylum mazatlanum*. Regional endemics include *Brickellia rhomboidea*, *Hofmeisteria crassifolia*, *Mandevilla*

TABLE 1. Largest families of Nacapule plants.

FAMILY	GENERA	SPECIES
Fabaceae	29	34
Asteraceae	27	32
Poaceae	15	23
Malvaceae	13	18
Euphorbiaceae	9	16
Cactaceae	10	13

TABLE 2. Largest genera of Nacapule plants.

FAMILY	GENUS	SPECIES
Euphorbiaceae	*Euphorbia*	6
Nyctaginaceae	*Boerhavia*	5
Poaceae	*Bouteloua*	5
Convolvulaceae	*Cuscuta*	4
Malvaceae	*Abutilon*	3
Asparagaceae	*Agave*	3
Asteraceae	*Ambrosia*	3
Poaceae	*Aristida*	3
Burseraceae	*Bursera*	3
Cyperaceae	*Cyperus*	3
Moraceae	*Ficus*	3
Fouquieriaceae	*Fouquieria*	3
Convolvulaceae	*Ipomoea*	3
Acanthaceae	*Justicia*	3
Asteraceae	*Perityle*	3
Solanaceae	*Physalis*	3
Portulacaceae	*Portulaca*	3
Fabaceae	*Vachellia*	3

nacapulensis, and *Verbesina felgeri*. Others occur primarily on the Baja California peninsula, with limited distributions in Sonora, e.g., *Dalea purpusii*, *Euphorbia ceroderma*, and *Washingtonia robusta* (Rebman et al. 2016).

The most diverse plant families in the Nacapule flora are Fabaceae, Asteraceae, Poaceae, Malvaceae, Euphorbiaceae, and Cactaceae (Table 1). Fifteen genera have 3 or 4 species each, and only *Euphorbia* with 6 species and *Boerhavia* and *Bouteloua* with 5 species are more diverse (Table 2).

The Nacapule flora, with 291 native species, contains 42% of the total native flora of the Guaymas region (ca. 700 native taxa, Felger et al. 2016). This region, centered on Guaymas and San Carlos, comprises 532,000 hectares (5320 km^2) and extends from Tastiota to the Río Yaqui delta and includes the Sierra El Aguaje, Sierra Libre, and Sierra Bacatete. The Nacapule flora represents approximately 12.4% of the total flora (ca. 2500 species) of the 300,000 km^2 of the Sonoran Desert (Shreve 1951; Wiggins 1964; Van Devender et al. 2010). The topography of Nacapule is complex, and although there are other topographically complex riparian canyons in the region, they apparently do not support so many species in such a small area. The flora of Nacapule is dynamic, with immigrations and departures. The largest influences have been people and former cattle grazing, although severe weather events have also brought changes.

A stream flows all year in the upper part of the canyon and intermittently through the lower part of the canyon. From time to time flash floods from hurricanes or hurricane-fringe rains substantially alter the canyon bottom (Figure 6). Felger (1999) shows a 1996 photo of exposed roots of some of the larger *Washingtonia* palms indicating that in some places the canyon floor had eroded more than one meter during the lifetime of those palms. Destruction of portions of the wetland vegetation and understory vegetation, mostly due to decades of cattle grazing in the 20th century, contributed to reduction of the stream flow. However, conservation measures by the property owners in the early 21st century have resulted in considerable restoration of the stream flow and vegetation.

The lower part of the canyon runs more or less east-west for nearly one kilometer and the high, north-facing canyon wall and mountain slope shade the lower canyon during much of the year (Figures 1 and 2). In 1965 Felger recorded the plants in a 5 × 50 m quadrat in this unusual habitat (Felger 1966). The quadrat could not be made larger because of the constraints of the topography. Forty-one species were recorded within the quadrat. An additional 14 species occurred on the canyon floor within 5 m of the quadrat and more species were quickly encountered as one walked through the canyon. Plant coverage here was estimated at 98%. Large shrubs and small trees produced a closed canopy with crown heights generally at 4 to 6 m. The vegetation was weakly stratified into tree, shrub, and ground-herb layers and interlaced by vines and scandent shrubs. Vegetation cover consisted mostly of large, spreading shrubs, e.g., *Coccoloba goldmanii, Coursetia glandulosa*, and *Vallesia laciniata*. Eleven species of vining plants were present, e.g., *Antigonon leptopus, Gouania rosei*, and *Passiflora mexicana*. Arborescent species along the canyon floor were generally scattered in small groves or groups of several adult individuals. The vegetation could not be characterized by any one or several species. Some years later a road into the lower part of the canyon obliterated the quadrat site, although the road was closed after fencing in the 1990s. Flooding and gravel deposition following Hurricane Jimena in 2009 further altered the quadrat site. By 2012 a broad footpath

FIGURE 6A

FIGURE 6B

FIGURES 6 A–C. *Ficus insipida* at the Ojo de Agua in the main fork of the upper canyon, showing stream channel changes between 2004 and 2011. (A) May 2004, Dave Lytle collecting aquatic invertebrates. (B) November 2009, the former Ojo de Agua; the stream channel filled with gravel following Hurricane Jimena in September 2009. (C) November 2011, Dean Hendrickson in background. Photos by Michael Bogan.

FIGURE 6C

provided access through the lower canyon in the vicinity of the former road.

The upper part of the canyon divides, forking northward through a fig and palm grove and westward along a rugged trail to small waterfalls and pools. Both canyon forks extend up the east face of the mountain, providing substantial drainage into the lower canyon. There are many permanent shallow pools and hidden seeps along the shaded bottom of the upper reaches of the canyon. Notable plants in this part of the canyon include the tall fan palm *Washingtonia robusta*, the large figs *Ficus insipida* and *F. pertusa*, and a number of herbaceous wetland species such as *Eleocharis geniculata, Erythranthe floribunda*, *Fuirena simplex,* and *Ludwigia octovalvis*.

In contrast to the verdant canyon floor, the canyon walls support more xerophytic vegetation. Hesper palms (*Brahea brandegeei*) grow from crevices in sheer cliffs and rock slopes above the canyon floor. Other common rock-adapted plants clinging to cliffs and rock slopes include *Agave chrysoglossa, Asclepias leptopus, Ficus palmeri, Hofmeisteria crassifolia, Perityle palmeri*, and *Pleurocoronis laphamioides*. On more gentle gradients with a soil profile there are dense stands of small trees and shrubby vegetation ranging to near 100% cover. Vegetation on north- and east-facing slopes is relatively dense and verdant and resembles tropical thornscrub or tropical deciduous forest found east and south of the Sonoran Desert. The more arid, south-facing canyon slope supports Sonoran Desert elements such as *palo blanco* (*Mariosousa willardiana*), desert ironwood (*Olneya tesota*), and palo verde (*Parkinsonia microphylla*). Vegetation on the south-facing canyon walls resembles that of the desert slopes outside the canyon.

The open desert on the bajada adjacent to the canyon has a perennial vegetation cover of about 50% although summer-fall ephemerals may seasonally carpet the ground with essentially 100% cover. Winter-spring annuals (ephemerals) are concentrated near the larger perennials such as desert ironwood (*Olneya tesota*). These larger desert shrubs and small trees provide shade, perhaps extra nutrients, and protection from grazers, producing "island patches" (Búrquez & Quintana 1994). Many of the large xerophytic shrubs and small trees on the open desert tend to be set well apart from each other, while smaller and seemingly shorter-lived and quicker-growing shrubs have aggregated patterns of distribution. This pattern seems at least in part to be the legacy of cattle grazing. Conspicuous shrubs and small trees of the open desert include *Bursera microphylla, Colubrina viridis, Forchhammeria watsonii, Fouquieria diguetii, F. macdougalii*, *Jatropha cuneata, Mimosa distachya* var. *laxiflora, Olneya tesota*, and *Ruellia californica*.

An arroyo, called Arroyo Nacapule (Felger 1999), leads southeastward from the canyon entrance and courses through the bajada desert plain for several kilometers. Cut about 5+ m deep with steep walls, it supports some of the unusual Nacapule plants, e.g., *Serjania palmeri* and *Zanthoxylum fagara*, scattered palms (*Brahea brandegeei* and *Sabal uresana*), and a few large *Ficus palmeri* trees.

Growth forms of the Nacapule plants are shown in the Appendix, which also serves as a checklist. Trees are represented by 31 species (10% of the flora). By way of comparison, tree species represent only about 6% of the flora of the northern Sierra Madre Occidental as well as that of the state of Sonora (Felger et al. 2001). Three species of *Ficus* and three genera of palms are the most conspicuous larger trees. One of these figs, *Ficus insipida*, forms buttress roots from a massive trunk, a unique growth habit for the Sonoran Desert region. The largest groups are annuals (88 species, 28%), shrubs (85 species, 27%) and herbaceous perennials (83 species, 27%). Perennial vines, represented by 23 species (7%), grow through shrubs and trees, lacing into gallery groves of tall palms. Succulent plants include 25 species, more than half of which are cacti.

Three general kinds of ephemerals (desert annuals that complete their life cycle within a single season) are distinguished: (1) Hot weather or summer ephemerals, which are the most diverse, usually germinate with the first substantial summer thunderstorms. Some may also grow with early fall rains (such as hurricane-fringe storms) while the soil and air temperatures are still high, allowing quick maturity. (2) Winter-spring ephemerals grow during the cooler seasons and may flower during late fall, winter, and/or spring. (3) Non-seasonal ephemerals grow with sufficient soil moisture at any time of the year.

Twenty-two wetland species of tropical as well as temperate origin grow along the permanent stream and canyon bottom pools, or from seeps on canyon walls (Appendix). *Ficus insipida* and *F. pertusa* occur on rocky slopes, mostly north facing, but only attain large stature in riparian habitats. All three palms occur in the canyon bottom, but only *Washingtonia* is confined to permanent or near-permanent wet soil or shallow stream water. *Lemna* is a floating aquatic, and seedlings and juvenile plants of *Echinodorus, Ludwigia peploides* and *Typha* grow fully submerged; older *Echinodorus* plants can become emergent or thrive on wet soil, and *Typha* soon becomes emergent. Other wetland plants are emergent from shallow water or thrive in wet ground or seeps.

The aquatic fauna is likewise rich and diverse (Bogan et al. 2014). Nacapule supports three species of amphibians, one species of aquatic garter snake, and at least 121

aquatic invertebrate taxa. Three genera of riffle beetles (Coleoptera: Elmidae) found at Nacapule are not known from other any other streams in the region. In total, 10 species of aquatic invertebrates are regionally unique to the canyon. Additionally, two undescribed species of caddisflies (Trichoptera: Hydroptilidae) might be endemic to Nacapule.

FLORISTIC DYNAMICS

The flora of the canyon is dynamic, with arrivals and departures and swings in population. During the 1980s and 1990s, several species appeared to spread to the canyon, possibly as a result of cattle grazing. These include non-natives as well as species native to the Guaymas–San Carlos region but perhaps not part of the original Nacapule flora, such as *Baccharis sarothroides, Cylindropuntia fulgida,* and *Vachellia campechiana*. In 2016, these three species were present in the canyon but their numbers were still low. Some weedy arrivals may not have persisted, although they are widespread in the region: e.g., *Ambrosia confertiflora* and *Chenopodiastrum murale*. Other changes may be due to human visitation, nearby development, or climate changes. *Waltheria indica* was rare in the late 1990s but by 2015 had become abundant along the canyon bottom and on rocky slopes. *Melinis repens* has increased substantially since the 1990s, especially along the canyon floor and near the canyon entrance. *Corchorus olitorius* was found in 2015. *Corynandra viscosa* was first recorded in 2013 and by 2015 it was abundant along the canyon floor. *Cenchrus ciliaris*, although rampant in many disturbed habitats, is infrequent in the canyon. At least five native species have not been found in recent decades, although they still occur in the region: *Cyperus squarrosus, Fimbristylis dichotoma, Justicia sonorae*, *Psilotum nudum,* and *Vachellia californica*.

Nineteen species are not native to the regional flora. These are mostly Old World weedy plants, e.g., *Cenchrus ciliaris, Corynandra viscosa*, *Malva parviflora,* and *Melinis repens*. Three non-natives were not found in the 1999 report: *Citrullus lanatus*, *Corchorus olitorius*, and *Corynandra viscosa.* Non-natives established as reproducing populations are identified by an asterisk (*), and non-natives not reproducing in the canyon are marked with double asterisks (**).

***Citrullus lanatus*
***Corchorus olitorius*
***Tropaeolum majus*
**Cenchrus ciliaris*
**Cenchrus echinatus*
**Chenopodiastrum murale*
**Corynandra viscosa*
**Cynodon dactylon*
**Dactyloctenium aegyptium*
**Digitaria ciliaris*
**Eclipta prostrata*
**Erigeron canadensis*
**Lactuca serriola*
**Malva parviflora*
**Melinis repens*
**Physalis pubescens*
**Portulaca oleracea*
**Sisymbrium irio*
**Sonchus oleraceus*

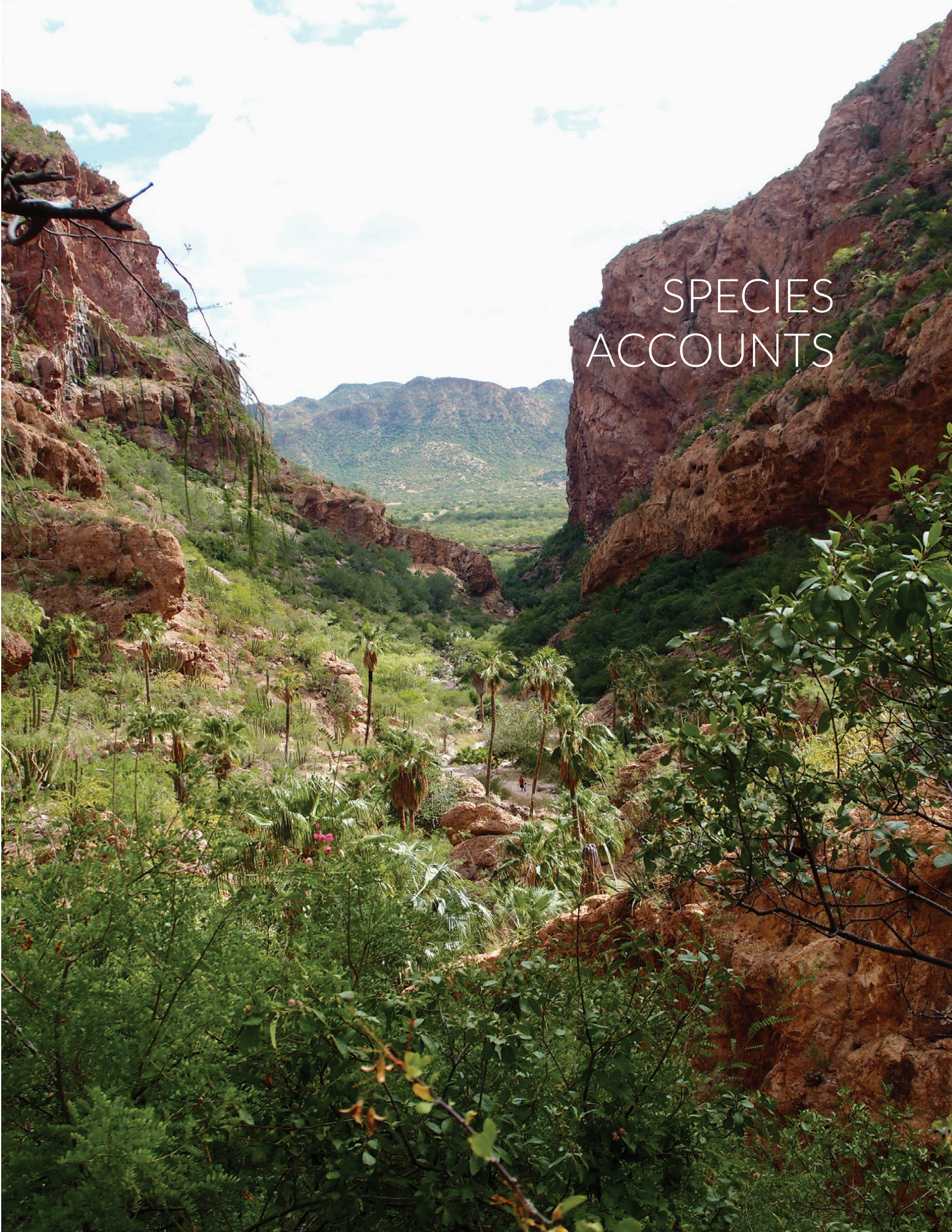
CONSERVATION

San Carlos has become a major resort town with hotels, vacation homes, a golf course, and marinas. The vegetation there has been decimated but vegetation on the nearby rugged mountains remains virtually intact. Until the 1980s most of Cañón del Nacapule appeared only moderately altered from Felger's first visit on that hot summer afternoon in 1960, when the population of the entire state of Sonora was less than half of what it would grow to by 2000. The route from San Carlos to Nacapule was a rough, rock-filled dirt track until the 1990s. During the 1980s a road was pushed up the canyon, parts of the canyon floor were cleared, decorative rock was extracted from the slopes, sometimes with dynamite, and some of the trees were smashed. Substantial portions of the understory vegetation in the lower canyon disappeared. Tourism and cattle grazing also impacted the vegetation, resulting in trash, vandalism, and trampling of fragile wetland vegetation.

The lower part of the canyon had long been open to cattle grazing, which severely impacted the riparian vegetation. Juan Pablo Gallo (pers. comm., Nov 2015) tells us, "Nacapule was fenced in 1994 to 1997, then it was open to cattle almost all the 2000s, even though there were times in which there were no cattle there. Last time I went there was just before Tropical Depression Jimena, and after the canyon was opened to any kind of tourists, which brought a lot of trash, human waste, beer cans, graffiti on the rocks, etc."

The canyon and nearby land including Nacapule Spring, formerly part of the Ejido Trece de Julio, are owned and managed by the Dávila family as a popular place for hiking and ecotourism (Enriquez-Baca 2012). The Guaymas office of CONANP (Comisión Nacional de Áreas Naturales Protegidas), under the direction of Ana Luisa Figueroa Carranza, provided assistance from 2010 to 2012 in the form of funds and training in conservation-oriented ecotourism and infrastructure management for Nacapule. In March 2011, the entrance to Cañón del Nacapule was again fenced to exclude cattle and control human traffic. Miguel Dávila-Pacheco has managed the canyon and maintained its fences, facilities, and other improvements since that time. There is a gated parking lot with *palapas*, a restroom, and on most days a guard who collects a modest fee from visitors and hands out a color brochure about the canyon in Spanish and English. Interpretive signs displaying natural history information have been placed along the trail through the canyon. At the west end of the canyon, a rope and plank ladder ascending a vertical wall offers access to the upper reaches of the canyon and waterfall pools.

Cañón del Nacapule is a small and vulnerable place. The vegetation has recovered substantially under management by the Dávila family and continued conservation measures are recommended. Future measures should include protecting the virtually inaccessible steep mountains of the entire drainage area leading into the canyon, which remained ecologically intact at the time of this writing. Cañón del Nacapule and its nearby surroundings, with 291 native species, provides conservation for 42% of the total native flora (ca. 700 taxa) of the 532,000 hectares of the greater Guaymas region (Felger et al. 2016; also see Felger et al. 2017).



SPECIES ACCOUNTS

The flora is presented alphabetically by family, genus, and species with the ferns listed first, followed by the flowering plants: magnoliids, eudicots, and monocots. Family designations follow APG III and IV (Angiosperm Phylogeny Group 2009, 2017) and Stevens (2012). Plants not native to the region are indicated with an asterisk (*) and non-natives not established as reproducing populations are marked with double asterisks (**). Selected synonyms are given in brackets. Selected common names are listed, with the local Spanish language name(s) shown in italics.

Selected specimens are cited, along with standardized abbreviations for herbaria (Index Herbariorum, Thiers 2017). If no herbarium is indicated, the specimen is at the University of Arizona Herbarium (ARIZ). When more than one collector is listed on a label, usually only the first collector is given. When no collection number is given on the label, the specimen is identified by the date of collection. We have seen nearly all specimens or images thereof. Flowering times are expressed by the season or months of probable or known flowering. In many cases flowering times or seasons vary greatly from year to year, and one can expect variation greater than what is presented here. We provide longer descriptions for plants of special interest. Three taxa were described (named) from specimens collected at Nacapule: *Telosiphonia nacapulensis* (*Mandevilla nacapulensis*), *Vallesia baileyana* (*V. laciniata*), and *Verbesina felgeri*; for these we provide the original publication information following the plant name. Descriptions and keys pertain to taxa and populations as they occur in the flora area.

KEYS TO THE MAJOR PLANT GROUPS AND FAMILIES

The following keys are intended to be user-friendly. They employ a minimum of technical terminology and rely more on easily visible vegetative features than on reproductive parts, although the latter are often more accurate. Leaf characters generally refer to mid-stem leaves rather than the leaves on spur branches (short shoots or brachyblasts). Some families and taxa will key out in more than one place, especially those with variable features such as spines. Taxa that can have both alternate and opposite leaves will usually key out either way. Two non-native taxa not established in the flora area, *Corchorus olitorius* (Malvaceae) and *Tropaeolum majus* (Tropaeolaceae), are not covered by the key to families and major groups.

KEY TO THE MAJOR GROUPS

1. Plants spore-bearing, without flowers or seeds; leaves those of typical ferns, or essentially leafless with stems dichotomously branched, seldom more than 30 cm tall. _____ _____**PTERIDOPHYTES** (see Species Accounts for key to Pteridophyte families)

1' Plants with flowers and seeds; leaves various or none; a few mm to tree-size.

2. Leaf veins parallel; floral parts in 2s or 3s, includes agaves, aquatic plants, cattails, grasses, palms, and sedges. _____**MONOCOTS**

2' All other flowering plants, not as above (although *Ludwigia peploides* also can be aquatic); leaf veins in a net-like or palmate pattern (when visible); flower parts typically in 4s, 5s, or more.

3. Leaves arrow-shaped; perianth 3.5–5 cm, of a single bilateral segment, tooth-like above and funnel-like below; ovary inferior. _____**MAGNOLIIDS**, **Aristolochiaceae** (see species accounts)

3' Leaves various; perianth often with a calyx and corolla, or calyx only but not tooth-like, or perianth none; ovary superior or inferior. _____**EUDICOTS**

MONOCOTS

1. Palms, with a solitary well-developed trunk reaching more than 5 m tall, with broad, fan-shaped leaves to 1 m or more long. _____**Arecaceae**

1' Annual or perennial herbaceous plants, or coarse succulent rosette plants, without a well-defined trunk (except for *Dasylirion* with trunk less than 1 m tall); leaves various but generally shorter than 1 m.

2. Leaves succulent (except for *Dasylirion*), forming rosettes, armed with marginal spines or only a stout terminal spine.

3. Leaves glabrous and with a stout terminal spine and/or marginal spines. _____**Asparagaceae**

3' Leaves with silvery peltate scales (upper surfaces sometimes becoming glabrate), the margins with recurved spines. _____**Bromeliaceae** (*Hechtia*)

2' Plants not succulent, not forming rosettes, and unarmed.

4. Plants aquatic (floating), minute, with 1–several flat leaves 1–6 mm long. _____**Araceae** (*Lemna*)

4' Plants terrestrial, or emergent from shallow water or becoming stranded in mud or gravel; leaves variable, usually more than 10 mm long (seedlings and young plants of *Echinodorus* and *Typha* have submerged leaves).

5. Flowers conspicuous, the perianth evident, blue or white.

6. Young plants aquatic or with floating leaf blades, adult plants emergent or on wet soil; petioles prominent; flower buds not enclosed in a bract; flowers white; stamens all similar. __**Alismataceae** (*Echinodorus*)

6' Dryland plants; stems prominent and elongated, leaves sessile or petioles inconspicuous; flower buds enclosed or subtended by a prominent leafy bract (spathe); flowers blue; stamens of 3 sizes and kinds. _____**Commelinaceae** (*Commelina*)

5' Flowers not colorful, the perianth scale-like, or reduced to bristles, or minute or absent.

7. Cattails; leaves linear, mostly more than 1 m tall, erect, strap-shaped, thickened and pithy; wetland habitats. _____**Typhaceae** (*Typha*)

7' Grasses, sedges, and spikerushes; leaves less than 1 m long, not thickened and pithy; wetland or dryland habitats.

8. Sedges and spikerushes; wetland habitats or usually at least temporarily wet soils; stems triangular or terete, solid (pithy); leaf sheaths usually closed; each flower subtended by a single bract. __**Cyperaceae**

8' Grasses; wetland to desert habitats; stems terete, hollow or solid; leaf sheaths open or closed; each flower usually subtended by two bracts (lemma and palea). _____**Poaceae**

EUDICOTS

1. Plants parasitic, without roots, the parasitic attachments (haustoria) above ground. _____**KEY 1**

1' Plants not parasitic (if parasitic, the attachment is by roots below ground and not obvious, e.g., Krameriaceae).

2. Plants obviously succulent. _____**KEY 2**

2' Plants not succulent.

3. Vines; stems twining, vining, or sprawling across the ground, not self-supporting. _____**KEY 3**

3' Plant not vines.

4. Composites; individual flowers in a head resembling a single "normal" flower (*Lagascea* has clusters of 1-flowered heads); heads surrounded by a series of bracts (somewhat sepal-like) forming an involucre. ___**Asteraceae**

4' Not composites; inflorescence and flowers various but not grouped into heads subtended by a series of sepal-like bracts.

5. Leaves compound. _____**KEY 4**

5' Leaves simple.

6. Leaves opposite or whorled. _____**KEY 5**

6' Leaves alternate. _____**KEY 6**

EUDICOTS: KEY 1. PARASITIC PLANTS

1. Stems usually vining, thread-like, and uniformly yellow or orange; flowers white. _____**Convolvulaceae** (*Cuscuta*)

1' Stems not threadlike, not yellow or orange; flowers various colors.

2. Flowers showy, red or orange. _____**Loranthaceae** (*Psittacanthus*)

2' Flowers small and not showy, whitish, yellow, or green.

3. Stems often hanging in loose spirals; flowers white, calyx 6-lobed. _____**Loranthaceae** (*Struthanthus*)

3' Stems not hanging in spirals; flowers yellow or green, calyx 3-lobed. _____**Santalaceae** (*Phoradendron*)

EUDICOTS: KEY 2. SUCCULENT PLANTS

1. Cacti; stems with areoles bearing a cluster of spines. _____**Cactaceae**

1' Not cacti; without areoles and without spines (stem tips spinescent in *Euphorbia ceroderma*).

2. Plants herbaceous.

3. Leaves deeply divided or lobed, usually glaucous; flowers lavender-pink. _____**Asteraceae** (*Hofmeisteria*)

3' Leaves with entire margins, not glaucous; flowers yellow, orange, or pink.

4. Warm-weather annuals; leaves usually not more than 2.5 cm long; flowers yellow, orange, or red, and solitary in leaf axils. _____**Portulacaceae** (*Portulaca*)

4' Perennials; mid-stem leaves 2.5–11+ cm long; flowers pink, on slender pedicels in open panicles. _____ _____**Talinaceae** (*Talinum*)

2' Sub-shrubs, shrubs, and small trees.

5. Shrubs or sub-shrubs (coarse perennials); leaves linear and less than 5 mm wide, few and soon-deciduous; sap milky.

6. Stems upright, branching from the base, each stem unbranched or few-branched, stems tips not spinose; flowers bisexual; fruits spindle-shaped, more than 6 cm long. _____**Apocynaceae** (*Asclepias subulata*)

6' Stems branching at angles, branched from base and above, stems often thorn-tipped; flowers unisexual; fruits globose, less than 1 cm long. _____**Euphorbiaceae** (*Euphorbia ceroderma*)

5' Shrubs or small trees, with well-developed leaves more than 5 mm wide, though leaves drought-deciduous; sap not milky.

7. Small shrubs; stems not succulent, leaves semi-succulent; fruits achenes. _____**Asteraceae** (*Pleurocoronis*)

7' Shrubs and small trees; stems or trunks succulent, leaves not succulent; fruits not achenes.

8. Leaves pinnately compound; seeds 1 per fruit, with a brightly colored, fleshy aril. _**Burseraceae** (*Bursera*)

8' Leaves simple; seeds 1–3, without an aril. _____**Euphorbiaceae** (*Jatropha*)

EUDICOTS: KEY 3. VINES

1. Vines with tendrils.

   2. Stipules none; flowers unisexual; ovary inferior. _____**Cucurbitaceae**

   2' Stipules present; flowers bisexual; ovary superior (*Gouania* in Rhamnaceae has inferior ovaries).

      3. Leaves compound, pinnately or bipinnately. _____**Sapindaceae** (*Cardiospermum*, *Serjania*)

      3' Leaves simple, although sometimes deeply lobed.

         4. Tendrils at ends of flowering branches; floral bracts and flowers pink. _____**Polygonaceae** (*Antigonon*)

         4' Tendrils at bases of inflorescences or leaves; bracts and flowers not pink.

            5. Tendrils at base of inflorescences and/or leaves; flowers about 0.5 cm wide; fruits densely tomentose and 3-winged. _____**Rhamnaceae** (*Gouania*)

            5' Tendrils at leaf bases; flowers 0.45–2+ cm wide; fruits glabrous or pubescent but not tomentose and not winged.

               6. Leaves prominently 2- to 5-lobed, and not succulent; flowers at least 2 cm wide; fruits multiple-seeded. _____**Passifloraceae** (*Passiflora*)

               6' Leaves not lobed (ovate), and often semi-succulent; flowers about 0.5 cm wide; fruits 1-seeded. _____**Vitaceae** (*Cissus*)

1' Vines without tendrils.

   7. Leaves compound or deeply lobed or divided and appearing compound.

      8. Leaves palmately and deeply 3-lobed; flowers unisexual and inconspicuous (not including bracts), petals none. _____**Euphorbiaceae** (*Dalechampia*)

      8' Leaves with 3–7 leaflets or leaflet-like lobes; flowers bisexual with conspicuous corollas.

         9. Flowers radially symmetrical, the corollas funnelform; fruits rounded capsules. _____ _____**Convolvulaceae** (*Ipomoea ternifolia*)

         9' Flowers bilaterally symmetrical, the corollas pea-like; fruits of diverse pods, longer than wide. _____ _____**Fabaceae** (*Galactia*, *Macroptilium*, *Nissolia, Phaseolus, Rhynchosia*)

   7' Leaves simple.

      10. Leaves opposite.

11. Sap milky; flowers of various colors, not bright yellow; fruits not winged. _____ _____**Apocynaceae (***Funastrum, Marsdenia, Metastelma, Polystemma*)

11' Sap not milky; flowers (petals) yellow; fruits winged. _____**Malpighiaceae** (*Callaeum, Cottsia*)

10' Leaves alternate.

12. Flowers unisexual and inconspicuous (does not include floral bracts).

13. Plants glabrous or sparsely pubescent; leaf margins entire; male and female flowers on separate plants; fruits fleshy, 1-seeded. _____**Menispermaceae** (*Cocculus*)

13' Plants with coarse, sometimes stinging, hairs; leaf margins toothed; male and female flowers on the same plant; fruits dry, 3-seeded. _____**Euphorbiaceae** (*Dalechampia, Tragia*)

12' Flowers bisexual and conspicuous, although sometimes small.

14. Cool-season annuals with slender tack-shaped glandular hairs; flowers bilaterally symmetric; corollas pink or white with pink-purple markings. _____ _____**Plantaginaceae** (*Sairocarpus*, upper stems and pedicels sometimes twining)

14' Warm-season annuals or perennials, glabrous or pubescent, the hairs not tack-shaped; flowers radially symmetric; corollas of various colors, mostly of a single color.

15. Leaves on mature growth thick and semi-succulent; flowers 4-merous; fruits 1-seeded, fleshy (berries), becoming dry at maturity. _____**Vitaceae** (*Cissus*)

15' Leaves not semi-succulent; flowers 5-merous; fruits dry (capsules), with 1 or more seeds.

16. Plants not woody, or sometimes scarcely so at base; flowers 1 or more cm wide, the corollas of various colors; fruits glabrous or glabrate capsules, globose to ovoid, not winged. _____ _____**Convolvulaceae** (*Ipomoea* in part, *Jacquemontia* in part)

16' Lowermost stems woody; flowers about 0.5 cm wide, the corollas whitish; fruits densely tomentose and 3-winged. _____**Rhamnaceae** (*Gouania*)

EUDICOTS: KEY 4. LEAVES COMPOUND (LEAFLETS 3 OR MORE; INCLUDES SOME WITH DEEPLY DIVIDED OR LOBED LEAVES THAT APPEAR COMPOUND)

1. Leaves opposite.

2. Woody shrubs to small trees; leaves palmately compound. _____**Lamiaceae** (*Vitex*)

2' Annuals to trees; leaves pinnately compound. _____**Zygophyllaceae**

1' Leaves alternate.

3. Annuals; leaves palmately compound with 3 or more leaflets; flowers yellow, with 4 petals and 6 stamens. _____**Cleomaceae**

3' Annuals to shrubs and trees; leaves pinnately compound or with 3 leaflets; flowers of various colors, petals and stamens not as above.

4. Shrubs or small trees, armed; leaves glandular-punctate, with citrus-like odor when crushed; leaflet margins crenate to toothed. _____**Rutaceae** (*Zanthoxylum*)

4' Herbs to trees, armed or unarmed; leaves not glandular-punctate, not smelling like citrus; leaflet margins entire or shallowly toothed.

5. Herbs to trees, armed or unarmed; leaves often with pulvini at base of petioles and/or leafstalks (pulvini are swollen, often dark areas that swell or contract to move the leaves and/or leaflets); leafstalks often with nectary gland(s); stipules often well developed and persistent; fruits 1- to many-seeded. _____**Fabaceae**

5' Trees and shrubs, unarmed; leaves without pulvini or leafstalk glands; stipules none; fruits 1-seeded.

6. Leaves 2.5–14 cm long, the leaflets or pinnae to 6 cm long; fruits less than 10 mm long, splitting to reveal a brightly colored aril. _____**Burseraceae** (*Bursera*)

6' Leaves (12) 20–35 cm long, the larger leaflets 6–20 cm long; fruits rounded, at least 12 mm diameter, indehiscent, and without an aril. _____**Sapindaceae** (*Sapindus*)

EUDICOTS: KEY 5. LEAVES SIMPLE AND OPPOSITE AND/OR WHORLED

1. Sap milky.

2. Flowers conspicuous, bisexual, with calyces and corollas; fruits paired and slender, more than 4 cm long. _____**Apocynaceae** (*Asclepias*, *Haplophyton, Mandevilla*)

2' Flowers minute, unisexual, without a perianth (flowers enclosed in a cup-like involucre of gland-bearing, united bracts, the whole structure simulating a small bisexual flower); fruits not paired, about as wide as long, less than 1 cm. _____**Euphorbiaceae** (*Euphorbia*)

1' Sap not milky.

3. Trees or woody shrubs usually at least 1 m tall.

4. Stems usually square in cross-section; leaf margins serrate to toothed (at least above the middle).

5. Plants with branched white hairs; leaves often grayish or whitish. _____**Lamiaceae** (*Condea*)

5' Plants with simple hairs; leaves greenish. _____**Verbenaceae** (*Citharexylum*, *Lantana, Lippia*)

4' Stems terete; leaf margins entire.

6. Plants armed with 2 or 4 spines at nodes. _____**Rubiaceae** (*Randia*)

6' Plants unarmed.

7. Plants glabrous; leaves linear-oblong to narrowly elliptic, less than 1 cm wide, markedly glandular-punctate. _____**Oleaceae** (*Forestiera*)

7' Plants pubescent at least in part; leaves linear-elliptic to lanceolate or ovate, often more than 1 cm wide, not glandular-punctate.

8. Leaves thick and leathery; male and female flowers on different plants, female flowers solitary, the male flowers in small clusters. _____**Simmondsiaceae** (*Simmondsia*)

8' Leaves not thick and leathery; flowers bisexual.

9. Shrubs to small trees, usually taller than wide, mostly with a single well-formed trunk and corky-ridged bark; flowers more than 6 cm long, corollas white; ovary inferior; fruits of many-seeded capsules. _____**Rubiaceae** (*Hintonia*)

9' Much-branched shrubs not forming a single trunk, the plants usually as wide as or wider than tall, with smooth or peeling bark; flowers less than 5 cm long, corollas pink or red; ovary superior; fruits 1–4-seeded.

10. Inflorescences not woolly; flowers conspicuous, 1–4 cm long. _____**Acanthaceae**

10' Flowers in white woolly panicles; flowers inconspicuous, less than 0.5 cm long. _____**Amaranthaceae** (*Iresine*)

3' Plants herbaceous, mostly not more than 1 m tall, and if woody, then only near the base.

11. Flowers conspicuous or inconspicuous; perianth of sepals, petals none.

12. Plants glabrous; fruits of many-seeded capsules. _____**Molluginaceae** (*Mollugo*)

12' Plants pubescent (except for *Boerhavia gracillima*); fruits 1-seeded, dehiscent or not.

13. Herbage with woolly or branched hairs, but not glandular-sticky; ovary superior. _____**Amaranthaceae** (*Froelichia*, *Tidestromia*)

13' Pubescence not of woolly or branched hairs; herbage and/or fruits glandular-sticky (except for *Boerhavia gracillima*); ovary appearing inferior. _____**Nyctaginaceae**

11' Flowers conspicuous; perianth with calyx and corolla.

14. Corollas radially symmetrical.

15. Delicate annuals; herbage slimy with glistening, white, glandular hairs. _____ _____**Phrymaceae** (*Erythranthe*, flowers essentially symmetrical)

15' Perennials; herbage not slimy-pubescent.

16. Pubescence of simple hairs or plants glabrate or glabrous; flowers yellow or white; fruits paired and slender, more than 3 times longer than wide. _____**Apocynaceae**

16' Pubescence of 2-armed hairs or plants glabrous; flowers yellow; fruits not paired, as wide as or wider than long (winged or globose). _____**Malpighiaceae** (*Callaeum, Galphimia*)

14' Corollas bilaterally symmetrical (*Erythranthe* flowers only slightly bilateral).

17. Delicate annuals; herbage slimy with glistening, white, glandular hairs; corollas bright yellow (subtly bilateral). _____**Phrymaceae** (*Erythranthe*)

17' Annuals or perennials; herbage glandular or not but not slimy-pubescent with glandular hairs; corollas not bright yellow.

18. Perennials; fruits of 2–4-seeded capsules, elastically dehiscent. _____**Acanthaceae**

18' Annuals (*Stemodia* sometimes short-lived perennials); fruits of many-seeded capsules, dehiscent but not elastically. _____**Plantaginaceae** (*Nuttallanthus*, *Pseudorontium*, *Sairocarpus*, *Stemodia*)

EUDICOTS: KEY 6. LEAVES SIMPLE AND ALTERNATE

1. Plants with pubescence of stellate hairs (hairs with 3 or more arms, branched from the base).

2. Small shrubs; leaves often becoming orange before falling; flowers unisexual, the male flowers on racemes often longer than the leaves, white with 10 stamens, the female flowers solitary, forming rounded fruits with 3 seeds. _____**Euphorbiaceae** (*Croton sonorae*)

2' Herbaceous plants to shrubs; leaves not becoming orange; flowers bisexual and of various colors, stamens 4 or 5 to many, fruits with 1–many seeds.

3. Small shrubs often with spines on stems and leaves; stamens 5, the anthers larger than the filaments and with terminal pores; fruits indehiscent, globose berries. _____**Solanaceae** (*Solanum*)

3' Annuals to shrubs, not armed; stamens 5 or more, anthers smaller than the filaments and opening by longitudinal splits; fruits dehiscent (capsules).

4. Corollas lavender, pale blue, or white; stamens 5, the filaments separate; capsules globose to ovoid and smooth; seeds 1–4. _____**Convolvulaceae** (*Jacquemontia*)

4' Corollas of various colors; stamens 5–many, the filaments often united in a column; capsules not globose to ovoid and not smooth; seeds few–many. _____**Malvaceae**

1' Pubescence various but not with stellate hairs, or plants glabrate or glabrous.

5. Woody shrubs and trees, usually more than 1 m tall.

6. Leaves scabrous (rough like sandpaper); flowers unisexual and bisexual often on the same inflorescence, petals none; fruits 1-seeded. _____**Cannabaceae** (*Celtis*)

6' Leaves not scabrous; flowers and fruits various, sometimes similar to above but not in combination with scabrous leaves.

7. Shrubs and trees armed (at least some branches on each plant).

8. Leaves spinescent-tipped; plants otherwise unarmed. _____**Primulaceae** (*Bonellia*)

8' Leaves not spine-tipped; twigs and nodes variously armed.

9. Long-shoot branches with a rigid spine (derived from a leaf midrib) at many or all nodes, stems not thorn-tipped; flowers red. _____**Fouquieriaceae** (*Fouquieria*)

9' Stems or twigs often thorn-tipped or with axillary thorns (not derived from leaf midrib); flowers not red.

10. Leaves semi-succulent.

11. Plants glabrous; flowers inconspicuous, sepals 4, dull colored, petals none; fruits translucent white, drying blackish, 1-seeded. _____**Achatocarpaceae** (*Phaulothamnus*)

11' Plants glabrous or pubescent; flowers conspicuous, calyx and corollas present, each 4- or 5-lobed, corollas lavender or white; fruits orange or red-orange, multiple-seeded. __**Solanaceae** (*Lycium*)

10' Leaves not at all succulent.

12. Multiple-stem shrubs, woody but without a well-formed thick trunk, the bark mostly smooth; leaf veins 3, branched from base. _____**Rhamnaceae** (*Colubrina viridis, Condalia*, *Ziziphus*)

12' Trees or large shrubs with thick, prominent trunks and limbs, and deeply furrowed bark; leaf veins obscure except the midrib. _____**Sapotaceae** (*Sideroxylon*)

7' Shrubs and trees unarmed.

13. Sap milky.

14. Leaf margins toothed. _____**Euphorbiaceae** (*Pleradenophora*)

14' Leaf margins entire.

15. Stipules small, not enclosing growth buds; flowers white, small but conspicuous, fragrant, and white; fruits fleshy, 1-seeded, 10+ mm long, not enclosed in a fig. _____**Apocynaceae** (*Vallesia*)

15' Stipules prominent, bract-like, enclosing growth buds; individual flowers inconspicuous; individual fruits minute, enclosed in a fleshy fig. _____**Moraceae** (*Ficus*)

13' Sap not milky.

16. Leaf blades longer than wide (mostly 2 or more times as long as wide).

17. Large shrubs or small trees; corollas white, 2–3 cm wide. _____**Cordiaceae** (*Cordia sonorae*)

17' Shrubs or trees; flowers not white, corollas less than 2 cm wide, or corollas none.

18. Trees with a well-developed trunk.

19. Trees with smooth bark; leaf margins prominently inrolled. ____**Resedaceae** (*Forchhammeria*)

19' Trees or large shrubs with checkered or furrowed bark; leaf margins not inrolled.

20. Leaves linear-lanceolate, the margins finely serrate; flowers unisexual, corollas none. _____ _____**Salicaceae** (*Salix*)

20' Leaves oblanceolate to obovate, the margins entire; flowers bisexual, corollas whitish. _____ _____**Sapotaceae** (*Sideroxylon*)

18' Shrubs and small trees, multiple-stemmed, without a well-formed trunk.

21. Leaves linear to narrowly elliptic, the margins entire; flowers bilaterally symmetric; fruits spiny. _____**Krameriaceae** (*Krameria*)

21' Leaves broader, the margins entire, lobed, or toothed; flowers radial; fruits not spiny.

22. Small shrubs to 0.5 m tall; leaves prominently serrate-toothed; flowers bright yellow. _____ _____**Passifloraceae** (*Turnera*)

22' Shrubs usually more than 1 m tall; leaf margins entire or lobed but not toothed; flowers not bright yellow.

23. Herbage not sticky-viscid; stems thick and semi-succulent; fruits not winged. _____ _____**Euphorbiaceae** (*Jatropha cuneata*)

23' Herbage, especially when young, sticky-viscid; stems slender, not succulent; fruits 3-winged capsules. _____**Sapindaceae** (*Dodonaea*)

16' Leaf blades relatively broad, mostly less than twice as long as wide, or wider than long.

24. Leaf margins toothed.

25. Hairs coarse and firm, not glandular; flowers bisexual, white, more than 2 cm wide; fruits inconspicuous and indehiscent, 1-seeded. _____**Cordiaceae** (*Cordia parvifolia*)

25' Hairs markedly glandular, not firm; flowers unisexual, often reddish, less than 1 cm wide; fruits conspicuous, 2- or 3-seeded capsules. _____**Euphorbiaceae** (*Acalypha*)

24' Leaves or leaf lobes with entire margins (or occasionally 1 or few small teeth on some leaves).

26. Leaf blades nearly orbicular with a blunt tip; stipules forming a tubular cap enclosing the developing bud and later clasping and encircling the stems. _____**Polygonaceae** (*Coccoloba*)

26' Leaf blades mostly lanceolate to elliptic (not orbicular), the tip blunt or pointed; stipules none or not as above.

27. Plants glabrous or glabrate.

28. Twigs flexible; flowers yellow-green; stamens 5. _____**Rhamnaceae** (*Colubrina viridis*)

28' Twigs rigid or brittle, not flexible; flowers white (in *Adelia*, the male flowers); stamens 10.

29. Twigs rigid, not brittle; leaves not succulent; male and female flowers on separate plants; capsules brown at maturity, 3-seeded. _____**Euphorbiaceae** (*Adelia*)

29' Twigs brittle; leaves often semi-succulent; flowers bisexual; fruits red, 1–5 seeded. _____ _____**Stegnospermataceae** (*Stegnosperma*)

27' Plants pubescent (especially the new growth).

30. Flowers in white woolly panicles; individual flowers inconspicuous, not yellow. _____ _____**Amaranthaceae** (*Iresine*)

30' Pubescence not white woolly; flowers axillary or in racemes; flowers conspicuous, yellow or yellow-green.

31. Pubescence of 2-armed hairs; inflorescences racemose; flowers bright yellow and showy. _____ _____**Malpighiaceae** (*Echinopterys*)

31' Pubescence of simple hairs; flowers axillary; flowers dull yellow-green. _____ _____**Rhamnaceae** (*Colubrina californica*)

5' Annual and perennial herbs, not woody or scarcely woody below, mostly less than 1 m tall.

32. Perennial herbs; leaf veins parallel; flowers subtended by an asymmetric spathe (leafy bract) with a pointed tip; flowers deliquescing in sunlight; sepals 3, petals 3 (the 2 larger ones blue); stamens of 3 sizes and kinds, including 1 yellow stamen and 3 yellow staminodes. _____See **MONOCOTS**: **Commelinaceae** (*Commelina*)

32' Perennial herbs or not, leaf veins not as above; flowers of various colors, not subtended by a spathe, usually not deliquescing; flowers not 3-merous; stamens usually all similar.

33. Herbage spiny or not; fruits spinescent.

34. Herbage, calyx, and fruits spiny; corollas to 5 cm long; stamens numerous; capsules longer than wide. _____**Papaveraceae** (*Argemone*)

34' Herbage and calyx not spiny; corollas 12–16 cm long; stamens 5; capsules globose. _**Solanaceae** (*Datura*)

33' Herbage and fruits without spines (unarmed).

35. Plants with 2-armed or branched hairs.

36. Herbage with 2-armed hairs; flowers unisexual; fruits of 3-seeded capsules. _____ _____**Euphorbiaceae** (*Argythamnia*)

36' Herbage with branched (dendritic) hairs; flowers bisexual; fruits with more than 3 seeds.

37. Hairs soft, plants not sticking like Velcro; cool-season annuals. _____**Brassicaceae** (*Descurainia*)

37' Hairs harsh, bearing minute hooks so that herbage, calyces, and fruits stick like Velcro; perennials or non-seasonal annuals. _____**Loasaceae**

35' Plants with simple hairs (not branched) or glabrous.

38. Annuals; inflorescence branches of circinate-scorpioid cymes (coiled, the flowers on one side).

39. Leaves pinnately lobed or toothed. _____**Hydrophyllaceae** (*Phacelia*)

39' Leaves entire.

40. Plants with glassy hairs; leaves linear, 1 mm wide; capsules longer than wide, enclosed in glassy-haired sepals longer than the capsules; nutlets glabrous and more or less ovate-triangular. _____ _____**Boraginaceae** (*Johnstonella*)

40' Plants with coarse but not glassy hairs; leaves oblanceolate to elliptic, 2+ mm wide; capsules globose, sepals shorter than the capsules; nutlets pubescent and rounded. _____**Heliotropiaceae** (*Euploca*)

38' Annuals and herbaceous perennials; flowers solitary or inflorescence branches straight (not scorpioid).

41. Cool-season annuals; leaves conspicuously lobed or divided.

42. Leaves usually more than 2 cm long, with irregular lobes; sepals and petals each 4 and separate; stamens 6. _____**Brassicaceae**

42' Leaves to 2 cm long, with 2–5 pairs of evenly-spaced linear lobes; calyx and corolla each 5-lobed; stamens 5. _____**Polemoniaceae** (*Dayia*)

41' Perennials or annuals of various seasons; leaves entire or shallowly lobed (margins wavy).

43. Flowers inconspicuous.

44. Flowers bilateral, with calyx and corolla; fruits multiple-seeded pods 3–4 cm long. _____ _____**Fabaceae** (*Sphinctospermum*)

44' Flowers radial; perianth with sepals, corolla none; fruits 1-seeded, less than 5 mm long.

45. At least some inflorescences longer than the leaves. _____ _____**Amaranthaceae** (*Amaranthus*, *Chenopodiastrum*, *Chenopodium*)

45' Flowers in small axillary clusters shorter than the petioles. _____**Urticaceae** (*Parietaria*)

43' Flowers conspicuous.

46. Plants of wetland habitats or seasonally wet soils; young plants often aquatic; flowers (3) 4 or 5 (6)-merous, corollas yellow; ovary inferior. _____**Onagraceae** (*Ludwigia*)

46' Plants usually of dryland habitats; not aquatic; flowers mostly 5-merous, corollas of various colors; ovary superior.

47. Calyx with sticky glands; corollas white, 1.5–2.5 cm wide; fruits 1-seeded capsules. _____ _____**Plumbaginaceae** (*Plumbago*)

47' Calyx not sticky; corollas not white, or if white, then not more than 1 cm wide; fruits multiple-seeded, fleshy or dry (capsules).

48. Flowers bilaterally symmetrical.

49. Upper stems slender, leafless, with overlapping scales. _____**Acanthaceae** (*Elytraria*)

49' Stems leafy, not scaly. _____**Plantaginaceae** (*Nuttallanthus*, *Pseudorontium*)

48' Flowers radially symmetrical.

50. Fruits indehiscent, fleshy berries.

51. Flowers with calyx of 4 separate petal-like sepals, corollas none; fruit of 1-seeded berries. ___ _____**Petiveriaceae** (*Rivina*)

51' Flowers with calyx and corolla, these 5-lobed; berries multiple-seeded. _____
_____**Solanaceae (***Capsicum*, *Physalis*)

50' Fruits dehiscent, capsules.

52. Flowers white, 2–3 mm long; fruits of 3-valved capsules with 3 seeds. _____
_____**Violaceae** (*Hybanthus*)

52' Flowers not white, or if white then more than 10 mm long; capsules with 1–many seeds.

53. Corollas blue; capsules with 1–4 seeds. _____**Convolvulaceae** (*Evolvulus*)

53' Corollas not blue; capsules with more than 4 seeds.

54. Perennials; corollas bright yellow; capsules paired, more than 4 time longer than wide.
_____**Apocynaceae** (*Haplophyton*)

54' Annuals or perennials; corollas not yellow; capsules not paired, less than 2 times longer than wide.

55. Annuals; leaves 1.5–4.5 cm long, not glandular-sticky; corollas rotate, pink to purple. _____**Namaceae** (*Nama*)

55' Perennials, leaves 6–12 cm long, glandular-sticky; corollas tubular, white. _____**Solanaceae** (*Nicotiana*)

PTERIDOPHYTES • FERNS

1. Plants with dichotomously branched (forked) aboveground stems; leafless or with scale leaves less than 3 mm long. _____**PSILOTACEAE**

1' Plants appearing stemless or with creeping rhizomes; leaves more than 10 mm long. _____**PTERIDACEAE**

PSILOTACEAE • WHISK FERN FAMILY

Psilotum nudum (Linnaeus) Palisot de Beauvois

Whisk-fern

Glabrous perennials with multiple stems, branching dichotomously (forked), erect, slender, green, and ridged; without leaves but with minute scale-like appendages; bearing 3-lobed, yellow sporangia on the upper branches. Plants rootless but with short-creeping rhizomes that contain symbiotic fungi.

Known from the canyon by a single colony. Boutin (1971: 141) reported: "In the spring of 1970, while studying the palm oases on the central coast of western Sonora, Mexico, I discovered a small colony of *Psilotum nudum* Palisot in Nacapule Canyon … The *Psilotum* grew at an alga-covered seep on the canyon wall in the shade of palms, *Washingtonia robusta* Wendl., and a few trees of a fig, *Ficus padifolia* [*F. pertusa*] … Only one colony of *Psilotum* with about a dozen stems two to three inches high was found. A small collection of this plant (*Boutin*

Psilotum nudum, Sánchez-Escalante, La Balandrona

& Brandt 2814) is now growing in the Huntington Botanical Gardens."

Myron Kimnach, one of the original collectors, provided Richard with precise locality information, including a hand-drawn map showing the site in the upper part of the canyon, at about where the canyon makes a sharp turn northward. However, Richard and others were not able to relocate the colony, and by the mid-1980s it was assumed to be extirpated.

Although the *Psilotum* was small, apparently stunted by the relatively dry conditions, under cultivation in a greenhouse at the Huntington Botanical Gardens the stems reached 15–17 cm tall, within the usual size range for the species.

The only other record for the Guaymas region is that of a well-established population in the upper portion of Cañón la Balandrona, on the north side of the Sierra El Aguaje. There are no other records for this moisture-requiring plant within the Sonoran Desert, although a small colony was found at the desert edge east of Tucson (*McMahon 146*; McMahon & Fishbein 1994). Otherwise the nearest known populations are in oak woodland at Sycamore Canyon in southern Arizona (Toolin et al. 1979) and conifer woodland and forest in southeastern Sonora (Gentry 1942; Yatskievych & Piper 1998). "All populations from NW Mexico and Arizona are on rocks, whereas the species is mostly epiphytic throughout the rest of its range" (Yatskievych & Piper 1998: 178).

Nacapule Canyon, 15 Jan 1970, *Boutin & F. Brandt 2814* (HNT 7143). Grown in Greenhouse at Huntington Library Botanic Gardens, San Marino, CA from plant originally collected in Nacapule Canyon, Sonora in 1970 by Fred Boutin (*2814,* HNT 25061), pressed 6 May 1986 by R.S. Felger (ARIZ 260328). Cañón La Balandrona, N side of Sierra El Aguaje, 220 meters, seven colonies, from crevices or cracks in shaded, north- and east-facing canyon walls and huge boulders in the canyon bottom; uppermost reaches of the canyon below impassible canyon-bottom cliffs and rock walls, the largest colony ca. 1.2 m along a horizontal crack in a canyon-bottom boulder, the smaller colonies are ca. 30 cm, 19 Dec 2001, *Felger 01-672* (ARIZ, MEXU, MO, UC, USON).

PTERIDACEAE • BRAKE FERN FAMILY

The four Nacapule ferns have leaves that curl up tightly during dry periods and expand during moist conditions to reveal the green surfaces.

1. Leaves once pinnate, the upper surfaces of leaf segments with deciduous stellate-pectinate (star-shaped and comb-like) scales. _____**Astrolepis**

1' Leaves one or more times pinnately divided, without stellate or pectinate scales, the upper surfaces of leaf segments mostly glabrous.

2. Leaf segments pale green on both surfaces. _____**Cheilanthes**

2' Leaf segments brownish or whitish below, darker green above.

3. Leaf blades about as wide as long; lower leaf surfaces without farina. _____**Myriopteris**

3' Leaf blades at least twice as long as wide; lower leaf surfaces with white or yellow farina. _____**Notholaena**

Astrolepis sinuata (Lagasca ex Swartz) D.M. Benham & M.D. Windham subsp. **sinuata**

[*Cheilanthes sinuata* (Lagasca ex Swartz) Domin. *Notholaena sinuata* (Lagasca ex Swartz) Kaulfuss]

Wavy star fern

Densely tufted ferns with short, scaly rhizomes. Leaves sword-shaped, once pinnate, the leaf-axis scaly. Leaflets somewhat thickened, the upper surfaces with deciduous scales, the lower (abaxial) surfaces obscured by overlapping scales 1.6–2.1 mm long, with broad, membranous and fringed margins.

The Nacapule specimen is the only record of this genus from the Guaymas region. However, it is expected elsewhere in the Sierra El Aguaje, especially at higher elevations.

Crevices in rock ledge on north-facing canyon wall; rare in the canyon, *Felger 92-1030*.

Cheilanthes lozanoi (Maxon) R.M. & A.F. Tryon var. **seemannii** (Hooker) Mickel & Beitel

[*Pellaea seemannii* Hooker]

Astrolepis sinuata, Pilares de Nacozari, Sonora

Cheilanthes lozanoi var. *seemannii*, El Baviso

Leaves mostly 20–30 cm long, the lower surface of leaf segments with a nearly continuous margin of golden brown sori. Among rocks on north-facing slopes.

Felger 84-136 (ARIZ, UCR).

Myriopteris pringlei (Davenport) Grusz & Windham

[*Cheilanthes pringlei* Davenport]

Pringle's lip fern

Diminutive ferns with creeping rhizomes. Leaves divided into minute segments. Shaded north-facing rock slopes; rhizomes often in moss and humus overlying rock surfaces.

13 Dec 2013, *Carnahan*, photos; *Felger 84-135, 85-1186*.

Myriopteris pringlei, Nacapule

Notholaena lemmonii D.C. Eaton var. **lemmonii**

Lemmon's cloak fern

Sword-leaved ferns, the leaves at least twice as long as wide. Among rocks on shaded slopes.

Carnahan 1646 (ARIZ, USON); *Felger 20151028-5*.

Notholaena lemmonii var. *lemmonii*, Nacapule

FLOWERING PLANTS

MAGNOLIIDS

ARISTOLOCHIACEAE • BIRTHWORT FAMILY

Aristolochia watsonii Wooton & Standley

[*A. brevipes* Bentham var. *acuminata* S. Watson, not *A. acuminata* Lamarck. *A. porphyrophylla* H. Pfeifer]

Hierba del indio; Indian root

Drought-deciduous herbaceous perennials from a thickened tuberous root. Stems sprawling or vining. Canyon bottom and slopes, and rock crevices on north-facing canyon wall.

30 Dec 2011 & 11 Mar 2015, *Carnahan*, photos; *Felger 85-239; Starr 213*.

Aristolochia watsonii, Nacapule

EUDICOTS
ACANTHACEAE • ACANTHUS FAMILY

1. Leaves alternate or appearing whorled; flower spikes on slender, scaly stems; corollas blue, not more than 1 cm long. _____**Elytraria**

1' Leaves opposite; flowers not on slender scaly stems; corollas not blue, or if bluish then more than 1 cm wide or long.

2. Shrubs or mound-shaped bushes.

3. Leaves conspicuously glandular-sticky; corollas lavender, large and showy, about as wide as long. _____**Ruellia**

3' Leaves not glandular-sticky; corollas not lavender, longer than wide.

4. Corollas rose-pink; fertile stamens 4. _____**Holographis**

4' Corollas red or red-orange; fertile stamens 2. _____**Justicia** (*J. californica, J. candicans*)

2' Perennial herbs.

5. Floral bracts 4-ranked, large and conspicuous; calyx 4-lobed; corollas cream-yellow with purple markings. _____**Tetramerium**

5' Floral bracts not 4-ranked and not large and conspicuous; calyx 4- or 5-lobed; corollas of various colors.

6. Calyx 4-lobed; flowers lavender; capsules glandular. _____**Justicia sonorae**

6' Calyx 5-lobed; flowers white, yellow, or lavender; capsules not glandular.

7. Capsules T-shaped, the segments narrowly club-shaped, gradually tapered below, indehiscent; seeds 2._ _____**Aphanosperma**

7' Capsules abruptly narrowed below to a claw, dehiscent, seeds 2–4. _____**Carlowrightia**

Aphanosperma sinaloensis, Sánchez-Escalante, La Pintada

Aphanosperma sinaloensis (Leonard & Gentry) T.F. Daniel

[*Carlowrightia sinaloensis* Leonard & Gentry]

Herbaceous perennials, the herbage appearing with summer rains and sometimes with spring rains. Leaves thin, relatively large, and falling with the first dry conditions. Corollas cream-white, minute, and quickly falling with daytime heat. The unusual fruit sets it apart from *Carlowrightia* (Daniel 2004). Restricted to ca. 0.5 km of shaded canyon bottom beneath *Coccoloba* shrubs.

Felger 85-1194, 85-1316.

Carlowrightia

1. Leaves lanceolate to ovate; seeds 4, all alike. _____**Carlowrightia arizonica**

1' Leaves linear; seeds 2–4, the 3rd and 4th seeds (if present) different from the others. _____**Carlowrightia pectinata**

Carlowrightia arizonica A. Gray

[*C. californica* Brandegee. *C. cordifolia* A. Gray]

Hierba del toro, *lemilla*

Carlowrightia arizonica, San Carlos

Suffrutescent perennials with drought-deciduous leaves. Growing and flowering primarily during late spring and the summer rainy season. Corollas white with a yellow "eye" and purple nectar guidelines on the upper lip (formed by two fused petals). The corollas snap open at about sunrise and fall in the daytime heat, usually by mid- to late morning. Canyon bottom, slopes, and nearby desert.

Felger 84-614, 85-556.

Carlowrightia pectinata Brandegee

Herbaceous perennials with slender stems to ca. 1 m long. Growing and flowering primarily during the summer rainy season. Leaves nearly linear, thin, quickly drought-deciduous. Corollas pale yellow with dark red nectar-guides. Canyon bottom and lower north-facing slopes; not common.

Carnahan 1607 (ARIZ, ASU, USON); *Felger 84-603*, *02-1055; Starr 216*.

Carlowrightia pectinata, Nacapule

Elytraria imbricata (Vahl) Persoon

Cordoncillo

Dwarf perennial herbs. Leaves tardily drought-deciduous, growing and flowering primarily during summer rainy season; flowers blue. Common understory plants; widespread, shaded canyon bottom, mostly north-facing slopes, and in nearby desert habitats.

28 Oct 2015, *Carnahan*, photos; *Felger 84-120, 85-862*.

Holographis virgata (Harvey ex Bentham & Hooker) T.F. Daniel subsp. **virgata**

[*Berginia virgata* Harvey ex Bentham & Hooker var. *virgata*]

Scarcely woody shrubs to 1.6 m tall. Tardily drought-deciduous. Flowers bright rose-pink; flowering response non-seasonal. Widespread and common, mostly in open, xeric habitats; canyon bottom and slopes, and nearby open desert. Heavily browsed by rabbits and deer, and formerly by cattle.

Elytraria imbricata, Nacapule

11 Jan 2016, *Carnahan*, photos; 12 Jan 1982, *Daniel 1972* (ASU); *Felger 85-565*.

Justicia

1. Plants herbaceous; corollas lavender. _**Justicia sonorae**

1' Plants shrubby; corollas orange to red.

2. Stem surfaces densely covered with microscopic hairs of a single size; flowers pedicelled. _**Justicia californica**

2' Stems with minute and larger hairs, not entirely covering the stem surface; flowers sessile or very short-pedicelled. _____**Justicia candicans**

Justicia californica (Bentham) D.N. Gibson

[*Beloperone californica* Bentham]

Chuparrosa; desert hummingbird-bush

Sprawling shrubs to 2+ m high, nearly leafless during drier times of the year. Flowers red-orange; non-seasonal

Holographis virgata, Nacapule

Justicia californica, Nacapule

but often with massive flowering in March. Dry watercourses in the canyon bottom and nearby desert.

16 Dec 2012, *Carnahan*, photos; *Felger 85-580; Starr 204*.

Justicia candicans (Nees) L.D. Benson

[*Jacobinia ovata* A. Gray. *J. ovata* var. *subglabrata* S. Watson]

Tronador

Understory shrubs 1–1.5 m tall with slender stems. Leaves drought-deciduous. Flowers bright red-orange; various seasons, especially late fall and early winter. Most common in the canyon bottom and north-facing slopes; not found in adjacent open desert.

Búrquez-M. 94-251 (USON); 30 Jan 2017, *Carnahan*, photos; *Daniel 2336* (ASU); *Felger 84-92; Starr 205*.

Justicia candicans, Cañón de Robinson

Justicia sonorae Wasshausen

Herbaceous perennials with wiry stems 0.5–1.2 m long. Flowers showy, the corollas lavender with white nectar-guide streaks on the lip. One small colony observed in the canyon bottom in 1985 (Felger 1999) and not recorded in the canyon since then.

Justicia sonorae, San Carlos

Ruellia californica (Rose) I.M. Johnston subsp. **californica**

RAMA PARDA

Scarcely woody shrubs 1–1.5 m tall. Leaves strong-smelling (skunk-like), noticeably glandular-sticky; tardily drought-deciduous. Corollas lavender, rarely white, large and showy; at various seasons. Mostly open, exposed habitats, and drier areas on canyon slopes and near the canyon bottom; locally abundant.

11 Nov 2014, *Carnahan*, photos; *Felger 11954*; *Gallagher 273* (ASU); *Starr 713*.

Tetramerium nervosum Nees

[*T. hispidum* Nees. *Dianthera sonorae* S. Watson]

FULGENCIA; HAIRY FOURNWORT

Ruellia californica, Nacapule

Tetramerium nervosum, Nacapule

Herbaceous perennials. Corollas cream-white and lavender, falling with mid-morning heat; generally flowering during hot weather, especially after rains. Often beneath shrubs; canyon bottom and north-facing slopes.

Bertelsen 92-145; 11 Nov 2014, *Carnahan*, photos; *Daniel 1968* (ASU); *Felger 85-1222; Wilder 10-469* (ARIZ, UCR).

ACHATOCARPACEAE

Phaulothamnus spinescens A. Gray

Ojo de víbora; snake-eyes

Woody shrubs, *Lycium*-like, spinescent and glabrous; drought-deciduous. Flowers inconspicuous. Fruits globose, ca. 5 mm diameter, fleshy, and translucent white. Canyon bottom and north-facing slopes.

Daniel 2339 (ASU); *Felger 92-1014*; *Keil 16590* (UCR).

Phaulothamnus spinescens, Sánchez-Escalante, near Hermosillo

AMARANTHACEAE • AMARANTH FAMILY (INCLUDES CHENOPODIACEAE)

1. Shrubs 1.5–2 m tall. _____**Iresine**

1' Annuals (ephemerals) and perennial herbs, less than 1 m tall.

2. Leaves opposite.

3. Pubescence of simple hairs; leaves sub-sessile to short-petiolate; flowers many on elongated inflorescences held above the leaves. _____**Froelichia**

3' Pubescence of branched hairs; larger leaves with prominent petioles; flowers 1–3 in sessile clusters among the upper leaves. _____**Tidestromia**

2' Leaves alternate.

4. Flowers unisexual. _____**Amaranthus**

4' Flowers bisexual.

5. Plant not stinky; leaves shiny on both surfaces, or sometimes grayish below; seed margins acute with a distinct rim; seed surface dull even after removal of the pericarp. _____**Chenopodiastrum**

5' Plants often stinky; leaves pale and mealy; seed margins obtuse; seed surface shiny blackish after removal of the pericarp. _____**Chenopodium**

Amaranthus fimbriatus, Estero Soldado

Amaranthus watsonii, pistillate plant, Las Barajitas

Amaranthus

1. Herbage glabrous; inflorescences "soft," the bracts not spiny or stiff; pistillate sepals fringed; stamens 3. _____**Amaranthus fimbriatus**

1' Herbage glandular pubescent; inflorescence bracts (caution, bracts not sepals) stiff and often sharp; pistillate sepals not fringed; stamens 5. __**Amaranthus watsonii**

Amaranthus fimbriatus (Torrey) Bentham

Bledo, quelitillo; FRINGED AMARANTH

Hot-weather ephemerals, sometimes persisting until December or even spring. Herbage glabrous. Male and female flowers on the same plant; flowers green and white. Inflorescences "soft," the bracts not spiny or stiff; pistillate calyx urn-shaped, the sepals fringed. Canyon bottom, mostly in open habitats, sometimes on slopes, and the nearby desert.

Carnahan 1539 (ARIZ, USON); *Felger 95-60*.

Amaranthus watsonii Standley

Bledo, quelite; CARELESS WEED, PIGWEED

Non-seasonal ephemerals. Herbage glandular pubescent. Male and female flowers on separate plants, the pistillate bracts spinescent; sepals more or less lanceolate with entire margins. Canyon bottom and lower slopes, mostly in disturbed areas, and often abundant in the nearby open desert, and at Nacapule Spring. Honeybees collect the pollen.

Bertelsen 92-147; *Carnahan 1614* (ARIZ, USON); *Felger 84-146, 85-1198A* (ARIZ, ASU), *94-861*. Nacapule Spring, *Carnahan 1596, 1620.*

*__Chenopodiastrum murale__ (Linnaeus) S. Fuentes, Uotila & Borsch

[*Chenopodium murale* Linnaeus]

Chual; NET-LEAF GOOSEFOOT

Chenopodiastrum murale, San Carlos

Winter-spring ephemerals. Leaves dark green to reddish green and shiny on both surfaces, or sometimes grayish below. Seed margins acute with a distinct rim; seed surface dull even after removal of pericarp. Found in 1995 in heavily grazed area at Nacapule Spring, and not seen prior to that time. Common in nearby San Carlos.

Nacapule Spring, *Felger 95-105* (ARIZ, USON).

Chenopodium neomexicanum Standley

Annuals, germinating in spring and maturing during summer. Mature plants stink like dead fish but the tender, young herbage is eaten locally as greens (*quelites*). Common along the canyon bottom, especially in disturbed areas.

Felger 85-266, 85-1329.

Froelichia interrupta (Linnaeus) Moquin var. **alata** (S. Watson) R.A. McCauley

[*F. alata* S. Watson]

Herbaceous perennials, probably short-lived, mostly growing and flowering with summer rains. Flowers inconspicuous, nearly hidden in woolly bracts. Not

Chenopodium neomexicanum, Santa Cruz County, Arizona

Froelichia interrupta, Bahía San Pedro

common; rock crevices and ledges on north-facing slopes and rarely along the canyon bottom.

Bertelsen 92-155; Canyon bottom, 30 Dec 2011 & 11 Nov 2014, *Carnahan*, photos; *Felger 85-1320*.

Iresine alternifolia, Nacapule

Iresine latifolia, El Baviso

Iresine

1. Leaves mostly alternate; sepals glabrous or sparsely pubescent. _____**Iresine alternifolia**

1' Leaves opposite; sepals usually woolly. _____ _____**Iresine latifolia**

Iresine alternifolia S. Watson

[*Dicraurus alternifolius* (S. Watson) Uline & A. Gray]

Shrubs 1.5–2 m tall with slender stems. Leaves tardily drought-deciduous, turning orange before falling. Male and female flowers on separate plants. Inflorescences and flowers white. Canyon bottom and north-facing slopes.

Usually distinguished from *I. latifolia* by its alternate leaves; however, *I. alternifolia* may have opposite as well as alternate leaves, even on the upper branches. The leaves of *I. alternifolia* are usually smaller and with rounded tips while those of *I. latifolia* are larger and pointed. Plants of *I. alternifolia* in the Guaymas region tend to have more elongated and more slender inflorescences and larger leaves than those from the Baja California peninsula.

26 Jan 2016, *Carnahan*, photos; *Felger 84-94; Keil 16591* (UCR); *Starr 28*.

Iresine latifolia (M. Martens & Galeotti) Bentham & Hooker f.

[*Gomphrena latifolia* M. Martens & Galeotti. *Iresine latifolia* D. Dietrich ex Moquin, an invalid name, see Tropicos 2017. *Iresine calea* (Ibáñez) Standley]

Shrubs 1.5–2 m tall. Leaves opposite. Male and female flowers on separate plants. Inflorescences and flowers white. Canyon bottom and north-facing slopes; not as common as *I. alternifolia*.

Iresine latifolia cannot always be readily separated from *I. hartmanii* Uline of northwestern Mexico, and perhaps they are not distinct species (Felger 1999; Zumaya 2008). *Iresine hartmanii* differs from *I. latifolia* by having hairy stamen appendages.

26 Jan 2016, *Carnahan*, photos; *Felger 84-172*; *Steinmann 13 Mar 1992*.

Tidestromia lanuginosa (Nuttall) Standley subsp. **eliassoniana** Sánchez-del Pino & Flores Olvera

[*T. eliassoniana* (Sánchez-del Pino & Flores Olvera) Sánchez-del Pino & Flores Olvera]

Hierba ceniza; HONEYSWEET

Hot weather ephemerals. Flowers minute, yellow. Seasonally abundant in open, xeric habitats such as the arroyo bed near the canyon entrance, south-facing slopes, and the nearby open desert.

11 Mar 2015, *Carnahan*, photos; *Felger 85-1223*; Near mouth of canyon, 24 Sep 1990, *Quinn & Sundt 11*.

Tidestromia lanuginosa, Nacapule

APOCYNACEAE • DOGBANE FAMILY (INCLUDES ASCLEPIADACEAE)

1. Vines, the stems generally twining, at least at the tips.

2. Leaves linear to lanceolate, more than twice as long as wide, the margins often revolute.

3. Stems essentially glabrous or sparsely pubescent with scattered straight hairs; flowers more than 5 mm long, the corolla surfaces readily visible. _____**Funastrum**

3' Stems with a longitudinal line of usually curved hairs; flowers 4 mm long, the inner corolla surfaces obscured by hairs. _____**Metastelma**

2' Leaf blades broadly ovate to cordate, less than twice as long as wide, the margins not revolute.

4. Herbage essentially glabrous; fruits at least 5 cm in diameter, tough and leathery to hard-shelled. ___**Marsdenia**

4' Herbage conspicuously pubescent; fruits less than 2 cm in diameter, soft-walled. _____**Polystemma**

1' Stems not vining.

5. Shrubs more than 1.5 m tall; fruits indehiscent, fleshy, about 1 cm long. _____**Vallesia**

5' Suffrutescent perennials or shrubs less than 1 m tall; mature fruits dry (capsules), more than 1 cm long.

6. Stems leafless or sparsely leaved; leaves linear-filiform, less than 5 mm wide. _____**Asclepias**

6' Stems leafy; leaves lanceolate to ovate, more than 5 mm wide.

7. Suffrutescent perennials; leaves alternate or some opposite or sub-opposite, the blades thin; flowers bright yellow, the floral tube ca. 1 cm long; capsules 2–2.5 mm wide; seeds with a tuft of hair at both ends. _____ **Haplophyton**

7' Small woody shrubs; leaves opposite, the blades rather thick; flowers white, the floral tube 6.5–12 cm long; capsules more than 5 mm wide; seeds with a tuft of hair at one end only. _____ **Mandevilla**

Asclepias

1. Flowers 8–10 mm long; fruits less than 5 cm long. _____ **Asclepias leptopus**

1' Flowers more than 15 mm long; fruits 5 or more cm long. _____ **Asclepias subulata**

Asclepias leptopus I.M. Johnston

CLIFF MILKWEED

Suffrutescent perennials. Stems very slender, ascending to upright and drooping during drought. Leaves few, filiform, and quickly drought-deciduous. Flowers white and green; various seasons. Fruits slender and smooth, mostly 3.5–4 cm long.

Rock crevices, mostly on north-facing canyon walls but also on arid, exposed rock faces. Larvae of *Danaus gilippus strigosus* (striated queen) feed on the plant and the butterflies visit the flowers.

Ames 12 Mar 1977; 12 Jan 2015, *Carnahan*, photos; *Felger 84-147*; 12 Oct 1897, *Palmer 256* (DS, UC, the label on these two specimens reads "Guaymas," while the label of a specimen of the same number at US reads "near Nacapuly, 15 miles west of Guaymas"; also see Johnston 1924: 1127 and McVaugh 1956: 220).

Asclepias subulata Decaisne

MATA CANDELILLA, YAMATE; REED-STEM MILKWEED

Asclepias leptopus, Nacapule

Asclepias subulata, Arroyo Nacapule

Funastrum heterophyllum, Playa Algodones

Perennials with many semi-succulent, erect stems. Leaves few, filiform and quickly deciduous. Flowers cream-white; various seasons; visited by large orange-winged tarantula-hawk wasps (*Pepsis*). Fruits slender and smooth, mostly 8–15 cm long. Widely scattered in open desert near canyon mouth.

11 Nov 2014, *Carnahan*, photos; *Felger 94-858*, *95-65* (ARIZ, USON).

Funastrum heterophyllum (Engelmann ex Torrey) Standley

[*F. hartwegii* Schlechter. *Sarcostemma cynanchoides* Decaisne subsp. *hartwegii* R.W. Holm. *S. heterophyllum* Engelmann ex Torrey]

Guirote; CLIMBING MILKWEED

Perennial vines. Flowers maroon-purple and white; any season. Canyon bottom and arroyos in nearby open desert.

Felger 84-123.

Haplophyton cimicidum A. de Candolle

Hierba de la cucaracha; COCKROACH PLANT

Haplophyton cimicidum, Nacapule

Herbaceous perennials. Leaves drought-deciduous. Corollas bright yellow and showy; mostly during warmer months. Canyon bottom, slopes, and floodplain and hills near the canyon entrance.

29 Oct 2015, *Carnahan*, photos; *Felger 84-122*; *Starr 25*.

Mandevilla nacapulensis (Felger & Henrickson) A.O. Simões, Kinoshita & M.E. Endress

[*Telosiphonia nacapulensis* Felger & Henrickson, Aliso 14: 194, 1996.]

NACAPULE ROCK TRUMPET

Shrubs to 1 m tall, the branches divaricate, firm and woody. Leaves tardily drought-deciduous. Flowers white and showy, often 3–5 cm across, 7–10 cm long and long-tubed, fragrant, mostly opening in the late afternoon and fading the following morning; flowering more or less throughout the summer rainy season. Fairly common on open rocky slopes, ledges, and bases of cliffs.

Sierra El Aguaje, from the vicinity of Bahía San Carlos and Nacapule northward to Bahía San Pedro, and in

Mandevilla nacapulensis, Las Barajitas

Marsdenia edulis, San Carlos

the Sierra Libre. Its closest relative seems to be *Mandevilla brachysiphon* (Torrey) Pichon (*Telosiphonia brachysiphon* [Torrey] Henrickson) of northern Sonora, Chihuahua, Arizona, and New Mexico (Henrickson 1996).

Felger 85-830 (holotype, ARIZ; isotypes GH, MEXU, NY, TEX); *Felger 85-869* (ARIZ, ASU), *92-1034*.

Marsdenia edulis S. Watson

Talayote

Large perennial vines, the base often woody with winged, corky bark; leaves tardily drought-deciduous. Flowers 7–8 mm long, white with a pale pink mid-stripe on the corolla lobes; flowering at least following summer rains. Fruits 7.5–12 cm long, green, smooth, ovoid, and hard-shelled. Canyon bottom and mostly north-facing slopes.

30 Dec 2011, *Carnahan*, photo; *Felger 85-866*; *Wilder 10-475* (ARIZ, UCR, USON).

Matelea cordifolia, see **Polystemma cordifolium**

Metastelma arizonicum A. Gray

[*M. albiflorum* S. Watson, 1889, not *M. albiflorum* Grisebach, 1861. *M. watsonianum* Standley. *Cynanchum arizonicum* (A. Gray) Shinners]

Small perennial vines growing in shrubs; leaves tardily drought-deciduous, narrow, and dark green with revolute margins. Flowers 3–4 mm long, green except for dense white (villous) hairs on the inner surface of the corolla lobes; warmer months. These hairs point downward and toward the center of the flower. A small insect attracted to the flower would thus be directed toward the center, and the downward pointing hairs would prevent its access elsewhere. Scattered in the canyon including slopes.

Carnahan 1606 (ARIZ, USON); *Felger 85-560.*

Polystemma cordifolium (A. Gray) McDonnell & Fishbein

[*Matelea cordifolia* (A. Gray) Woodson. *Rothrockia cordifolia* A. Gray]

Talayote

Metastelma arizonicum, San Carlos

Polystemma cordifolium, Nacapule

Perennial vines often growing through shrubs and trees with drought-deciduous, broadly ovate, pale-green leaves, foul-smelling when bruised or crushed. Flowers whitish, 15 mm long. Herbage, flowers, and fruits produced at various seasons following rainy periods. Canyon bottom, north-facing slopes, and less common on south-facing slopes.

27 Oct 2015, *Carnahan*, photos; *Felger 84-621; Phillips 75-142*.

Vallesia

1. Leaves 3.3–8 cm long; stipules 1.3–1.5 mm long, the margins essentially entire; corolla tube 3.6–4.3 mm long. _____**Vallesia glabra**

1' Leaves 5–12 cm long; stipules 1.5–3 mm long, the margins laciniate; corolla tube 9.5–10.5 mm long. _____**Vallesia laciniata**

Vallesia glabra Cavanilles var. **glabra**

Huevito

Shrubs to 2.5 m in height, mostly evergreen. Flowers white; various seasons. Several widely scattered young plants were found in 1995 in areas of cattle grazing in the arroyo below the canyon entrance. These apparently spread into the area in the late 1980s or early 1990s. This species is locally common in the vicinity of Nacapule Spring. It is also common elsewhere in the region. *Vallesia glabra* can be distinguished from *V. laciniata* by its smaller and shinier leaves, and smaller flowers. We did not find the two species growing intermixed.

Felger 95-43, *95-60*, *95-122A* (USON).

Vallesia laciniata Brandegee

[*V. baileyana* Woodson, Ann. Mo. Bot. Gard. 24: 14, 1937.]

Huevito, jazmín del Nacapule

Vallesia glabra, San Carlos

Vallesia laciniata, La Navaja

Shrubs to 3–4 m tall, with multiple stems, the branches flexible, with age becoming woody especially near the base. Leaves essentially evergreen, alternate, the blades 4.4–11.3 cm long, 1.3–2.7 cm wide, oblong-lanceolate, the upper surfaces glabrous to minutely puberulent, especially along the midrib, the lower surfaces short-pubescent, the petioles 5–10 mm long, relatively thick; stipules triangular, laciniate, yellowish, soon becoming brown. Inflorescences sub-umbellate, often of two short, dichotomous branches, the clusters often 4–6 cm across, each with 10–25 flowers. Peduncles 12.6–23.5 mm long, erect, firm, with minute scales. Flowers with strong gardenia-like fragrance day and night, the nectar sweet-tasting. Flowering any time of year, often profusely March through April. Each flower subtended by scales resembling the stipules. Calyx green, the tube swollen, 0.8–1 mm long, the lobes triangular-acute, 0.8–1.2 mm long. Corolla tube at first green, becoming white during or just after anthesis, 10–10.5 mm long, narrowed to 0.8–1.5 mm wide below, conspicuously swollen above to 2.5–2.7 mm wide, the tube wall thickened here to 0.3 mm, the tube constricted to 2 mm in width at apex of throat; corollas otherwise pure white, fading yellowish when dried, with a star-shaped, slightly thickened callous of white, glistening and erect hairs surrounding the throat orifice, the lobes spreading, each 7–7.5 mm long, the margins inrolled above. Anthers yellow, 1.4–1.6 mm long, tapered above, the filaments shorter than anthers, the stamens inserted on throat of corolla tube. Style 6 mm long, whitish below, the stigma green, 1.3–1.4 mm long, cylindrical and thick, enveloped in clear jelly-like substance, notched above. Fruits paired or one fails to develop, 1-seeded drupes 10–13 mm long, the pericarp fleshy, translucent whitish to whitish pink. Seeds (9) 10–12 mm long, oblanceolate, white and bony, the surfaces with a raised, dendritic-reticulate pattern.

Locally dense along the canyon bottom and in pockets of dense, brushy vegetation on the lower north-facing slopes; essentially restricted to the winter-shaded portion of the canyon. Also in Cañón Las Barajitas and at the Cañón Los Anegados–Robinson complex. *Vallesia laciniata* occurs on the Baja California peninsula from the vicinity of Comondú southward (Rebman et al. 2016), and in western Sonora in the Sierra El Aguaje and mountains southeast of Cd. Obregón. Williams (1996) suggests that *V. conzattii* Standley of southern Mexico and *V. baileyana* are synonyms of *V. laciniata.*

The fruits are eaten by coyotes and other animals and the seeds are seen in their scats along the canyon-bottom trail and trails leading out of the canyon. Seed-grown plants are cultivated to a limited extent in southern Arizona but are sensitive to freezing temperatures. It can also be propagated by cuttings in a greenhouse mist-bench with bottom heat. The luxuriant foliage and spectacularly sweet-scented flowers make it worthy of extensive cultivation in Sonora and other arid and semi-arid tropical regions.

"Nacapule Canyon, 'citaboro,' very fragrant bush, flowers white," *Bailey 30 Mar 1934* (holotype of *V. baileyana*, MO); *Búrquez-M. 94-240* (USON); *Carnahan SC 934* (ARIZ, USON); *Felger 84–110*; *Gentry 19880; Van Devender 84–255*; *Wilder 10-467* (ARIZ, UCR).

Nacapule Canyon, north fork; *Ficus insipida* and young *Washingtonia robusta*

ASTERACEAE (COMPOSITAE) • COMPOSITE OR DAISY FAMILY

1. Perennials; stems semi-succulent, the leaves conspicuously succulent. _____**Hofmeisteria**

1' Annuals or perennials; not succulent (leaves sometimes semi-succulent in *Pleurocoronis*).

2. Annuals; sap milky; florets all ligulate, bisexual, and conspicuous, the ligules strap-shaped and 5-lobed.

3. Achenes (cypselas) beaked, the beak slender like a wire and about as long as or longer than the achene body; corollas all similar in size, usually deliquescent. _____**Lactuca**

3' Achenes not beaked (sometimes narrowed to a neck but the neck not slender like a wire and much shorter than the achene body); corollas graduated (inner ones smaller), not deliquescent. _____**Sonchus**

2' Annuals or perennials; sap not milky; florets highly variable but not all ligulate.

4. Small shrubs or subshrubs; leaf bases persistent on stems as short, blunt projections; heads of bilabiate florets only; achenes expanded at apex into a disk bearing numerous pappus bristles. ___**Trixis**

4' Annual or perennial herbs to shrubs; leaf bases not persistent as above; heads with ray and disk florets, or only disk or disk-like florets, these not bilabiate; achenes various.

5. Heads with both ray and disk florets, the rays usually obvious (taxa with small, inconspicuous, or early-deciduous rays will key out in either choice; if in doubt, go to the next couplet 5').

6. Pappus none.

7. Leaves alternate.

8. Plants annuals or short-lived herbaceous perennials; leaves dissected; rays white with dark longitudinal lines below. _____**Coreocarpus**

8' Plants shrubby or subshrubby; leaves entire; rays yellow.

9. Herbage not viscid; leaves ovate; rays more than 10 mm long. _____**Encelia**

9' Herbage viscid-sticky; leaves linear; rays less than 3 mm long. _____**Gymnosperma**

7' Leaves opposite.

10. Rays white, minute, and not persistent. _____**Eclipta**

10' Rays yellow, fading greenish, showy, and persistent. _____**Heliopsis**

6' Pappus present, at least on disk achenes.

11. Plants glabrous and dotted with prominent oil glands, pungently aromatic.

12. Leaves deeply divided; rays white. _____**Thymophylla**

12' Leaves entire but some with basal bristles; all flowers yellow.

13. Annuals; leaves with prominent bristles at base. _____**Pectis**

13' Perennials; leaves without bristles. _____**Porophyllum**

11' Plants pubescent or nearly glabrous, not dotted with oil glands and not pungently aromatic.

14. Plants glabrous except woolly tufts at leaf bases and axils; pappus of many long, soft, white hairs. _____ _____**Senecio**

14' Herbage sparsely to densely pubescent; pappus of scales and sometimes also with 1 or 2 awns or bristles.

15. Herbage with soft hairs; disk florets not subtended by bracts; achenes with a thickened, white, ciliate margin. _____**Perityle**

15' Herbage with short but coarse hairs; disk florets subtended by chaffy bracts enclosing the achenes and falling with them; achenes without a thickened rim. _____**Viguiera**

5' Heads of disk florets only, outer florets without an obvious ligule or ray, or if ray florets present then inconspicuous or reduced, or lacking a well-developed ligule (if in doubt about presence of rays then take this choice).

16. Heads unisexual, the pistillate florets in a bur. _____**Ambrosia**

16' Heads not unisexual; none of the florets in burs.

17. Annuals; leaves sessile or nearly so, the margins entire or nearly so; florets minute, inconspicuous and dull-colored (rarely, reddish on tips); achenes 1 mm or less.

18. Majority of bracts of head partially or completely enclosing a floret; outer several florets without pappus. _____**Logfia**

18' Majority of bracts of head not directly associated with florets; all florets with pappus.

19. Plants sparsely pubescent, not at all woolly; leaves with a few shallow teeth. _____**Erigeron**

19' Plants densely white-woolly; leaves entire. _____**Gamochaeta**

17' Annuals and perennials; leaves sessile or not, the margins entire or not; florets small or medium-sized, often colorful, greenish, yellow, white, or pink; achenes 2 mm or more, or if smaller then perennials.

20. Annuals or perennials; pappus none.

21. Herbs, mostly annuals, not viscid-sticky; leaves opposite; outer florets white, the central ones yellow. _____**Eclipta**

21' Perennials, shrubs or subshrubs with viscid-sticky herbage; leaves alternate; all florets yellow. _____ _____**Gymnosperma**

20' Perennials, pappus present.

22. Stems conspicuously winged.

23. Leaves alternate, soft-pubescent and glandular, the margins finely toothed; flowers pink. _____**Pluchea**

23' Leaves opposite, densely scabrous-hispid, the margins coarsely lobed and toothed; flowers yellow. _____**Verbesina**

22' Stems not winged.

24. Herbage and phyllaries resinous-glutinous and aromatic; flower heads unisexual. _____**Baccharis**

24' Herbage and phyllaries not resinous-glutinous; flower heads bisexual.

25. Many-stemmed perennial bushes; pappus of plumose bristles. _____**Bebbia**

25' Annuals or perennials; pappus not plumose.

26. Pappus of uniform, slender, capillary bristles.

27. Flowers dull yellow-green, the flower heads clearly multiple-flowered and on separate peduncles. _____**Brickellia**

27' Flowers bright yellow, the "heads" actually a globose collection of small, single-flowered heads. _____**Lagascea**

26' Pappus with scales or broad bristles in addition to slender bristles.

28. Leaves entire or nearly so, the petioles shorter than the leaf blades; heads 4 mm long. _____ _____**Koanophyllon**

28' Leaf margins crenate to toothed, the petioles mostly as long as or longer than the blades; heads 8–10 mm long. _____**Pleurocoronis**

Ambrosia ambrosioides, Pinacate

Ambrosia

Herbaceous perennials and shrubs. Flower heads with disk florets; female flowers in burs.

1. Herbaceous perennials; leaves 1–3 times pinnately divided. _____**Ambrosia confertiflora**

1' Plants bushy or shrubby; leaves simple, the margins toothed (not divided).

2. Leaf blades elongated-triangular, often 15+ cm long or more. _____**Ambrosia ambrosioides**

2' Leaf blades ovate-cordate, 2–10 cm long._____ _____**Ambrosia cordifolia**

Ambrosia ambrosioides (Cavanilles) W.W. Payne

[*Franseria ambrosioides* Cavanilles]

Chicura; canyon ragweed

Ambrosia confertiflora, San Carlos

Multiple-stem shrubs to 1.5+ m tall. Leaves partially evergreen but reduced in size and number during drought, the blades seldom without insect damage and studded with insect galls. Flowering in spring. Infrequent along canyon floor and the open desert; more numerous in nearby arroyos.

Felger 94-861; *Gentry 19879.*

Ambrosia confertiflora de Candolle

[*Franseria confertiflora* (de Candolle) Rydberg]

Estafiate; slim-leaf ragweed

Herbaceous perennials. One colony ca. 1 m across, found in 1992 in disturbed area at edge of the road, adjacent to *Vallesia laciniata* and *Coccoloba goldmanii*. There are no other records in the canyon for this weedy plant.

Felger 92-1021.

Ambrosia cordifolia, La Navaja

Ambrosia cordifolia (A. Gray) W.W. Payne

[*Franseria cordifolia* A. Gray]

Chicurilla

Bushy perennials ca. 1 m tall. Growing and flowering with cool-season rains, and essentially leafless during the summer. Canyon floor and north-facing slopes; not common.

11 Mar 2015, *Carnahan*, photos; *Felger 11990, 95-7.*

Baccharis sarothroides A. Gray

Romerillo; desert-broom

Broom-like shrubs to 2 m tall, although mostly much smaller. Flower heads of white disk florets. Scattered along the canyon bottom in open, especially disturbed areas. First seen in the canyon in December 1985 and apparently more numerous in subsequent years.

Baccharis sarothroides, staminate plant, Santa Cruz County, Arizona

Bebbia juncea, San Carlos

Carnahan 1541 (ARIZ, ASU, USON); *Felger 92-1038, 94-873*; *Wilder 10-484* (UCR).

Bebbia juncea (Bentham) Greene var. **aspera** Greene

Hierba ceniza; sweetbush

Suffrutescent bushy perennials, often 1–1.5 m tall. Leaves usually sparse and quickly drought-deciduous. Flower heads discoid; flowers yellow and fragrant, at almost any time of the year; attracting hordes of butterflies. Widespread, south-facing slopes, open areas in the canyon bottom, and the nearby open desert.

28 Oct 2015, *Carnahan & Felger*, observation & photos; *Felger 85-569* (ARIZ, ASU).

Brickellia

1. Leaf margins coarsely toothed; outer phyllaries ca. 1 mm wide; achenes (3) 3.5–4 mm long.____ _____**Brickellia coulteri**

1' Leaf margins blunt-toothed to scalloped; outer phyllaries 1.2–1.4 mm wide; achenes 2.2–2.9 mm long. _____**Brickellia rhomboidea**

Brickellia coulteri A. Gray var. **coulteri**

Shrubs to 1 m tall with slender, brittle stems. Leaves gradually drought-deciduous. Flowers rather inconspicuous, yellow-green and purple; non-seasonal. Canyon bottom and slopes, and nearby open desert.

Carnahan 1593 (ARIZ, USON), *1613* (ARIZ, ASU, USON); *Felger 84-151*; *Van Devender 28 Dec 1982*.

Brickellia coulteri, Nacapule

Brickellia rhomboidea Greene

Sprawling shrubs 1.5–2+ m across, scarcely woody at the base and with whitish stems. Leaves probably nearly evergreen, highly variable in size and shape. Phyllaries green, the flowers yellow-green. Distinguished from *B. coulteri* by its thicker stems, and larger, broader, thicker,

Brickellia rhomboidea, Nacapule

Brickellia rhomboidea, Nacapule

Coreocarpus sonoranus, Nacapule

and obtuse leaves. Several colonies along the canyon bottom, and at a shaded north-facing seep near the upper end of the canyon.

Brickellia rhomboidea is endemic to the Guaymas region (see Turner 1997). It is similar to *B. brandegeei* B.L. Robinson from Baja California Sur, southwestern Sonora, and northwestern Sinaloa; differences seem minor. *Brickellia rhomboidea* has smaller flower heads and achenes less than 3 mm long, whereas *B. brandegeei* has larger heads and achenes 3.6 mm long. The name *B. rhomboidea* has priority.

26 Jan 2016, *Carnahan*, photos; *Felger 84-151, 84-582, 85-1307*.

Coreocarpus sonoranus Sherff var. **sonoranus**

[*C. johnstonii* Sherff. *C. shrevei* Sherff var. *latilobus* Sherff]

Ephemerals to short-lived perennials. Leaves drought-deciduous, thin to sometimes semi-succulent. Flower heads with ray and disk florets, the rays white with dark purple lines below, the disk yellow; apparently non-seasonal depending on soil moisture. Canyon bottom, often in shade.

13 Dec 2013, *Carnahan*, photos; *Felger 84-604, 92-1037*.

Eclipta prostrata, Nacapule

*Eclipta prostrata** (Linnaeus) Linnaeus

[*E. alba* (Linnaeus) Hasskarl. *E. erecta* Linnaeus]

Chile de agua; FALSE DAISY

Non-seasonal ephemerals. Flower heads with numerous minute, white ray and yellow disk florets; flowering during warm weather. Wet soil and emergent from shallow water in the canyon floor in the vicinity of *Washingtonia* and *Ficus insipida*.

Carnahan SC 911; *Felger 84-153*; *Phillips 75-172*; *Wilder 10-480* (ARIZ, UCR).

Encelia farinosa A. Gray var. **farinosa**

Incienso, *rama blanca*, *hierba del bazo*; BRITTLEBUSH

Small shrubs. Flower heads with yellow ray and disk florets; flowering spring and with summer or fall rains. Abundant in the open desert and drier, exposed slopes.

Felger 95-106.

Encelia farinosa, Bahía San Pedro

Erigeron canadensis, Santa Cruz County, Arizona

*Erigeron canadensis Linnaeus var. glabratus A. Gray

[*Conyza canadensis* (Linnaeus) Cronquist var. *glabrata* (A. Gray) Cronquist]

Cola de caballo; HORSEWEED

Warm weather annuals. Flower heads with numerous minute, white ray and disk florets, usually flowering in fall. One colony found in the canyon in 1985, in wet soil in the canyon bottom in an area heavily grazed by cattle.

Felger 85-1300.

Gamochaeta sphacelata (Kunth) Cabrera

[*Gnaphalium sphacelatum* Kunth]

Small, densely white-woolly winter-spring annuals. Flowers inconspicuous, in very small, discoid heads. Canyon bottom, especially near the entrance; apparently uncommon.

Felger 85-244B.

Gamochaeta sphacelata, Sánchez-Escalante, San Antonio

Gymnosperma glutinosum (Sprengel) Lessing

Suffrutescent perennials; herbage sticky-glutinous. Flower heads with bright yellow ray and disk florets, the ray corollas reduced. Locally rare; first seen in the canyon in 1992, near *Washingtonia* and *Ficus insipida* trees in areas

Gymnosperma glutinosum, Arroyo Nacapule

heavily grazed by cattle. Also occasionally on rocky slopes.

Felger 92-1029.

Heliopsis anomala (M.E. Jones) B.L. Turner

[*Encelia anomala* M.E. Jones. *Heliopsis rubra* T.R. Fisher. *H. parvifolia* A. Gray var. *rubra* (T.R. Fisher) Wiggins]

Winter-spring annuals to sub-shrubby, short-lived perennials. Flower heads solitary on long peduncles, with bright yellow ray and disk florets; November to April. Scattered along the canyon floodplain; seldom common.

Carnahan SC 909; *Felger 95-5*.

Hofmeisteria crassifolia S. Watson

Small, globose perennials with succulent leaves and stems. Nearly evergreen but leaves reduced in size and number during drought. Flower heads solitary on long peduncles, the rays lavender-pink, the disks white; flowering response non-seasonal. Mostly growing from rock crevices, especially north-facing cliffs. Endemic to the Guaymas region.

Burgess 6379; 16 Dec 2012, *Carnahan*, photos; *Van Devender 84-254*.

Heliopsis anomala, Nacapule

Hofmeisteria crassifolia, San Carlos

Koanophyllon palmeri, Nacapule

Koanophyllon palmeri (A. Gray) R.M. King & H. Robinson

[*Eupatorium palmeri* A. Gray]

Umbrella thoroughwort

Suffrutescent perennials. Leaves nearly evergreen. Flower heads discoid, the flowers inconspicuous, white or greenish white. Shaded north-facing slopes near the canyon floor and occasional among dense vegetation in shaded areas of the canyon floor.

Carnahan 1565 (ARIZ, USON); *Felger 11996, 85-863*.

Lactuca serriola Linnaeus

Prickly lettuce, compass plant

Annuals, germinating in late winter or spring, flowering in late spring. Flower heads of pale yellow ligulate florets. Rare; found in February 1995 in the canyon bottom along the road.

Felger 95-119 (ARIZ, USON).

Lactuca serriola, Santa Cruz County, Arizona

Lagascea decipiens, Nacapule

Logfia filaginoides, Santa Cruz County, Arizona

Lagascea decipiens Hemsley var. **decipiens**

Confiturilla

Shrubs 1.5–2.5 m tall. Leaves tardily drought-deciduous. Flowers bright yellow and discoid, in globose clusters of 1-flowered heads; flowering much of the year except in extreme drought. Mostly along the canyon bottom and on north-facing slopes.

13 Dec 2013, *Carnahan*, photos; *Felger 84-161*; *Phillips 75-167*.

Logfia filaginoides (Hooker & Arnott) Morefield

[*Filago californica* Nuttall. *Logfia californica* (Nuttall) Holub]

California fluff-weed

Small, slender, white-woolly, winter-spring ephemerals. Heads minute, with inconspicuous disk florets. Open desert habitats near the canyon mouth and open areas along the canyon bottom.

Felger 85-244A.

Pectis rusbyi, Las Barajitas

Pectis rusbyi Greene ex A. Gray

[*P. palmeri* S. Watson]

Manzanilla de coyote

Summer-fall ephemerals with pungently aromatic herbage. Flower heads with bright yellow ray and disk florets. Canyon floor near the entrance and open desert near the canyon. One of the most abundant summer wildflowers in the region.

Burgess 6530; *Carnahan 1575* (ARIZ, USON).

Perityle

1. Rays white, the disk florets yellow. __**Perityle emoryi**

1’ Ray and disk florets yellow.

2. Erect-growing delicate annuals; rays less than 5 mm long; widespread. _____**Perityle californica**

2’ Perennials; rays at least 7 mm long. _____ _____**Perityle palmeri**

Perityle californica, San Carlos

Perityle californica Bentham

[*P. deltoidea* S. Watson]

Cool-weather ephemerals. Ray and disk flowers bright yellow. Canyon bottom, slopes, and open desert; often seasonally abundant.

Búrquez-M. 94-239 (USON); 26 Jan 2016, *Carnahan*, photos; *Felger 84-111, 85-555*.

Perityle emoryi Torrey

Desert rock daisy

Spring ephemerals. Rays white, the disk yellow. Canyon bottom near the entrance.

Felger 85-584B.

Perityle emoryi, La Navaja

Perityle palmeri, Nacapule

Perityle palmeri S. Watson

[*P. leptoglossa* Harvey & A. Gray subsp. *palmeri* (S. Watson) Felger & Lowe]

Herbaceous perennials, flowering in the first season. Ray and disk flowers bright yellow; apparently non-seasonal. Steep rock slopes, and crevices on north and east-facing cliffs and in large rocks in the canyon bottom.

11 Nov 2014, *Carnahan*, photos; *Felger 85-262*.

Pleurocoronis laphamioides, San Carlos

Pluchea salicifolia, La Navaja

Pleurocoronis laphamioides (Rose) R.M. King & H. Robinson

[*Hofmeisteria laphamioides* Rose. *H. laphamioides* var. *pauciseta* (I.M. Johnston) S.F. Blake. *H. pluriseta* var. *pauciseta* I.M. Johnston]

Perennial subshrubs, sub-globose, ca. 80 cm across, the leaves semi-succulent. Nearly evergreen or ultimately drought deciduous. Flower heads discoid, florets white to pale yellow with purple stigmas; non-seasonal. North-facing rock walls of canyon.

11 Mar 2015, *Carnahan*, photos; *Felger 92-1053, 94-856*.

Pluchea salicifolia (Miller) S.F. Blake

[*Conyza salicifolia* Miller. *Pluchea adnata* (Humboldt & Bonpland ex Willdenow) C. Mohr. *P. subdecurrens* Cassini. *P. subdecurrens* var. *canescens* A. Gray. *P. salicifolia* var. *canescens* (A. Gray) S.F. Blake]

Sprawling shrubs to 2 m tall and 3 m across. Stems brittle and winged from decurrent, sessile leaves, the leaves evergreen or nearly so and pungently aromatic. Flower heads of 200+ pink disk florets; flowering in warmer months. A vigorous but highly localized population in the upper reaches of the canyon at seeps and along the streambed beneath *Washingtonia* palms.

Also in a few other riparian canyons in the Sierra El Aguaje. *Pluchea salicifolia* is not known elsewhere in the Sonoran Desert, although it occurs in eastern Sonora as far north as Nacozari and ranges southward to Guatemala. It is similar to *P. parvifolia* (A. Gray) Godfrey of Baja California Sur, which is distinguished by having larger flower heads (Rebman et al. 2016; Turner 1997).

11 Mar 2015, *Carnahan*, photos; *Felger 84-144, 84-583*.

Porophyllum pausodynum B.L. Robinson & Greenman

[*P. brachypodum* B.L. Robinson. *P. seemannii* S. Watson, not *P. seemannii* Schultz-Bipontinus]

Short-lived perennials to 1 m tall. Herbage green with the pungent aroma characteristic of the genus. Leaves

Porophyllum pausodynum, Nacapule

tardily drought-deciduous. Flower heads discoid, of pale yellow florets; apparently non-seasonal. Rock crevices, often on north-facing slopes.

13 Dec 2013, *Carnahan*, photos; *Felger 84-108, 85-563*.

Senecio lemmonii A. Gray
LEMMON GROUNDSEL

Winter-spring ephemerals. Leaves thin. Flower heads with bright yellow ray and disk florets. Canyon bottom, not common, mostly in shade beneath trees and shrubs.

Carnahan 1611 (ARIZ, USON); *Felger 84-579, 85-263*.

***Sonchus oleraceus** Linnaeus
CHINITA; COMMON SOW-THISTLE

Winter-spring ephemerals. Heads ligulate, with pale yellow florets. Scattered along the canyon bottom. A common weed in the region.

26 Jan 2016, *Carnahan*, photo; *Felger 85-253; Van Devender 84-242*.

Senecio lemmonii, Nacapule

Sonchus oleraceus, San Carlos

Thymophylla concinna (A. Gray) Strother
[*Dyssodia concinna* (A. Gray) B.L. Robinson]
MANZANILLA DEL COYOTE; DOGWEED

Winter-spring ephemerals dotted with small oil glands and pungently aromatic. Rays white, the disk yellow. Mostly on sandy or gravelly soils; canyon entrance and nearby south-facing slopes and open desert (Felger 1999).

Trixis californica Kellogg var. **californica**

Scarcely woody, bushy perennials. Flower heads with yellow, bilabiate florets; non-seasonal but especially in

Thymophylla concinna, Caborca

Trixis californica, Bahía San Pedro

spring. Common and widespread, mostly on slopes and in the surrounding desert.

11 Mar 2015, *Carnahan*, photos; 28 Oct 2015, *Carnahan & Felger*, observation; *Felger 85-571, 85-859*.

Verbesina felgeri B.L. Turner, Phytologia 57: 127, 1985.

Suffrutescent to shrubby perennials, probably short-lived, to 1.8 m tall; eventually drought-deciduous or dying back

Verbesina felgeri, Nacapule

Verbesina felgeri, Nacapule

to near ground level in extreme drought. Heads of bright yellow ray and disk florets; apparently in various seasons depending on soil moisture.

The population seems to wax and wane in different years. In 1984 fewer than a half dozen plants were found

in the shade beneath dense canyon-bottom vegetation adjacent to the north-facing wall in the lower part of the canyon. In October of the following year, which was a wetter year, approximately 65 plants were located in the same area. In 2015 it was locally common along the canyon bottom. It also occurs in several other large riparian canyons in the Sierra El Aguaje. Plants grown from cuttings from the type collection have been distributed to botanical gardens and plant nurseries in southern Arizona and Sonora.

According to Turner (1985), *V. felgeri* "has no strikingly close relatives" and is in the section *Pterophyton*, which is mostly centered in Jalisco and surrounding areas.

19 Oct 1984, *Felger 84-97* (holotype, TEX; isotypes: ARIZ, MEXU, RSA); 10 Oct 1985, *85-1125*; 18 Nov 1985, *85-1327*; *20151028-14*.

Viguiera dentata, Nacapule

Viguiera dentata (Cavanilles) Sprengel

[*V. dentata* var. *lancifolia* S.F. Blake]

Rosamaría

Straggly annuals to short-lived, herbaceous perennials; tardily drought-deciduous. Heads with yellow ray and disk florets. Locally rare, a few in the canyon bottom in shade beneath trees and shrubs. *Viguiera dentata* also occurs other canyons in the Sierra El Aguaje. It is more common beyond the desert, including tropical deciduous forest and oak woodland, as a robust perennial.

11 Mar 2015, *Carnahan*, photos; *Felger 84-101, 85-1224*.

BORAGINACEAE • BORAGE FAMILY

Consensus about family classification of the former, broadly interpreted Boraginaceae results in 11 monophyletic families (Boraginales Working Group 2016), five of which occur in Nacapule Canyon.

1. Woody shrubs or small trees; flowers white. _____ **Cordia** (see CORDIACEAE)

1' Annuals or perennial herbs; flowers white, lavender, or pinkish.

2. Corollas white; fruits with 4 small nutlets.

3. Ephemerals or perennials, pubescent but hairs not glassy; nutlets round. _____ _____ **Euploca** (see HELIOTROPIACEAE)

3' Winter-spring ephemerals with glassy hairs; nutlets longer than wide, not round. _____

_____**Johnstonella** (BORAGINACEAE)

2' Corollas lavender or pinkish, not white; fruits capsules.

4. Plants not glandular-sticky and stinky; leaves sessile or the blade gradually tapering into the petiole, the margins entire or inrolled; seeds many. _____**Nama** (see NAMACEAE)

4' Plants glandular pubescent, sticky, and stinky; petioles prominent; leaf blades lobed, pinnatifid or dissected; seeds 4._____**Phacelia** (see HYDROPHYLLACEAE)

Johnstonella – *Peludita*

1. Nutlets 1–1.4 mm long, 1 nutlet usually larger than the other 3. _____**Johnstonella angustifolia**

1' Nutlets 0.5–0.7 mm long, all the same size. _____ _____**Johnstonella grayi**

Johnstonella angustifolia (Torrey) Hasenstab & M.G. Simpson

[*Cryptantha angustifolia* (Torrey) Greene]

Narrow-leaf cryptantha, desert cryptantha

Winter-spring ephemerals. Inflorescence branches coiled, the flowers white; nutlets 4, heteromorphic. Canyon bottom near entrance and nearby open desert.

Felger 85-575A (ARIZ, USON).

Johnstonella grayi (Vasey & Rose) Hasenstab & M.G. Simpson var. **cryptochaeta** (J.F. Macbride) Hasenstab & M.G. Simpson

[*Cryptantha grayi* (Vasey & Rose) J.F. Macbride. var. *cryptochaeta* (J.F. Macbride) I.M. Johnston]

Winter-spring ephemerals generally smaller and more delicate than *J. angustifolia*. Inflorescence branches moderately coiled, the flowers minute, white; nutlets 4, homomorphic. Canyon bottom near entrance and nearby open desert.

Felger 85-237A, *85-575C*. Nacapule Spring, *Felger 95-113*.

Johnstonella grayi, San Carlos

BRASSICACEAE • MUSTARD FAMILY

1. Plants with dendritic, candelabra-shaped hairs (stalked and branched above); leaves finely divided into many small segments. _____**Descurainia**

1' Herbage glabrous or with simple hairs; leaves coarsely toothed or pinnately lobed but not divided into many small segments.

2. Petals more than 5 mm long, and lobed (appearing "fringed"), white to pink; fruits 2 mm or more wide. _____ _____**Dryopetalon**

2' Petals 3–4 mm long, not lobed, pale yellow; fruits 0.8–1.5 mm wide. _____**Sisymbrium**

Descurainia pinnata (Walter) Britton

Pamita; TANSY MUSTARD

Winter-spring ephemerals. Flowers minute, pale yellow. Mostly along canyon bottom in open areas and nearby open desert.

Felger 85-249.

Descurainia pinnata, San Carlos

Dryopetalon runcinatum A. Gray

[*D. runcinatum* var. *laxiflorum* Rollins]

Cool-weather ephemerals, sometimes germinating in mid-October. Flowers showy, the petals lobed, white, fading to pink on the margins; December to March. Canyon bottom and north-facing slopes.

16 Dec 2012 & 11 Mar 2015, *Carnahan*, photos; *Felger 85-242; Starr 207*.

*__Sisymbrium irio__ Linnaeus

Pamitón; LONDON ROCKET

Winter-spring ephemerals. Flowers yellow, minute. Common along the canyon bottom when cattle grazed freely.

Felger 85-265.

Dryopetalon runcinatum, Nacapule

BURSERACEAE • FRANKINCENSE FAMILY

Bursera

1. Bark not exfoliating or peeling; leaflets mostly obovate; fruits with 2 carpels (valves). _____**Bursera laxiflora**

1' Bark exfoliating in papery flakes or sheets during the dry season; leaflets lanceolate or linear; fruits with 3 valves.

2. Twigs not reddish; leaflets lanceolate to elliptic, 15–60 × 3–10 mm, the margins irregularly toothed or sometimes entire. _____**Bursera fagaroides**

2' Twigs reddish; leaflets mostly linear, 5–25 × 1–2.5 mm, the margins entire or occasionally with a few small lobes. _____**Bursera microphylla**

Bursera fagaroides (Kunth) Engelmann var. **elongata** McVaugh & Rzedowski

Torote papelillo (*papelío*)

Sisymbrium irio, San Carlos

Small trees, the bark papery and peeling during dry seasons. Leaves present during summer rainy season and shed in fall. Flowers white, minute; early summer. Canyon slopes and open desert. Distinguished from *B. microphylla* by its larger leaves with larger, broader, and fewer leaflets.

Felger 20151028-6.

Bursera laxiflora S. Watson

Torote prieto

Large shrubs or small trees, the bark red-brown and not peeling. Leaves drought-deciduous, produced following rainfall at any season. Flowers and fruits on long, slender, pendulous peduncles. Flowers white, minute; August. Canyon bottom near entrance, slopes, and open desert.

13 Dec 2013, *Carnahan*, photos; *Felger 85-843*, *20151028-7*.

Bursera fagaroides, Cañón de Robinson

Bursera laxiflora, San Carlos

Bursera microphylla, Las Barajitas

Bursera microphylla A. Gray

Torote blanco; elephant tree

Small trees or large shrubs with fat, semi-succulent limbs and trunk, the bark papery, peeling in late-spring dry season, the sap and leaves highly aromatic. Leaves appearing at any time of year following rainfall. Flowers yellowish white, minute; summer. Common in open desert and on rocky canyon slopes, especially south-facing slopes.

11 Jan 2016, *Carnahan*, observation; *Felger 92-1060; Ibarra-Manríquez 5407* (ASU, MEXU, MO); *Starr 215*.

CACTACEAE • CACTUS FAMILY

1. Areoles (spine clusters) with small, terete, inconspicuous, and soon deciduous leaves, and glochids (small spines deciduous at a touch) in addition to the larger persistent spines, or larger spines sometimes absent.

2. Prickly pears; stem segments flattened or compressed ("pads"); surfaces relatively flat, not tuberculate; spines not sheathed _____**Opuntia**

2' Chollas; stem segments ("joints") more or less rounded in cross-section (cylindroid), often tuberculate; sheaths covering most of each spine. _____**Cylindropuntia**

1' Areoles without leaves or glochids.

3. Columnar cacti, the stems more than 1–2 m tall.

4. Stems with 6–10 ribs; spines of the adult (upper or fertile) portion of the stems twisted and much longer than the spines of the juvenile (lower or sterile) portion of the stems. _____**Lophocereus**

4' Stems with 10 or more ribs; spines of the fertile portion of the stems usually not twisted and much shorter than the spines of the sterile portion of the stems, or spines similar in juvenile and adult stems.

5. Stems and spines not noticeably dimorphic, the areoles and spines similar on juvenile (lower or sterile portion) and adult (upper or fertile portion) stems; stem ribs 13–19. _____**Stenocereus**

5' Stems and spines dimorphic, the juvenile portion of stems with distinct areoles and stout spines, the adult stems with the areoles coalesced or close together and spineless or with smaller, bristly spines; stem ribs (12) 13–25.

6. Stems green to yellowish green, not glaucous, the mature (adult or fertile) stems with 19–25 stem ribs. _____**Carnegiea**

6' Stems bluish glaucous, the mature stems with (12) 13–15 ribs. _____**Pachycereus**

3' Not columnar cacti, stems less than 1–2 m tall or long.

7. Barrel cacti, the stems solitary and more than 15 cm thick, the spines rigid. _____**Ferocactus**

7' Not barrel cacti, the stems solitary, branched, or many, less than 15 cm thick, the spines variable.

8. Stems less than 1 cm in diameter, more than 20 times longer than wide; flowers nocturnal. __**Peniocereus**

8' Stems more than 5 cm in diameter, not more than 6 times longer than wide; flowers diurnal.

9. Spines all straight, the flower bases and fruits spiny. _____**Echinocereus**

9' Spines straight or hooked, the flowers and fruits spineless. _____**Mammillaria**

Carnegiea gigantea (Engelmann) Britton & Rose

Sahuaro; saguaro

Giant columnar cactus, although those in the canyon mostly 2–3 m tall. Stem surfaces green or yellowish green, not glaucous. Stems dimorphic: juvenile portion of stems with 11–15+ ribs, distinct areoles, and stout spines; adult stems with 19–25 ribs, the areoles coalesced or close together and spineless or with smaller, bristly spines. Flowers nocturnal, large, and white; April and May. Relatively scarce, mainly on south-facing slopes, and mostly immature plants.

S-facing canyon wall, single stem 3 m tall, 28 Oct 2015, *Carnahan & Felger*, observation.

Cylindropuntia – *Choya*; cholla

1. Stems green all year; fruits proliferating in perennial pendent chains of more than 3 fruits, remaining green and fleshy when ripe, present all year. _____ _____**Cylindropuntia fulgida**

1' Stems often purplish in winter and dry seasons; fruits single, not proliferating (occasionally with 2 fruits together), not present all year and sometimes not green. _____**Cylindropuntia versicolor**

Cylindropuntia fulgida (Engelmann) Knuth var. **fulgida**

[*Opuntia fulgida* Engelmann var. *fulgida*]

Choya brincadora; JUMPING CHOLLA

Flowers pink; summer. This cholla was locally rare near the canyon entrance in 1996 and in 2015 we saw only 3 plants, also near the canyon entrance. It is common in nearby areas in the San Carlos–Guaymas region.

Xeric vegetation near canyon entrance, one plant, 29 Oct 2015, *Carnahan & Felger*, observation; mesa near canyon entrance, rare, ca. 1 m tall, 9 Jan 1996, *Felger*, observation.

Cylindropuntia versicolor (Engelmann ex J.M. Coulter) F.M. Knuth

[*Opuntia versicolor* Engelmann ex J.M. Coulter]

Siviri; STAGHORN CHOLLA

Often 1.5–2+ m tall with an upright trunk and main stems, and spreading branches, the cladodes (joints) purple-brown during drier, cooler months. Inner tepals greenish yellow with red-brown tips; March and early April. Fruits fleshy, greenish yellow even when ripe, usually persistent until the following year, often becoming enlarged and swollen, usually solitary or occasionally

Cylindropuntia fulgida, Sánchez-Escalante, La Pintada

Cylindropuntia versicolor, San Carlos

Echinocereus llanuraensis, Nacapule

producing chains of 2 or 3 fruits. Common in desertscrub near the canyon entrance and scattered on the steep canyon sides.

11 Jan 2016, *Carnahan*, photo; *Felger 85-546* (ARIZ, ASU).

Echinocereus – *Viejitos, cabeza de viejo*; hedgehog cactus

1. Spines more than 3 cm long. _____ _____**Echinocereus llanuraensis**

1' Spines to 1.5 cm long. ___**Echinocereus scopulorum**

Echinocereus llanuraensis (Rutow) W. Blum & D. Felix

[*E. engelmannii* (Engelmann) Lemaire subsp. *llanuraensis* (Rutow) Felger. *E. nicholii* subsp. *llanuraensis* Rutow]

Guaymas hedgehog cactus

Stems several to many, ca. 15–30 cm long and 5 cm diameter. Spines moderately dense, bi-colored, dull yellow to brown, white, or gray, fading (or remaining) gray with age, the central spines 4, the longer ones 3–5.8 cm long, twisted or straight, flattened or terete, the other spines terete. Flowers showy, 5–6 cm wide, 9.5 cm long, the inner tepals magenta; spring and summer, and sometimes also in November. Open, usually sparsely vegetated rock slopes with shallow soil or exposed and often nearly barren rock on various exposures. The type locality is given as "Guaymas." It is widespread in the San Carlos region and through the Sierra El Aguaje, on Cerro El Vigía above Guaymas, and also in the Sierra Libre.

S-facing rock slope near N fork of canyon, flowering, 11 Mar 2015, *Carnahan*, photos; S-facing slope, near canyon entrance, peak flowering, 9 Mar 1985, *Felger 85-545*; 26 Nov 1994, *Felger 94-860*.

Echinocereus scopulorum, Sánchez-Escalante, Los Anegados

Echinocereus scopulorum Britton & Rose

[*E. pectinatus* (Scheidweiler) Engelmann var. *scopulorum* (Britton & Rose) L.D. Benson, pro parte]

Sonora rainbow cactus

Stems solitary, the spines dull-colored, mostly 10–15 mm long. Flowers large and showy, the perianth bright pink fading to magenta; flowering in April, and also July and August. Fairly common on steep, mostly south-facing, sparsely vegetated rock slopes.

W-facing rock slope between Nacapule Spring and N fork of canyon, 28 Nov 2015, *Carnahan*, photo. Nacapule Spring, stem 28 × 7 cm, *Felger 95-63*.

Ferocactus emoryi (Engelmann) Orcutt

[*F. covillei* Britton & Rose. *F. emoryi* subsp. *covillei* (Britton & Rose) D.R. Hunt & Dimmitt]

Biznaga; barrel cactus

Ferocactus emoryi, Nacapule

Occasionally reaching 1.5 m in height. Spine clusters with stout spines only. Flowers yellow; August. Scattered on rocky slopes with various exposures and the nearby open desert. The Nacapule–San Carlos population is part of the southern race distinguished by yellow flowers, rather than the red flowers of the northern race.

28 Oct 2015, *Carnahan & Felger,* observations and photos.

Lophocereus schottii (Engelmann) Britton & Rose var. **schottii**

[*Pachycereus schottii* (Engelmann) D.R. Hunt]

Sinita; SENITA

Multiple-stem columnar cactus. Flowers dull whitish pink; warmer times of the year. Scattered on canyon slopes, probably resulting from bird-dispersed seeds, and among shrubs at the mouth of the canyon and on the nearby desert plain.

Lophocereus schottii, San Carlos

28 Oct 2015, *Carnahan*, photo; *Parfitt 3037* (ASU, *n* = 11, Pinkava et al. 1985).

Mammillaria – *Viejito, cabeza de viejo*; fishhook cactus

1. Stems generally taller than wide; central spines hooked or straight; sap watery. _____**Mammillaria grahamii**

1’ Stems globose, as broad or broader than wide, the spines straight or curved but not hooked; the sap milky. _____**Mammillaria johnstonii**

Mammillaria grahamii Engelmann subsp. **sheldonii** (Britton & Rose) D.R. Hunt

[*Neomammillaria sheldonii* Britton & Rose. *N. swinglei* Britton & Rose. *Mammillaria inaiae* R.T. Craig. *M. swinglei* (Britton & Rose) Boedeker]

Cabeza de viejo; FISHHOOK CACTUS

Mammillaria grahamii, La Manga, near San Carlos

Mammillaria johnstonii, San Carlos

Small cacti; stems globose to cylindrical, solitary or with a few branches, usually taller than wide, and with watery sap. Tubercle axils with or without bristles. Spine color variable; central spines one to several, hooked or sometimes straight even on the same plant, or some plants with straight spines only. (*M. inaiae* is a straight-spined form.) Inner (larger) tepals mostly white with a pinkish mid-stripe. Flowering at various seasons. Fruits globose to mostly club-shaped, usually red or sometimes orange. Rocky slopes with various exposures, mostly in shallow soils, and nearby open desert.

28 Oct 2015, *Carnahan*, photos; *Felger 95-622.*

Mammillaria johnstonii (Britton & Rose) Orcutt

[*Neomammillaria johnstonii* Britton & Rose. *Mammillaria johnstonii* var. *sancarlosensis* Craig. *M. johnstonii* var. *guaymensis* Craig]

Viejitos, *cabeza de viejo*; San Carlos pincushion cactus

Stems globose, often broader than tall (sometimes becoming taller and cylindrical in shade or wedged between woody shrub stems), solitary or clusters of several stems; sap milky; spines straight. Inner tepals cream to pink. Probably flowering at various seasons depending on rainfall; flowering in the region observed in March and in summer. Fruits globose to pear-shaped and fuchsia colored. Rocky slopes with shallow soil on various exposures. The spine lengths are highly variable.

16 Dec 2012, *Carnahan*, photos; 28 Oct 2015, *Carnahan & Felger*, observation.

Opuntia gosseliniana A.A. Weber

[*O. violacea* Engelmann var. *gosseliniana* (A.A. Weber) L.D. Benson]

Duraznilla; purple prickly-pear

Cladodes (pads) turning purplish during winter and early spring, probably in response to relatively cool nights or drought; spines 5.5–8 cm long. Flowers bright yellow; March and April. Seedlings and juvenile plants with long, hair-like spines. Rocky slopes on both sides of the canyon, and arid slopes near the canyon entrance.

16 Dec 2012, *Carnahan*, photos; 28 Oct 2015, *Carnahan & Felger*, observations.

Pachycereus pringlei (S. Watson) Britton & Rose

CARDÓN, SAHUESO

This large columnar cactus is very rare in the vicinity of the canyon. Stems bluish glaucous, the mature stems with (12) 13–15 ribs. A single cardón was found on a high rock ridge above Nacapule Spring. However, this cactus is common in nearby coastal desert areas.

Ridge above and slightly southwest of Nacapule Spring, 28 Nov 2015, *Curtis Latham Smith*, photo.

Peniocereus striatus (Brandegee) Buxbaum

[*Cereus striatus* Brandegee. *Neoevansia striata* (Brandegee) Sánchez-Mejorada. *Wilcoxia striata* (Brandegee) Britton & Rose. *Cereus diguetii* A.A. Weber. *Wilcoxia diguetii* (A.A. Weber) Diguet & Guillaumin]

SACAMATRACA; SONORAN QUEEN OF THE NIGHT

Inconspicuous cactus with clusters of potato-like tuberous roots and pencil-thin stems. Often 1–1.5+ m tall growing through shrubs such as *Lycium* or *Citharexylum* and seemingly mimicking the stems of its nurse plant. Flowers nocturnal, white; summer. Fruits ripening in late summer or early fall. Fairly common near the canyon entrance and the nearby open desert.

Felger 11973.

Opuntia gosseliniana, San Carlos

Peniocereus striatus, Las Barajitas

Stenocereus thurberi (Engelmann) Buxbaum

[*Lemaireocereus thurberi* (Engelmann) Britton & Rose]

Pitaya dulce, *pitayo* (plant), *pitaya* (fruit); organ-pipe cactus

Multiple-stem columnar cactus. Flowers nocturnal, the interior white; hot weather, mostly in early summer. Fruits red, juicy, sweet and edible, ripe during summer. Canyon slopes, most numerous on south-facing slopes, and also common in the nearby desert.

16 Dec 2012, *Carnahan*, photos; *Parfitt 3035* (ASU; n = 11, Pinkava et al. 1985).

Stenocereus thurberi, near Nacapule

Celtis pallida, Nacapule

CANNABACEAE • HEMP FAMILY (INCLUDES ULMACEAE, IN PART)

Celtis – Hackberry

1. Shrubs with irregular stems, the twigs usually armed with straight thorns or spines. _____**Celtis pallida**

1' Trees with a well-developed trunk; twigs unarmed. _____**Celtis reticulata**

Celtis pallida Torrey subsp. **pallida**

[*C. tala* Gillies var. *pallida* (Torrey) Planchon]

Garambullo; DESERT HACKBERRY

Briar-like shrubs to 2+ m tall; evergreen to tardily drought-deciduous. Flowers inconspicuous, green or yellow-green. Fruits orange, with a sweet, edible pericarp; abundant fruiting in early fall and sparsely at other seasons. Canyon floor in the lower part of the canyon and the nearby open desert.

Felger 85-1302, 92-1016.

Celtis reticulata, Sánchez-Escalante, Sierra Mazatán

Celtis reticulata Torrey

Cúmaro; canyon hackberry, western hackberry

Trees to 6+ m tall; trunk well developed, the bark smooth and gray. Leaves generally evergreen, highly variable, nearly as wide as long with mostly entire margins; sometimes producing new growth and leaves even during mid-winter. Fruits hard and dull red. Common along the canyon bottom.

The Guaymas–Sierra El Aguaje trees and those from southern Sonora (e.g., the Álamos region) have smooth trunks, without the irregular corky ridges characteristic of *C. reticulata* trees in northern Sonora and Arizona. In addition, the trees of the "northern" populations are winter-deciduous and winter-dormant.

Felger 3121, 85-1201 (ARIZ, CAS, MEXU, TEX).

CAPPARACEAE, *Forchhammeria*, see RESEDACEAE

CHENOPODIACEAE, see AMARANTHACEAE

CLEOMACEAE • CLEOME FAMILY

1. Herbage glabrous; corollas pale yellow, 3–5 mm long. _____**Cleome**

1' Herbage sticky glandular-pubescent; corollas bright yellow, ca. 10 mm long. _____**Corynandra**

Cleome tenuis S. Watson

Hot weather ephemerals with slender, upright stems, the leaves with 3–5 leaflets; flowers inconspicuous. Canyon bottom and nearby open desert.

Felger 84-173, *85-1177*, *85-1206*.

*__Corynandra viscosa__ (Linnaeus) Cochrane & Iltis subsp. __viscosa__

[*Cleome viscosa* Linnaeus. *Arivela viscosa* (Linnaeus) Rafinesque]

Sticky bee-plant

Non-seasonal annuals, conspicuously sticky glandular-pubescent and strong smelling. Leaves palmately compound with five leaflets. Flowers yellow, recorded in May, June, October, and December. Documented in 2013, and in 2015 it was abundant in lower, open areas of the canyon; not previously recorded in the canyon. Native to the Old World.

13 Dec 2013, *Carnahan*, photo; Wide sandy wash 0.2 km S of canyon mouth, 11 Nov 2014, *Carnahan*, observation; Gravels near canyon entrance, 27 Oct 2015, *Carnahan 1535* (ARIZ, USON).

Cleome tenuis, Los Anegados

Corynandra viscosa, Nacapule

CONVOLVULACEAE • MORNING GLORY FAMILY

1. Parasitic vines, without chlorophyll, stems uniformly yellow or orange; leaves reduced to scales or absent. __**Cuscuta**

1' Not parasitic, chlorophyll present, stems green or brown; leaves well developed.

2. Stems not vining; stigmas long and thread-like. _____**Evolvulus**

2' Vines and stem tips twining (*Jacquemontia agrestis* not vining); stigmas lobes oblong or globose.

3. Corollas white, blue, or pink; stigma lobes oblong. _____**Jacquemontia**

3' Corollas red, blue, or lavender; stigma lobes globose. _____**Ipomoea**

Cuscuta – *Fideo*; dodder

1. Stems relatively thick, 0.40–0.60 mm diameter; calyx lobes wider than long, with obtuse or rounded tips (apices); seeds 1 per capsule. _____**Cuscuta americana**

1' Stems very thin, 0.35–0.40 mm diameter; calyx lobes longer than wide, with acute tips (or sometimes obtuse in *C. umbellata*); seeds 2–4 per capsule.

Cuscuta americana, Nacapule

Cuscuta desmouliniana, Las Barajitas

2. Calyx ¼–¾ as long as the corolla tube. _____ _____**Cuscuta tuberculata**

2' Calyx equaling or somewhat longer than corolla tube.

3. Papillae present on the pedicels, calyx and corolla lobes; infrastaminal scales ca. ¾ as long as the corolla tube; seeds 2–4 per capsule. _____**Cuscuta desmouliniana**

3' Papillae absent on the pedicels and calyx (sometimes present of the adaxial face of corolla lobes); infrastaminal scales equaling or slightly longer than the corolla tube; seeds 4 per capsule. ___**Cuscuta umbellata**

Cuscuta americana Linnaeus
Dodder

Parasitic vines, probably annuals or perhaps perennials; on woody shrubs including *Colubrina viridis*, *Pleradenophora* (*Sebastiania*) *bilocularis*, and *Vallesia laciniata*. Non-seasonal growth and flowering response. Stems orange, thicker than those of the ephemeral species. Flowers white. Canyon bottom.

Carnahan 1647 (ARIZ, USON); *Felger 4087, 11963, 84-618*.

Cuscuta desmouliniana Yuncker
Dodder

Warm weather ephemeral vines on *Euphorbia polycarpa*. Stems orange and very slender. Flowers white. Terrace above arroyo at canyon mouth.

Burgess 6949.

Cuscuta tuberculata Brandegee
Dodder

Warm weather ephemeral vines, growing on *Boerhavia*. Stems yellow-orange and very slender. Flowers white. Gravels near the canyon mouth.

Felger 20151028-10.

Cuscuta umbellata, San Carlos

Evolvulus alsinoides, San Carlos

Cuscuta umbellata Kunth
Dodder

Warm weather ephemeral vines, sometimes persisting through winter, on various herbaceous plants, especially *Boerhavia* spp., *Bouteloua aristidoides, Euphorbia polycarpa*, and *Kallstroemia grandiflora.* Stems yellow-orange and very slender. Flowers white. Open habitats at canyon entrance and the open desert.

Felger 85-578.

Evolvulus alsinoides (Linnaeus) Linnaeus var. **angustifolia** Torrey
[*E. alsinoides* var. *acapulcensis* (Willdenow) Ooststroom]

Small herbaceous perennials. Flowers pale blue, open in the morning and fading with the heat of the day; non-seasonal with sufficient soil moisture. Canyon bottom in open habitats, north- and south-facing canyon slopes, and nearby desert, especially along washes.

Carnahan 1573; *Felger 84-106, 85-1187.*

Ipomoea – *Trompillo*; morning glory

1. Leaves divided into narrow, palmately arranged segments. _____**Ipomoea ternifolia**

1' Leaves simple, entire, dentate, or lobed.

2. Corollas bright red; sepals unequal; capsules reflexed. _____**Ipomoea cholulensis**

2' Corollas pinkish to bluish or lavender; sepals more or less equal; capsules erect. ___**Ipomoea hederacea**

Ipomoea cholulensis Kunth
[*Quamoclit cholulensis* (Kunth) G. Don. *Ipomoea cristulata* Hallier. *Quamoclit gracilis* Hallier f.]
Star morning glory

Warm-weather ephemerals; small vines, delicate to sometimes robust. Corollas bright red, often open all day.

Ipomoea cholulensis, Nacapule

Occasional in the canyon bottom, usually near water in the vicinity of *Ficus insipida*.

Desert populations of the more widespread *I. cholulensis* have been known as *I. cristulata*. There appears to be no discernable difference between *I. cristulata* and *I. cholulensis* (J. Andrew MacDonald, pers. comm. to Felger, Sep 2015; also see Felger et al. 2012).

Carnahan 1612 (ARIZ, USON); *Felger 4085, 85-1310*.

Ipomoea hederacea Jacquin

Trompillo; morning glory

Warm-weather annual vines, often rank-growing. Flowers open in the early morning, the corollas pinkish to bluish or lavender, generally with a white base. Infrequent along the canyon bottom.

Felger 4086, 85-1317.

Ipomoea ternifolia Cavanilles var. **leptotoma** (Torrey) J.A. McDonald

[*I. leptotoma* Torrey. *I. divergens* House]

Ipomoea hederacea, Sánchez-Escalante, north of Hermosillo

Warm-weather ephemeral vines. Leaves divided into narrow, palmately arranged segments. Corollas lavender. Canyon bottom and open desert.

Carnahan 1551 (ARIZ, USON); *Felger 4086, 85-1185*.

Jacquemontia

1. Annuals, usually not vining, with simple glandular hairs and stellate hairs. _____**Jacquemontia agrestis**

1' Perennials, the stems often vining, with stellate hairs and not glandular. _____**Jacquemontia pringlei**

Jacquemontia agrestis (Choisy) Meisner

[*J. palmeri* S. Watson. *J. palmeri* var. *varians* Brandegee]

Annuals/ephemerals, highly variable in size, sometimes as small as 15 cm tall, not vining or sometimes small, delicate vines (sometimes perennial?), with simple glandular hairs and/or stellate hairs. Leaves broadly to narrowly ovate, basally cordate to sub-truncate, the tip acute to acuminate or rarely obtuse. Corollas blue, about 1 cm wide. Flowering August–December. One record from near the mouth of the canyon.

Ipomoea ternifolia var. *leptotoma*, San Carlos

1 km SE of mouth of Nacapule Canyon, bajada, 13 Jan 1965, *Felger 11966*.

Jacquemontia pringlei A. Gray

[*J. pringlei* var. *glabrescens* A. Gray]

Perennials; small clambering vines with slender stems twining to tops of shrubs. Corollas 1.4–2.7 cm long, pale lavender, blue, pink, or white. Common in nearby San Carlos but not recorded in the canyon before 2013.

11 Nov 2014, *Carnahan SC 910*.

Jacquemontia agrestis, Sánchez-Escalante, Sierra Mazatán

Jacquemontia pringlei, Nacapule

CORDIACEAE • CORDIA FAMILY

Cordia

1. Shrubs; leaves mostly 1–3 cm long, the surfaces rough, the margins toothed. _____**Cordia parvifolia**

1’ Large shrubs or small trees; leaves more than 4 cm long, the surfaces smooth, the margins entire. __**Cordia sonorae**

Cordia parvifolia A. de Candolle
VARA PRIETA

Shrubs often 1.5–2+ m tall with hardwood stems and dark-colored bark; drought-deciduous. Flowers white, showy, opening an hour or so after dawn and falling with mid-day or afternoon heat; mass flowering following rains at almost any time of year except mid-winter. Canyon entrance and nearby open desert.

Felger 85-837.

Cordia sonorae Rose
PALO DE ASTA

Large shrubs to small trees 3–5+ m tall; tardily drought-deciduous. Flowers white; March and April. Fruits tightly held in the persistent calyx and corolla to form a parachute-like dissemination unit. Lower, north-facing slopes.

Cordia parvifolia, San Carlos

Burgess 6378; *Van Devender 84-249*; 4 m tall, old dried flowers littering the ground, 26 Aug 2010, *Wilder 10-491* (ARIZ, MO, UCR, USON).

CUCURBITACEAE • GOURD FAMILY

1. Perennials from a swollen, above-ground caudex; fruits smooth, fleshy, 3–5 cm long. _____**Ibervillea**

1' Annuals, without a caudex; fruits various.

2. Rare, warm-weather annuals; fruits smooth, remaining succulent when ripe, more than 10 cm in diameter. _____ _____**Citrullus**

2' Common, cool-season annual vines; fruits usually prickly, dry when ripe, 1–1.5 cm in diameter. _____ _____**Vaseyanthus**

****Citrullus lanatus** (Thunberg) Matsumura & Nakai subsp. **lanatus**
SANDÍA; WATERMELON

Occasional plants growing from discarded seeds; not reproducing.

Nacapule, gravel in canyon bottom, photo, 30 Dec 2011, *Carnahan SC 532*.

Ibervillea sonorae (S. Watson) Greene
[*Maximowiczia sonorae* S. Watson]
GUAREQUE

Perennials with a swollen, above-ground caudex resembling a large cow dropping; leafy, vining stems appearing with summer rains and quickly deciduous at the end of the rainy season. Flowers dull yellow; summer. Fruits

Cordia sonorae, San Carlos

yellow to orange-red when fully ripe; late summer. Common in the open desert and scattered on canyon slopes.

29 Oct 2015, *Carnahan*, photo; *Felger 84-132*, *85-1322*.

Vaseyanthus insularis (S. Watson) Rose

[*Echinopepon insularis* S. Watson. *E. palmeri* S. Watson. *Brandegea palmeri* (S. Watson) Rose. *Vaseyanthus insularis* var. *palmeri* (S. Watson) Gentry. *V. insularis* var. *inermis* I.M. Johnston]

Citrullus lanatus, Nacapule

Ibervillea sonorae, San Carlos

Annual vines growing luxuriantly with fall to spring rains and dying in late spring or summer heat; often carpeting otherwise barren rocky slopes and festooning trees and shrubs with green curtains. Flowers small, white. Fruits globose and prickly (echinate).

29 Oct 2015, *Carnahan*, photos; *Daniel 1996*, *n* = 13 (ASU); *Felger 85-250*; *Parfitt 3023* (ASU).

Vaseyanthus insularis, Nacapule

EUPHORBIACEAE • SPURGE FAMILY

1. Stems thick, succulent, terete, without spur-branches, the leaves few (quickly drought deciduous). _____ _____**Euphorbia ceroderma**

1' Stems not as above, not succulent or if so then with spur branches and leaves numerous.

2. Plants usually scandent or vining.

3. Hairs on herbage not stinging; leaves often 5–8.5 cm long, palmately 3-lobed. _____**Dalechampia**

3' Herbaceous with stinging hairs; leaves 1–5.5 cm long, ovate to elliptic, not lobed. _____**Tragia**

2' Plants not scandent or vining.

4. Sap milky; leaves opposite; flowers enclosed in a cup-like, gland-bearing involucre, the whole structure (cyathium) simulating a bisexual flower; male flowers consisting of a single, naked, pedicelled stamen. _____**Euphorbia**

4' Sap milky or not; leaves alternate; flowers not enclosed in a cup-like, gland-bearing involucre; male flowers with a perianth.

5. Annuals and herbaceous perennials, usually less than 1 m tall and with 2-armed hairs. ___**Argythamnia**

5' Shrubs, often 1 m or more in height, and glabrous or hairs various.

6. Plants without milky latex, the sap watery and frequently colored; leaves palmately lobed or toothed and glabrous or with simple hairs only. _____**Jatropha**

6' Plants with milky sap or the sap not apparent and not watery and not colored; leaves not palmately lobed and glabrate, glabrous or with simple or branched hairs.

7. Pubescence of stellate hairs. _____**Croton**

7' Pubescence of simple hairs, 2-armed hairs, or glabrate or glabrous.

8. Female flowers enclosed or subtended by a leaf-like, accrescent bract; anther cells elongate and narrow, often flexuous. _____**Acalypha**

8' Female flowers not enclosed by a leafy bract; anther cells globose or oblong, not flexuous.

9. Plants without milky sap; leaves obovate to oblanceolate, leaf margins entire; dioecious; male flowers with a rudimentary ovary. _____**Adelia**

9' Plants with milky sap; leaves lanceolate to elliptic, leaf margins serrate; monoecious; male flowers without a rudimentary ovary. _____**Pleradenophora**

Acalypha californica Bentham

[*A. pringlei* S. Watson. *A. vagans* Cavanilles sensu Wiggins 1964, see Steinmann & Felger 1990]

Yerba (*hierba*) *del cáncer*; COPPERLEAF

Shrubs often 1.5–1.8 m tall; leaves gradually drought deciduous. Dry season herbage usually viscid-sticky and tawny brownish, the wet season leaves green, usually not viscid, and notably larger. Mostly along the canyon bottom and north-facing slopes. Flowering at various seasons.

Felger 84-145, 20151028-10; *Starr 202*; *Van Devender 28 Dec 1982*.

Acalypha californica, Nacapule

Adelia obovata Wiggins & Rollins

Hardwood shrubs 2–3+ m tall; leaves quickly drought-deciduous. Flowers green, inconspicuous. Canyon bottom at canyon entrance.

Felger 92-1032.

Argythamnia – Wild mercury

1. Plants sub-shrubby; stems mostly erect and straight; male flowers with petals united to the staminal column at base, appearing to arise above the glands; style branches sometimes dilated and flattened at the apex. _____ _____**Argythamnia lanceolata**

1’ Plants herbaceous; stems mostly ascending to spreading or sometimes the main axis at first erect but the branches spreading and seldom straight; male flowers with petals free from the staminal column, appearing to arise between and alternating with the glands; style branches terete at the apex. _____**Argythamnia serrata**

Adelia obovata, La Manga, near San Carlos

Argythamnia lanceolata Bentham

[*Ditaxis lanceolata* (Bentham) Pax & Hoffmann. *Argythamnia palmeri* S. Watson. *Ditaxis palmeri* (S. Watson) Pax & K. Hoffmann]

Suffrutescent perennials mostly less than 1 m tall, occasionally to 2 m growing through shrubs, sometimes flowering in the first season; leaves often silvery-pubescent, tardily drought-deciduous; non-seasonal. Canyon bottom, slopes, and nearby desert. Plants in well-watered, shaded areas along the canyon bottom tend to have larger, broader, and green rather than silvery leaves; *A. palmeri* is apparently based on such plants from Guaymas.

Carnahan 1645 (ARIZ, USON); *Felger 84-134, 85-567*.

Argythamnia serrata (Torrey) Müller Argoviensis

[*A. neomexicana* Müller Argoviensis. *Ditaxis neomexicana* (Müller Argoviensis) A. Heller. *D. gracilis* Rose & Standley]

Non-seasonal ephemerals to short-lived perennials. Open slopes, canyon entrance, and adjacent desert.

Felger 85-836, 85-575.

Argythamnia lanceolata, San Carlos

Argythamnia serrata, Santa Cruz County, Arizona

Croton sonorae Torrey

[*C. pringlei* Watson]

JEDIONDÍA

Woody shrubs 1–1.5 m tall; tardily drought-deciduous, the leaves turning orange before falling. Staminate flowers white; August. Canyon bottom and slopes, and widespread on nearby desert plains and rocky slopes.

Carnahan 1547; *Felger 84-611; Warren 18 Aug 1975*.

Dalechampia scandens Linnaeus var. **scandens**

[*D. scandens* var. *fimbriata* (Kunth) Müller Argoviensis]

Facultative ephemerals in dry years, the plants as small as 10–30 cm tall, non-vining, and producing seeds; or during favorable seasons (years) becoming short-lived scandent or vining perennials with semi-woody bases. Flowers greenish, enclosed by a pair of relatively large leaf-like bracts. Canyon bottom, and mostly shaded, north-facing slopes.

Throughout its expansive geographic range in the American tropics and subtropics this species is usually a large scandent liana or rarely a perennial herb. The ephemeral phase is unusual. This species also enters the Sonoran Desert in Sonora in several other riparian canyons in the Sierra El Aguaje and the Sierra Libre.

17 Dec 2016, *Carnahan*, photo; *Felger 84-602*, *85-848*; *Yatskievych 82-151*.

Croton sonorae, Sierra El Tigre

Croton sonorae, Caborca

Dalechampia scandens, Nacapule

Euphorbia – *Golondrina*; spurge

1. Shrubs.

2. Stems succulent, straight, spinescent-tipped, leafless or leaves few, sessile, linear to filiform. _____**Euphorbia ceroderma**

2' Stems leafy and not succulent and not spinescent-tipped; leaves short-petioled, the blades about as wide as long, the margins serrate. _____ _____**Euphorbia tomentulosa**

1' Annual or perennial herbs, not shrubs.

3. Cyathia in dense, sub-capitate, leafless cymose clusters. _____**Euphorbia capitellata**

3' Cyathia mostly solitary in the axils of leafy shoots.

4. Plants glandular-pubescent and sticky to the touch; cyathia narrowed or constricted at apex, the petaloid appendages with triangular, pointed segments, the cyathia thus appearing star-shaped. _____**Euphorbia setiloba**

4' Plants pubescent but not glandular; cyathia not narrowed or constricted at apex; petaloid appendages broad, not pointed (rarely absent or reduced on immature cyathia).

5. Seeds 1–1.2 mm long, encircled by conspicuous transverse ridges.____**Euphorbia pediculifera**

5' Seeds 0.8–1.0 mm long, fairly smooth and grayish white. _____**Euphorbia polycarpa**

Euphorbia capitellata Engelmann

[*Chamaesyce capitellata* (Engelmann) Millspaugh. *Euphorbia capitellata* var. *laxiflora* S. Watson. *E. gladiosa* M.E. Jones]

Golondrina

Euphorbia capitellata, San Carlos

Herbaceous perennials, often flowering in the first season. Petaloid appendages white; nearly all year except during extended drought. Canyon bottom and near canyon entrance, mostly in gravelly washes, and dry, rocky slopes and nearby arroyo beds.

Felger 11953, *84-569*, *85-1176* (ARIZ, MEXU).

Euphorbia ceroderma I.M. Johnston
CANDELILLA

Shrubs 1–1.5 m tall, forming dense clumps, the stems green, rigid, and succulent, each stem with several or more spreading-ascending branches, the tips drying to form a rigid thorn. Leaves sparse, very quickly deciduous, and seldom seen, often 9–11 mm long, semi-succulent, sparsely puberulent with short, appressed white hairs, essentially sessile with a thick petiole less than 1 mm long, the blades narrowly linear-lanceolate, the apex acute. Cyathia subtended by 3 conspicuous slender reddish bracts 12–18 mm long; glands yellow, with small appendages. Reproductive with summer rains. Exposed, steep north

Euphorbia ceroderma, Nacapule

and south canyon slopes, and rugged slopes high above the canyon.

This is one of the few succulent euphorbias in the Sonoran Desert. It is common on rhyolitic hills and mountains to peak elevation around Guaymas and the Sierra El Aguaje. Also in Baja California Sur.

28 Nov 2015, *Carnahan*, photo; *Felger 92-1048, 94-859*; *Steinmann 1173* (UCR).

Euphorbia pediculifera Engelmann var. **linearifolia** S. Watson
[*Chamaesyce pediculifera* (Engelmann) Rose & Standley]
GOLONDRINA; LOUSE SPURGE

Non-seasonal ephemerals to mostly short-lived perennials. Appendages white, with age becoming pink. Widespread, especially in gravelly soil along the canyon bottom, and on rocky slopes and in the open desert.

Búrquez-M. 94-249 (USON); *Daniel 2003* (ASU); *Felger 85-564* (ASU), *85-1202; Van Devender 84-241*.

Euphorbia polycarpa Bentham
[*Chamaesyce polycarpa* (Bentham) Millspaugh. *Euphorbia polycarpa* var. *hirtella* Boissier. *E. intermixta* S. Watson]
GOLONDRINA; DESERT SPURGE

Euphorbia pediculifera var. *linearifolia*, Nacapule

Non-seasonal ephemerals to small perennial herbs. Appendages white, or in drought sometimes minute or nearly absent. Widespread; slopes, gravelly arroyo bed of canyon bottom, and especially common at the canyon entrance and in the open desert.

Felger 11975, *85-568* (ASU), *85-1183A*.

Euphorbia setiloba Engelmann

[*Chamaesyce setiloba* (Engelmann) Millspaugh]

Golondrina; FRINGED SPURGE

Non-seasonal ephemerals. Appendages white to pink, divided into 7 tooth-like segments forming a star-like pattern. Gravelly soils of open areas along canyon bottom and in the open desert.

Carnahan 1557 (ARIZ, ASU, USON); *Felger 85-1330*.

Euphorbia tomentulosa S. Watson

[*Chamaesyce tomentulosa* (S. Watson) Millspaugh]

Shrubs to 1.5 m tall, often with rather sparse foliage; leaves tardily drought-deciduous. Appendages white.

Euphorbia setiloba, Nacapule

Euphorbia tomentulosa, Bahía San Pedro

Reproductive non-seasonally. Canyon slopes, especially the more arid habitats, open rocky areas along canyon bottom, and on nearby desert hills.

Carnahan 1563; *Felger 94-862*; *Steinmann 15 Aug 1992*.

Jatropha

1. Shrubs or small trees; leaves with prominent petioles; leaf blades cordate, about as long as wide; leaf margins stipitate-glandular. _____**Jatropha cordata**

1' Shrubs; leaves sessile, spatulate, about twice as long as wide, mostly less than 2 cm long; leaf margins entire. _____**Jatropha cuneata**

Jatropha cordata (Ortega) Müller Argoviensis

Torote, torote papelillo, torote amarillo; Sonoran tree-limberbush

Slender, erect *Bursera*-like shrubs or small trees 2–3+ m tall; bark papery, tan, and peeling during dry seasons; leaves present during summer rainy season and quickly deciduous after the summer-fall rains cease. Flowers white to pink; July and August. Steep slopes on both sides of the canyon. It is an important host plant for the larvae of *Rothschildia cincta*, a large saturniid moth.

28 Oct 2015, *Carnahan & Felger*, observation; *Felger 84-119*, *85-858*; N-facing lower canyon slope, with *Rothschildia* cocoons, 9 Jan 1996, *Felger*, observation.

Jatropha cuneata Wiggins & Rollins

Sangrengrado, *matacora*; limberbush

Multiple-stem shrubs 1.5–2.5 m tall; lower stems and roots oozing blood-like sap when cut (hence the name *sangrengrado*); roots tuberous; short-shoot leaves small, sessile, entire, appearing after rains at almost any time of the year and quickly drought-deciduous, the long-shoots leaves larger, petioled, lobed, and developing with summer-fall rains. Flowers white; summer rainy season. South-facing slopes, the canyon entrance, and nearby desert.

Jatropha cordata, Sánchez-Escalante, near Hermosillo

Jatropha cuneata, Caborca

Felger 92-1041, *94-863*. Nacapule Spring, 28 Nov 2015, *Carnahan*, photo.

Pleradenophora bilocularis (S. Watson) Esser & A.L. Melo

[*Sapium biloculare* (S. Watson) Pax. *Sebastiania bilocularis* S. Watson]

Hierba de la flecha; Arizona jumping bean

Multi-stem shrubs 2–3 m tall, with milky sap. Leaves alternate, glabrous, shiny green or reddish with drought. Staminate flowers yellow; various seasons including August. Canyon floor where it is nearly evergreen, and

FROM LEFT TO RIGHT:
Pleradenophora bilocularis, near Nacapule
Tragia jonesii, Nacapule

tardily drought-deciduous on slopes and the open desert.

11 Mar 2015, *Carnahan*, photos; *Felger 85-854*; *Starr 211*.

Tragia jonesii Radcliffe-Smith

[Based on *T. scandens* M.E. Jones, not *T. scandens* Linnaeus]

Ortiguilla, quemador; NOSEBURN

Vining perennials with slender stems and mildly stinging hairs, the leaves drought deciduous. Usually beneath shrubs in the canyon bottom, north-facing slopes, and nearby desert habitats.

11 Mar 2015, *Carnahan*, photos; *Felger 85-550*.

FABACEAE (LEGUMINOSAE) • LEGUME FAMILY

Vines _____ A.

Annuals and herbaceous perennials _____ B.

Trees and woody shrubs _____ C.

A. VINES; the stems not self-supporting; flowers papilionoid.

1. Leaves with 5 leaflets; flowers yellow; pods indehiscent, 1-seeded and winged. _____ **Nissolia**

1' Leaves with 3 leaflets; flowers various colors; pods dehiscent, with 2 or more seeds, and not winged.

2. Lower surfaces of leaflets densely dotted with minute (use magnification) golden glands; flowers yellow; pods 2-seeded, constricted between seeds; seeds bicolored, red and black. _____ **Rhynchosia**

2' Leaves not gland dotted; flowers pink or purplish; pods with 2 or more seeds, not constricted between seeds; seeds of one color, not red and black.

3. Plants often glabrate; pods not more than 3 cm long. _____**Phaseolus**

3' Plants pubescent; pods 4 cm or more in length.

4. Leaflets entire; flowers 1.2–1.5 cm long; calyx 4-lobed, the lobes shorter than the tube; corollas pink; pods (4) 5–6.5 cm long. _____**Galactia**

4' Leaflets often shallowly lobed; flowers 2–2.5 cm long; calyx 5-lobed, the lobes longer than the tube; corollas dark red-brown (drying dark purple); pods 7.5–8 cm long. _____**Macroptilium**

B. ANNUALS AND HERBACEOUS PERENNIALS.

1. Leaves even-pinnate with 2–4 pairs of leaflets; flowers caesalpinioid and yellow. _____**Senna**

1' Leaves with 1 leaflet or odd-pinnate with 3–29 leaflets; flowers papilionoid, not yellow.

2. Leaflets 1; flowers whitish; pods entire and with a septum between seeds. _____**Sphinctospermum**

2' Leaflets (1) 3–29; flowers not whitish; pods various.

3. Delicate summer annuals; leaflets (1) 3; herbage and pods with minute hooked hairs; pods resemble a string of cut-outs with 1-seeded segments. _____**Desmodium**

3' Annuals to perennials; leaflets 3–many; plants without hooked hairs; pods entire.

4. Leaflets 7–29; pods 0.25–2 cm long; indehiscent to gradually or partially dehiscent.

5. Small cool-season ephemerals; leaflets 7–11 (13); inflorescences with 1–3 flowers, the flowers pinkish and white; pods 12–20 mm long, with more than 10 seeds per pod. _____**Astragalus**

5' Non-season annuals to weakly perennial; leaflets 13–29; inflorescences many flowered, the flowers purplish-blue; pods 1.8–2.5 mm long, 1-seeded._____**Marina**

4' Leaflets 3–21; pods 3–8 cm long, and dehiscent.

6. Leaflets 11–21; pods 5–8 cm long, with a septum between seeds. _____**Coursetia caribaea**

6' Leaflets 3–11; pods 3–4.5 cm long, without septa.

7. Perennial subshrubs; leaflets 3–5; flowers salmon color. _____**Indigofera**

7' Annuals to perennials; leaflets 5–11; flowers not salmon color. _____**Tephrosia**

C. TREES AND WOODY SHRUBS.

1. Palo verde trees, the bark of branches and most limbs conspicuously green for several or more years; flowers caesalpinioid, yellow. _____**Parkinsonia**

1' Not palo verde trees, the bark not green or usually green for only 1 or 2 years; flowers various.

2. Slender trees with peeling, papery white bark; young leaves with 1 (2) pair(s) of small pinnae at the end of long, slender, strap-like leafstalks. _____**Mariosousa**

2' Shrubs or trees, the bark not white and not peeling; leafstalks not unusually long and not strap-like.

3. Small shrubs; flowers papilionoid; pods 1-seeded and indehiscent. _____**Dalea**

3' Trees and shrubs; flowers caesalpinioid, mimosoid, or papilionoid; pods with 2 or more seeds (*Olneya* pods rarely 1-seeded), dehiscent or indehiscent.

4. Plants entirely unarmed (without spines, prickles, or thorns).

5. Leaves once pinnate; flowers papilionoid.

6. Flowers pink or white and pale yellow; pods gradually dehiscent, glandular sticky-pubescent, constricted between seeds, and not papery or inflated. _____**Coursetia glandulosa**

6' Flowers bright yellow; pods indehiscent, papery and inflated (bladder-like), not glandular sticky and not constricted between seeds. _____**Diphysa**

5' Leaves bi-pinnate; flowers caesalpinioid or mimosoid.

7. Stipules leafy (often soon deciduous); valves of pods separating from a conspicuous rim; flowers mimosoid, whitish._____**Lysiloma**

7' Stipules not leafy (sometimes without stipules); valves of pods not separating from the rim; flowers various.

8. Flowers caesalpinioid, in racemes; pods 15 or more mm wide (*Caesalpinia* sensu lato).

9. Leaves with 2 or 3 pairs of pinnae; leaflets 5–20 mm long, about as long as wide; pods semi-woody, less than twice as long as wide. _____**Coulteria**

9' Leaves with 3–5 pairs of pinnae; leaflets 6–10 mm long, longer than wide; pods not woody, at least twice as long as wide. _____**Erythrostemon**

8' Flowers mimosoid, in rounded clusters (capitate); pods 3–10 mm wide.

10. Pods in digitate clusters, 3 mm wide, the margins not cord-like, the valves remaining straight and not curling. _____**Desmanthus**

10' Pods one to several but not in digitate clusters, 5–10 mm wide with thin, cord-like margins, the valves curling back after dehiscence.

11. Flowers bright red. _____**Calliandra**

11' Flowers white to pale yellow. _____**Zapoteca**

4' Plants armed, at least some branches with spines, thorns, or spinescent twigs.

12. Flowers caesalpinioid or papilionoid.

13. Trunk and limbs fluted-sculptured, the bark smooth; leaves even-pinnate or sometimes partially bipinnate but the pinnae even-pinnate; leaflets 4–8, with conspicuous lateral veins; flowers caesalpinioid, yellow. _____**Haematoxylum**

13' Trunk and limbs not fluted, rounded in cross section, the bark rough on the trunk and older limbs; leaves odd-pinnate (or sometimes even-pinnate), leaflets 6–19, the lateral veins inconspicuous; flowers papilionoid, lavender-pink. _____**Olneya**

12' Flowers mimosoid.

14. Shrubs with internodal (between the nodes) prickles (spines), 2–5 mm long, and not paired; leaves with 2–4 pairs of pinnae; flowers pink-purple, in cylindrical spikes. _____**Mimosa**

14' Trees and shrubs with stipular spines (at the nodes), and mostly paired, larger spines 3–50 mm long; leaves with 1–25 pairs of pinnae; flowers white or yellow-orange, in rounded (capitate) heads or in cylindrical spikes or spike-like racemes.

15. Spines curved, catclaw-like, 3 mm long; leaves with 1–4 pinnae, each with 8–24 leaflets. _____ _____**Havardia**

15' Spines straight (terete), not curved (rounded in cross-section or boat-shaped), larger spines usually more than 10 mm long; leaves with 1–25 pairs of pinnae, each with 2–many leaflets.

16. Flowers in cylindrical spicate inflorescences (longer than wide); stamens 10. _____**Prosopis**

16' Flowers in capitate (rounded) clusters, stamens more than 10. _____**Vachellia**

Astragalus nuttallianus de Candolle var. **cedrosensis** M.E. Jones

Small-flowered milk-vetch

Delicate, winter-spring ephemerals. Flowers pinkish-purple and white, selfing and semi-cleistogamous. Canyon entrance and open desert. This is the smallest *Astragalus* species in the Sonoran Desert.

Felger 95-1.

Caesalpinia pumila, see **Coulteria pumila**

Calliandra californica, Nacapule

Coulteria pumila, Sánchez-Escalante, near Aguaje de Robinson

Caesalpinia palmeri, see **Erythrostemon palmeri**

Calliandra californica Bentham

Tabardillo; Baja California fairy duster

Shrubs 1–1.5 m tall; tardily drought-deciduous. Flowers bright red and showy. North- and northeast-facing slopes and occasional in the nearby desert.

Burgess 6533; 26 Jan 2016, north fork of canyon, *Carnahan*, photos; *Felger 92-1039*.

Coulteria pumila (Britton & Rose) Sotuyo & G.P. Lewis

[*Guaymasia pumila* Britton & Rose 1930, based on *Caesalpinia gracilis* Bentham ex Helmsley, Diagn. Pl. Nov. Mexico 1: 9, 1878 (nom. illeg. hom.; not *C. gracilis* Miquel, 1855). *Caesalpinia pumila* (Britton & Rose) F.J. Hermann; see Gagnon et al. 2016]

Palo colorado

Small shrubs; tardily drought-deciduous. Leaflets 5–20 mm long, orbicular or nearly so. Flowers yellow; summer. Pods explosively dehiscent. Open desert near the canyon and occasionally on east-facing slopes near the canyon mouth.

29 Nov 2015, *Carnahan*, photos; 11 Jan 2016, Arroyo Nacapule, *Carnahan*, observation; *Felger 85-871B*.

Coursetia

1. Perennial herbs or subshrubs usually less than 1 m tall; leaves odd-pinnate. _____**Coursetia caribaea**

1' Woody shrubs, usually more than 1.5 m tall; leaves even-pinnate. _____**Coursetia glandulosa**

Coursetia caribaea (Jacquin) Lavin var. **caribaea**

[*Cracca caribaea* (Jacquin) Bentham. *C. caribaea* var. *edwardsii* (A. Gray) Hassler. *C. edwardsii* A. Gray. *C. brandegeei* Rydberg. *Benthamantha edwardsii* (A. Gray) Rose]

Coursetia caribaea, Santa Cruz County, Arizona

Suffrutescent perennials, 50–80 cm tall. Flowers with a white or yellow keel, and a pink banner with red streaks on the back. Growing and flowering during hot-weather rains, the fruits ripening in October; leafless and dormant at other seasons. Common understory plants in the canyon bottom, and on densely vegetated north-facing slopes.

Felger 84-138 (ARIZ, UCR), *84-574*, *96-86* (ARIZ, BRIT).

Coursetia glandulosa A. Gray

[*C. microphylla* A. Gray. *Pictetia microphylla* Bentham ex Hemsley]

Sámota

Coursetia glandulosa, San Carlos

Coursetia glandulosa with lac, *Pseudomyrmex* ants, Nacapule

Multiple-stem shrubs to 2.5 m tall; leaves unfolding in spring after flowering except in severe drought, the foliage luxuriant with leaflets larger during the summer-fall rainy season and smaller and gradually deciduous during fall and winter. Flowers pale yellow and white with pink

Dalea pringlei var *multijuga*, Nacapule

Dalea purpusii, Nacapule

to red tinges; flowering in spring. Canyon bottom, north and south slopes, canyon entrance, and nearby desert slopes. Stems sometimes encrusted with orange lac produced by the ant-tended scale insect *Tachardiella fulgens* (Felger & Rutman 2015b; Kondo & Gullan 2011).

26 Jan 2016, with lac encrustation and *Pseudomyrmex* ants, *Carnahan*, photos; *Felger 85-256*.

Dalea

1. Suffrutescent perennials, with long, slender, straight stems. _____**Dalea pringlei**

1' Small shrubs, with many short and intricately branching twigs. _____**Dalea purpusii**

Dalea pringlei A. Gray var. **multijuga** Barneby

Suffrutescent perennials, often 1–1.5 m tall, with slender, few-branched straight stems, branching from base; stems and leaves glaucous and gland dotted. Flowers in dense spikes; corollas white or lavender, drying purple, the anthers bright yellow. Washes near the canyon mouth and floodplain in canyon bottom.

Wide sandy wash 0.2 km S of canyon mouth, 11 Nov 2014, *Carnahan SC 908*.

Dalea purpusii Brandegee

Dense, intricately branched shrubs 0.5–1.3 m tall, the stems slender, rigid. Herbage silvery-gray pubescent; tardily drought-deciduous. Flowers dark magenta-purple with a yellow spot on the banner; attracting large numbers of honeybees. Mostly on west- and south-facing rock faces, but also on other exposures. Widespread in the Sierra El Aguaje, often in crevices on barren rock. Also on the Baja California peninsula.

Dalea purpusii is a new record for Sonora. The Nacapule/Guaymas region population was previously misidentified and reported as *Dalea pulchra* Gentry (Felger 1999).

Carnahan 1604 (ARIZ, USON); *Felger 85-543*.

Desmanthus covillei, Nacapule

Desmodium procumbens, Nacapule

Desmanthus covillei (Britton & Rose) Wiggins & B.L. Turner

[*Acuan covillei* Britton & Rose. *A. palmeri* Britton & Rose. *A. subulatus* Britton & Rose. *Desmanthus palmeri* (Britton & Rose) Wiggins ex Turner. *D. subulatus* (Britton & Rose) Wiggins ex Turner]

Dais

Slender shrubs often 1.5 m tall, with delicate unarmed stems and filmy, drought-deciduous foliage. Growing and flowering mostly with summer rains. Flowers white. Pods sender, 5–13 cm long. Scattered along the canyon bottom and more common on north-facing slopes.

Carnahan 1554 (ARIZ, ASU, USON). Nacapule Spring, *Felger 84-133*.

Desmodium procumbens, Nacapule

Desmodium procumbens (Miller) Hitchcock var. **procumbens**

[*D. scopulorum* S. Watson. *D. wigginsii* Schubert]

Tick clover

Summer-fall ephemerals with trifoliolate leaves. Flowers white to pink, minute. Pods slender, resembling a series of cut-outs, the segments 1-seeded, triangular to 4-cornered or rounded, and with minute hooked hairs.

Diphysa occidentalis, San Carlos

Canyon bottom and north-facing slopes, mostly shaded beneath shrubs and trees.

The Nacapule specimens show some features of both this species and *D. scopulorum* S. Watson, which may be conspecific. Furthermore, *D. procumbens* var. *procumbens* and var. *exiguum* (A. Gray) Schubert are probably not distinct taxa.

27 Oct 2015, *Carnahan*, photos; *Felger 84-96* (ARIZ, ASU), *85-1304*.

Diphysa occidentalis Rose

Huilochi, huilonchi, guilochi, guilonchi

Shrubs or small trees to 3 m tall; gradually drought-deciduous. Flowers bright yellow; summer rainy season, and sometimes November or December to April depending on rains. Pods inflated, thin-walled, papery, and lumpy. North- and south-facing canyon slopes.

Felger 85-851; Keil 16589 (UCR); *Starr 201*; *Wilder 10-472*.

Erythrostemon palmeri, San Carlos

Erythrostemon palmeri (S. Watson) Gagnon & G.P. Lewis

[*Caesalpinia palmeri* S. Watson. *Poincianella arida* Britton & Rose]

Palo piojo

Shrubs with conspicuous lenticels (said to resemble *piojos*, or lice, hence the common name); tardily drought-deciduous. Leaflets 6–10 mm long, longer than wide. Flowers bright yellow, the sepals red; warmer months except severe drought. Pods explosively dehiscent. South-facing canyon slopes, dry habitats at the canyon entrance, and the open desert.

11 Mar 2015, *Carnahan*, observation; *Felger 85-584; Martin 12 Mar 1977*.

Galactia wrightii A. Gray

Herbaceous perennial vines. Pubescence variable, often sparser with age. Leaves trifoliolate, the leaflets entire. Inflorescences racemose, several to many-flowered.

Galactia wrightii, Santa Cruz County, Arizona

Flowers 1.2–1.5 cm long. Calyx 6.5–7 mm long, 4-lobed (the upper 2 lobes fused so that the calyx is 4-lobed), the lobes longer than the tube. Corollas pinkish. Pods 4–5 cm long, straight to moderately curved, flattened, pubescent, and elastically dehiscent. Flowering and fruiting at various seasons. Scattered along the canyon bottom and on brushy slopes.

Carnahan 1538 (ARIZ, USON); *Felger 92-1023*.

Haematoxylum brasiletto H. Karsten

Brasil

Hardwood shrubs or small trees, the trunks and major branches with fluted ridges and red heartwood. Twigs often zigzag and with straight, sharp thorns. Leaves gradually drought-deciduous. Flowers bright yellow; non-seasonal. Canyon bottom, north and south slopes, and the open desert.

16 Dec 2012, *Carnahan*, photos; *Starr 206*; *Wilder 10-477* (ARIZ, UCR).

Haematoxylum brasiletto, Nacapule

Havardia sonorae, San Carlos

Havardia sonorae (S. Watson) Britton & Rose

[*Pithecellobium sonorae* S. Watson]

Jócono, gato; Sonoran ebony

Multiple-trunk trees to 6+ m tall; tardily drought-deciduous. Pods ripe in November. Along a small arroyo running northward from near the canyon entrance.

Felger 94-850.

Indigofera jamaicensis, Nacapule

Lysiloma divaricatum, Nacapule

Indigofera jamaicensis Sprengel

[*I. laevis* Rydberg]

Suffrutescent perennials to 1 m tall. Leaves with 3–5 leaflets; drought-deciduous. Corollas dark salmon-pink; flowering non-seasonally. Pods slender and straight to moderately curved, and multiple-seeded. Mostly on slopes, with various exposures.

Carnahan SC 1025, *1534* (ARIZ, ASU, USON); *Felger 85-558*, *20151028-12*; *Wilder 10-486* (ARIZ, MO, UCR, USON).

Lysiloma divaricatum (Jacquin) J.F. Macbride

[*L. microphyllum* Bentham]

Mauto

Large shrubs or small trees 4–6 m tall. New growth in early summer; drought deciduous, the leaves mostly shed in early fall. Flowers cream-white; April–May. Pods ripening late summer to October. Canyon bottom and slopes, especially north-facing, and along arroyos in the nearby desert.

13 Dec 2013, *Carnahan*, photos; *Phillips 75-145; Starr 24*; *Wilder 10-478* (ARIZ, MO, UCR, USON).

Macroptilium atropurpureum (Mociño & Sessé ex de Candolle) Urban

Perennial vines; growing and flowering mostly during summer rainy season. Calyx 5-toothed, 5–7 mm long, the lobes shorter than the tube. Flowers dark red-brown. Pods 7.5–8 cm long, straight, terete, pubescent, and explosively dehiscent. Shaded canyon bottom among boulders and leaf litter, and north-facing slopes.

Felger 92-1023.

Marina parryi (Torrey & A. Gray) Barneby

[*Dalea parryi* Torrey & A. Gray]

Non-seasonal ephemerals, mostly flowering in spring, and occasionally short-lived perennials. Flowers dark blue. Open habitats: arroyo bed near the canyon mouth, open desert, and south-facing slopes.

Macroptilium atropurpureum, La Navaja

Marina parryi, Caborca

Felger 95-3 (ARIZ, NY, UCR). Nacapule Spring, *Felger 95-109* (ARIZ, USON).

Mariosousa willardiana (Rose) Seigler & Ebinger

[*Acacia willardiana* Rose]

Palo blanco, *palo liso*

Slender, wispy trees 3–5+ m tall; unarmed, the bark white, papery and peeling away in sheets during dry seasons; leaflets and then the pinnae drought-deciduous, leaving the leafstalk to function as a phyllode. Flowers pale yellow; February to May and October. Arid canyon slopes, cliffs, and the nearby desert.

30 Dec 2011, *Carnahan*, photos; *Felger 85-561*.

Mariosousa willardiana, Nacapule

Mimosa distachya, San Carlos

Mimosa distachya, San Carlos

Nissolia schottii, San Carlos

Mimosa distachya Cavanilles var. **laxiflora** (Bentham) Barneby

[*M. laxiflora* Bentham]

Shrubs with sharp, recurved internodal prickles along the stems; drought-deciduous. Flowers pink, fading to white; various seasons. Dry habitats, mostly near the canyon entrance, south-facing slopes, and the open desert.

Felger 84-610, 85-842. Nacapule Spring, 29 Nov 2015, *Carnahan*, observation.

Nissolia schottii (Torrey) A. Gray

Huirote panalero

Perennial vines climbing through shrubs; gradually drought-deciduous. Flowers bright yellow; summer rainy season and sometimes at other seasons. Canyon bottom, north-facing slopes, and nearby open desert.

Felger 85-874, *95-21*, *20151028-18*; *Wilder 10-467*.

Olneya tesota A. Gray

Palo fierro, tesota; ironwood

A grove of large shrubs and small trees on the steep south-facing slope in the mid-portion of the canyon, and

Olneya tesota, Bahía San Pedro

Parkinsonia microphylla, Bahía San Marte, BCS

common on nearby slopes and the open desert. Flowers pink and purple; late spring. Fruits ripening just before the onset of summer rains.

Felger 92-1026. 29 Nov 2015, Nacapule Spring, *Carnahan*, observation.

Parkinsonia – Palo verde

Large shrubs to medium trees with green bark and relatively soft wood. Short-shoots very reduced. Leaflets small, the leaflets and leaves quickly drought deciduous, the leaflets often falling independently. Flowers caesalpinioid; producing prodigious quantities of mostly yellow flowers, the filaments yellow and hairy at the base, the anthers orange. Pods indehiscent to tardily partially dehiscent, 1- to several-seeded.

1. Twigs spinescent at tip; axillary spines absent; petioles absent, the leaflets mostly 1–3.3 mm long. _____**Parkinsonia microphylla**

1' Twigs not spinescent at tip; spines 1 or 2 at each node (or absent on some branches), stout; leaves petioled or sometimes sessile; the leaflets 4–13 mm long. _____**Parkinsonia praecox**

Parkinsonia microphylla Torrey

[*Cercidium microphyllum* (Torrey) Rose & I.M. Johnston]

Palo verde; foothill palo verde

Small trees or large shrubs; drought deciduous. Flowers pale yellow and white; mass flowering in spring. Arid habitats, especially south-facing slopes and the open desert.

Open desert at canyon entrance, *Felger 92-1054*.

Parkinsonia praecox (Ruiz & Pavón ex Hooker) Hawkins

[*Cercidium praecox* (Ruiz López & Pavón ex Hooker) Harms]

Brea, palo brea

Parkinsonia praecox, Sánchez-Escalante, Sierra Mazatán

Parkinsonia praecox, Sánchez-Escalante, Sierra Mazatán

Small trees with nearly horizontal branches and pale green bark. Flowers bright yellow, the banner with basal red-orange spots or flecks. Mass flowering in spring. Scattered on the open desert near the canyon entrance.

Felger 20151028-15.

Phaseolus filiformis Bentham

Frijol silvestre; desert bean

Non-seasonal ephemeral vines. Flowers pink. Canyon bottom, slopes, and nearby open desert.

11 Nov 2014, *Carnahan*, photos; *Felger 84-126*.

Phaseolus filiformis, near Loreto, BCS

Prosopis glandulosa Torrey var. **torreyana** (L.D. Benson) M.C. Johnston

[*P. juliflora* (Swartz) de Candolle var. *torreyana* L.D. Benson]

Mezquite; western honey mesquite

Winter-deciduous, the new leaves and flower buds emerging in March. Flowers yellow, March and April and sporadically through the summer.

Scattered shrubs and small trees to 5+ m along the canyon bottom, rare until the mid-1980s, when increased presence was probably due to cattle grazing and disturbance. In 2015 mesquite was again rather scarce in the canyon. Fairly common in the nearby open desert and scattered near the canyon entrance, especially in Arroyo Nacapule leading southeast from the canyon. Also several small trees and one 14 m tall with a trunk 197 cm circumference at Nacapule Spring.

Felger 92-1052, 94-847. Nacapule Spring, *Carnahan 1597* (ARIZ, ASU, USON).

Prosopis glandulosa, San Carlos

Rhynchosia precatoria, Santa Cruz County, Arizona

Rhynchosia precatoria (Humboldt & Bonpland ex Willdenow) de Candolle

Ojo de chanate; ROSARY SNOUTBEAN

Perennial vines growing over shrubs; leaves velvety pubescent, the stems and leaves drought-deciduous. Flowers dull yellow with red-brown markings, the seeds shiny black and red. Growing and flowering with summer-fall rains, the pods maturing in October. Canyon bottom and north-facing slopes.

Carnahan 1610 (ARIZ, USON); *Felger 84-116; Phillips 75-164*.

Rhynchosia precatoria, Nacapule

Senna covesii (A. Gray) Irwin & Barneby

[*Cassia covesii* A. Gray]

Hojasén, daisillo; DESERT SENNA

Herbaceous or suffrutescent perennials, probably short-lived; stems and leaves drought deciduous. Flowers yellow; warmer months. Sandy soil at canyon entrance and scattered in nearby open desert.

30 Dec 2011, *Carnahan*, photo; *Felger 94-852*.

Senna covesii, San Carlos

Tephrosia tenella, San Carlos

Sphinctospermum constrictum, Sierra El Tigre

Sphinctospermum constrictum (S. Watson) Rose

[*Tephrosia constricta* S. Watson]

Hot-weather annuals. Leaves unifoliolate (a single leaflet). Flowers inconspicuous, white with lavender. Mostly on rocky slopes and gravelly soil of the canyon bottom.

Felger 85-1120, 85-1332.

Tephrosia tenella A. Gray

Red hoary-pea

Non-seasonal ephemerals or annuals, or occasionally short-lived perennials. Petals pink-purple, drying wine-colored, or sometimes white, less than 8 mm long. Mostly in gravels along the canyon bottom.

Gravels in canyon bottom, flowers white, *Carnahan SC 1026*; *Felger 85-547* (ARIZ, ASU, CAS, MEXU, NY, SD, TEX, USON); *Wilder 10-472* (ARIZ, UCR).

Vachellia californica, San Carlos

Vachellia campechiana, San Carlos

Vachellia

1. Leaves with 2 pinnae, each pinna with 2 or 3 pairs of large leaflets. _____**Vachellia californica**

1' Leaves with 2–many pinnae, each pinna with many small leaflets.

2. Spines flat to boat-shaped, at first red-brown and flexible, becoming whitish and firm._____ _____**Vachellia campechiana**

2' Spines straight, rounded (terete) in cross-section, usually white. _____**Vachellia farnesiana**

Vachellia californica (Brandegee) Seigler & Ebinger

[*Acacia californica* Brandegee. *A. pringlei* Rose subsp. *californica* (Brandegee) Lee, Seigler & Ebinger. *A. sonorensis* Rose]

Shrubs or small trees, with straight white stipular spines; mostly evergreen. Flowers pale yellow; (March) May and June. In 1985 it was locally scarce along the canyon bottom near the entrance and on the steep east-facing rock slope below the cliffs at the southeast canyon entrance. We did not find it in 2014 and 2015. This acacia is distinctive due to its dark green foliage contrasting with white spines. The leaflets are the largest of the Sonoran acacias.

Steep east-facing rock slope below cliffs at SE side of canyon mouth, 28 Dec 1985, *Felger*, observation (Felger 1999).

Vachellia campechiana (Miller) Seigler & Ebinger

[*Acacia cochliacantha* Humboldt & Bonpland ex Willdenow. *A. cymbispina* Sprague & Riley]

Chírahui, hinolo; boat-spine acacia

Shrubs 3+ m tall with large, paired, boat-shaped stipular spines; leaves drought-deciduous. Flowers yellow-orange; June to September (November). Occasional in the canyon bottom near the entrance and several seen at Nacapule Spring. Apparently spread by cattle during the 1980s or 1990s.

Vachellia farnesiana, San Carlos

29 Nov 2015, trail to Nacapule Spring, *Carnahan*, photo; Along wash 50–100 m SE from canyon entrance, 3 Jan 1995, *Felger 95-33*. Vicinity of Nacapule Spring, 4 Jan 1995, *Felger 95-57*.

Vachellia farnesiana (Linnaeus) Wight & Arnott

[*Acacia farnesiana* (Linnaeus) Willdenow. *A. minuta* (M.E. Jones) R.M. Beauchamp subsp. *densiflora* (Small) R.M. Beauchamp. *A. smallii* Isely]

Huizache, vinorama; sweet acacia

Shrubs 1.8–4 m tall with straight white stipular spines; entirely or sometimes partially winter-deciduous. Flowers bright yellow-orange, sweet-scented; December to March. Canyon entrance, not common, and rare elsewhere along the canyon bottom, and at the spring. Apparently introduced by cattle during the 1980s or 1990s. Usually weedy in the Guaymas region.

Daniel 1985 (ASU); *Felger 92-1044*. Nacapule Spring, *Felger 95-110* (ARIZ, USON).

Zapoteca formosa subsp. *rosei*, Sánchez-Escalante, Nacapule

Zapoteca formosa (Kunth) H.M. Hernández subsp. **rosei** (Wiggins) H.M. Hernández

[*Calliandra rosei* Wiggins. *C. schottii* S. Watson subsp. *rosei* (Wiggins) Felger & Lowe. *C. gracilis* (M. Martens & Galeotti) Standley]

Slender shrubs 1.5–3 m tall; tardily drought-deciduous in moist habitats, and quickly deciduous in dry habitats. "Proximal half of stamens white, distal half pink" (Gentry 1942: 123). Flowering in summer. Mostly in shaded habitats; canyon bottom, and on brushy, north- and east-facing slopes of the canyon and nearby hills.

Felger 4083, 84-95; *Wilder 10-470*.

FOUQUIERIACEAE • OCOTILLO FAMILY

Fouquieria

Three of the five Sonoran Desert species freely intermingle in the mountains from the vicinity of Cañón del Nacapule to about 5 km east of Bahía San Pedro. In this region *F. diguetii* locally reaches maximum population density in the more xeric habitats while *F. macdougalii* becomes more numerous in less xeric habitats characterized by denser vegetation and a greater number of species. In all three species the leaves are produced with sufficient rainfall at any time of year and are quickly drought-deciduous. The flowers attract hummingbirds.

1. Stems long, wand-like, upright, ascending to erect, usually not branched above; trunk very short, usually appearing trunkless. _____**Fouquieria splendens**

1' Stems and major limbs branched above; trunk(s) thick and well developed.

2. Inflorescences relatively compact, usually longer than wide; pedicels 2–6 (13) mm. _____**Fouquieria diguetii**

2' Inflorescences relatively loose and open, usually as wide as or wider than long, pedicels (3) 5–30 mm. _____ _____**Fouquieria macdougalii**

Fouquieria diguetii (van Tieghem) I.M. Johnston

Palo adán, *ocotillo*

Shrubs, often with rather thick limbs and a short trunk. Flowers red; various seasons. Rocky slopes on both sides of the canyon, but most common on south-facing slopes, and on nearby mountain slopes and in the open desert.

Daniel 2331 (ASU); *Felger 92-1040*.

Fouquieria diguetii, San Carlos

Fouquieria macdougalii Nash

Ocotillo macho, *ocotillo*; TREE OCOTILLO

Large shrubs or small trees to 4+ m with a thickened, twisted trunk and lower limbs, the bark often waxy yellow-brown and peeling in dry seasons. Flowers bright red; various seasons. Rocky slopes on both sides of the canyon,

Fouquieria macdougalii, Nacapule

Fouquieria splendens, Nacapule

apparently largest and best developed on north-facing slopes; also common in the surrounding mountains and the nearby open desert.

16 Dec 2012, *Carnahan*, photos; *Felger 11972, 92-1061*.

Fouquieria splendens Engelmann subsp. **splendens**
Ocotillo

Shrubs with wand-like spiny branches, essentially trunkless. Flowers red-orange, in late January, February, and March. Hot, exposed slopes, mostly near the canyon rim and high south-facing slopes, and few on rocky south-facing slopes near the canyon entrance. This is the southernmost record for this species in Sonora.

Flowering, 26 Jan 2016, *Carnahan*, photos; *Felger 85-542* (ARIZ, ASU, USON).

Euploca procumbens, San Carlos

HELIOTROPIACEAE • HELIOTROPE FAMILY

Euploca procumbens (Miller) Diane & Hilger
[*Heliotropium procumbens* Miller]

Usually herbaceous perennials, and also flowering in the first season. Flowers small and white. Canyon bottom; apparently locally scarce.

Felger 84-162; *Wilder 10-487*.

HYDROPHYLLACEAE • WATERLEAF FAMILY

Phacelia scariosa Brandegee

Spring ephemerals, often robust; glandular pubescent, sticky, and stinky; petioles prominent; leaves lobed, pinnatifid, or dissected. Corollas pale lavender. Seeds 4. Canyon bottom and slopes.

16 Dec 2012, *Carnahan*, photos; *Felger 85-247, 95-116*.

Phacelia scariosa, San Carlos

KRAMERIACEAE • RATANY FAMILY

Krameria

1. Small, knotty-stemmed shrubs usually to 0.5 m tall; spines on fruits with barbs more or less evenly distributed along the upper part of the spine shaft._____**Krameria erecta**

1' Straight-stemmed shrubs usually more than 1 m tall; spines on fruits barbed only at the tip. _____ _____**Krameria sonorae**

Krameria erecta Willdenow

[*K. parvifolia* Bentham]

Cósahui; RANGE RATANY

Spreading shrubs ca. 80 cm or less in height, with rigid stems beset with small, knotty short-shoots. Flowers bright magenta-purple; non-seasonal. Rocky-gravelly soil near canyon entrance and nearby open desert.

Felger 85-867A; Región del cañón del Nacapule, *Reina-G. 95-116* (USON).

Krameria erecta, Santa Cruz County, Arizona

Krameria sonorae Britton

Cósahui del sur; white ratany

Shrubs often 1.5–2.5 m tall, the stems slender, spreading, and flexible. Leaves sparse, quickly drought-deciduous. Sepals and lower petals nearly white inside, with red or red-lavender stripes and tinges, fading pink-lavender. Spines on the fruits bright red to red-brown and barbed only at the tip. Dry habitats, canyon mouth and nearby open desert.

Burgess 6527; 16 Dec 2012, *Carnahan*, photos; *Felger 94-867; Phillips 75-180*.

Krameria sonorae, San Carlos

LAMIACEAE (LABIATAE) • MINT FAMILY

1. Shrubs; leaves simple. _____ **Condea**

1' Large shrubs and small trees; most leaves compound with 3 or 5 leaflets. _____ **Vitex**

Condea albida (Kunth) Harley & J.F.B. Pastore

[*Condea emoryi* (Torrey) Harley & J.F.B. Pastore. *Hyptis albida* Kunth. *H. emoryi* Torrey. *H. emoryi* var. *amplifolia* I.M. Johnston. *H. emoryi* var. *palmeri* (S. Watson) I.M. Johnston]

Salvia; desert lavender

Shrubs 1.5–3.6 m tall, the herbage mostly white-pubescent with dendritic hairs. Leaves olive-green to whitish depending on moisture conditions and tardily drought-deciduous; leaves often 1–3 (4.5) cm long, but well-watered plants in shade (*Carnahan 1564*) have leaves up to 9.7 cm long, including petioles 2–2.4 cm long and blades 6–7.7 x 4–5 cm. Flowers small, lavender blue and fragrant, visited by honeybees and hummingbirds; flowering non-seasonally, often profusely, especially in spring. Near the canyon entrance and the nearby desert.

Condea albida, Nacapule

Canyon bottom, in shade near the canyon entrance, 29 Oct 2015, *Carnahan 1564* (ARIZ, ASU, USON); *Felger 85-582; Starr 714*.

Vitex mollis Kunth
Uvalama

Large shrubs, with golden-brown hairs, especially when young. Leaves with (1 or 2) 3–5 palmately arranged leaflets. Leaflets oblong-oval to obovate or elliptic, the terminal leaflet more than 7.5 cm long, the lateral leaflets smaller or sometimes not developing. Corollas about 2 cm long, with a lavender-blue lip and smaller white lobes, the tube with bluish purple guidelines. Fruits fleshy, 1.5–2 cm diameter, blackish when ripe. A small, single shrub found along the bottom of the north fork of the canyon. *V. mollis* also occurs in other riparian canyons in the Sierra El Aguaje.

North fork of canyon, 29 Nov 2015, *Carnahan 1603* (ARIZ, USON).

Vitex mollis, La Navaja

LOASACEAE • LOASA FAMILY

1. Flowers white or green and yellow, the corollas tubular. _____**Eucnide**

1' Flowers orange, corollas with spreading petals. _____**Mentzelia**

Eucnide

1. Perennials, the stems not succulent, the roots well developed; flowers white. _____**Eucnide cordata**

1'Annuals, the stems succulent, the roots weakly developed; flowers yellow and green. _____**Eucnide rupestris**

Eucnide cordata Kellogg
Pegajosa

Bushy perennials or shrubs sometime more than 1 x 1 m, with large, drought-deciduous leaves. Pieces of the plants adhere like "Velcro" due to the barbed hairs, especially

Eucnide cordata, Nacapule

Eucnide rupestris, Nacapule

Mentzelia aspera, Nacapule

during rainy seasons. Corollas tubular, white; probably flowering non-seasonally. Near the canyon entrance and scattered along the canyon bottom.

11 Nov 2014, *Carnahan*, photos; *Steinmann 412*; Edge of arroyo in alluvium, plant ca. ½ m tall and 1 m in circumference, *Wilder 10-474* (ARIZ, UCR).

Eucnide rupestris (Baillon) H.J. Thompson & W.R. Ernst

[*Loasella rupestris* Baillon. *Sympetaleia rupestris* (Baillon) S. Watson]

VELCRO PLANT, ROCK NETTLE

Non-seasonal ephemerals, the roots unusually small for the size of the plants. Pieces of the plants adhere like "Velcro" due to the barbed hairs. Stems and petioles succulent, the leaf blades relatively thin and bright yellowish green. Corollas with a yellow tube and green lobes. Most often in crevices on canyon wall cliffs and rocks, and occasionally in gravelly-sandy soil of the canyon bottom.

11 Nov 2014, *Carnahan*, photos; *Felger 84-606*.

Mentzelia aspera Linnaeus

PEGA-PEGA

Non-seasonal ephemerals, most often growing with summer-fall rains. As with *Eucnide*, pieces of the plants stick like Velcro. Flowers orange. Canyon bottom, mostly in sandy-gravelly soil in open areas, south-facing slopes, and nearby open desert.

28 Oct 2015, *Carnahan*, photos; *Felger 85-1331*.

Psittacanthus sonorae, near Nacapule

Struthanthus palmeri, San Carlos

LORANTHACEAE • SHOWY MISTLETOE FAMILY

1. Stems not pendent; flowers red to orange and showy. _____**Psittacanthus**

1' Stems pendent; flowers white, rather inconspicuous. _____**Struthanthus**

Psittacanthus sonorae (S. Watson) Kuijt

[*Loranthus sonorae* S. Watson. *Phrygilanthus sonorae* (S. Watson) Standley]

Toji

Parasitic on *Bursera microphylla*; stems and leaves terete and succulent. Flowers bright red, visited by hummingbirds; non-seasonal. Open desert adjacent to the canyon and south-facing slopes.

Daniel 1964 (ASU); *Felger 92-1061; Starr 715*.

Struthanthus palmeri Kuijt

[*Struthanthus haenkei* (C. Presl) Engler, sensu lato, in part. *S. haenkei* var. *angustus* I.M. Johnston]

Toji

Parasitic on *Mariosousa* (*Acacia*) *willardiana*, and elsewhere in the region also on other hosts, especially *Prosopis*. Stems pendent, often in loose spirals. Leaves semi-succulent and narrowly lanceolate. Flowers small, cream-white; fruits green, becoming red-orange, to 1 cm long. "*Struthanthus palmeri* is the most northerly of all Loranthaceae . . . in the New World" (Kuijt 1975: 25).

Felger 95-45; *Holler 11 Jan 1982* (DES); *Keil 16588* (UCR).

MALPIGHIACEAE • MALPIGHIA FAMILY

1. Stems vining, semi-vining, arching, or trailing; fruits winged.

   2. Fruits pale green when fresh, papery with age, with wings 2 or more cm long and wider than long. ____**Callaeum**

   2' Fruits green and usually tinged with red, with firm wings less than 1.5 cm long and longer than wide. _____**Cottsia**

1' Stems mostly erect to spreading, not vining, arching, or trailing; fruits not winged.

   3. Subshrub less than 1 m tall; leaves opposite. _____**Galphimia**

   3' Shrubs, usually 1.5 m tall or more; leaves alternate. _____**Echinopterys**

Callaeum macropterum (Mociño & Sessé ex de Candolle) D.M. Johnson

[*Mascagnia macroptera* (Mociño & Sessé ex de Candolle) Niedenzu]

GALLINITA, BATANENE

Bushy perennials in arid habitats, or robust vines in better-watered habitats with denser vegetation. Flowers yellow; various seasons. Fruits pale green, unusual with large papery wings, hence the name *gallinita* with reference to the wattles of a chicken. Canyon bottom, mostly in the more open, xeric habitats.

Felger 8046; *Parfitt 3020* (ASU).

Cottsia

1. Leaves ovate, widest at middle. ___**Cottsia californica**

1' Leaves lanceolate, widest below middle. _____ _____**Cottsia gracilis**

Cottsia californica (Bentham) W.R. Anderson & C. Davis

[*Janusia californica* Bentham]

Perennial vines with wiry stems; leaves gradually drought-deciduous, elliptic. Flowers yellow; with warm weather and moisture. Common and widespread in the canyon bottom, slopes, and open desert.

27 Oct 2015, *Carnahan*, photo; *Felger 85-1184; Starr 210*.

Cottsia gracilis (A. Gray) W.R. Anderson & C. Davis

[*Janusia gracilis* A. Gray]

Perennial vines, resembling *C. californica* but distinguished by the usually smaller and narrower, lanceolate leaves. South-facing canyon slopes. Generally in more xeric habitats than *C. californica*.

Felger 95-20.

Echinopterys eglandulosa (A. de Jussieu) Small

[*Bunchosia eglandulosa* A. de Jussieu]

Shrubs to 2 m tall. Leaves alternate, gradually drought-deciduous. Flowers bright yellow; various seasons with moisture and warm weather. Near the canyon entrance and on north-facing slopes.

Parfitt 3045; *Starr 222*.

Callaeum macropterum, La Navaja

Callaeum macropterum, Mex 15 near Guaymas

Cottsia californica, San Carlos

Cottsia gracilis, Arroyo La Pirinola

Galphimia angustifolia Bentham

[*G. angustifolia* var. *oblongifolia* (A. Gray) S. Watson. *Thryallis angustifolia* (Bentham) Kuntze]

Suffrutescent perennials. Flowers bright yellow; various seasons following rainfall. Canyon bottom and lower slopes.

Felger 84-159, 85-865.

Echinopterys eglandulosa, San Carlos

Galphimia angustifolia, Las Barajitas

MALVACEAE • MALLOW FAMILY (INCLUDES STERCULIACEAE AND TILIACEAE)

1. Fertile stamens 5; fruits of capsules separating into 2 or 5 segments.

   2. Capsules conspicuously 5-angled.

      3. Herbaceous perennials; flowers yellow; capsules with 5 thin, bristly wings or angles, and many-seeded; seeds kidney-shaped. _____**Hermannia**

      3' Shrubs; flowers rose-lavender; capsules angled but not bristly, 5-seeded; seeds obovoid. _____**Melochia**

   2' Capsules more or less globose, not angled.

      4. Flowers minute and maroon; capsules 5-seeded, separating into 5 segments. _____**Ayenia**

      4' Flowers small and bright yellow; capsules 1-seeded, not separating into segments. _____**Waltheria**

1' Stamens more than 10; fruits capsular (opening through longitudinal splits) or schizocarps (separating into 5 or more single-carpel segments or mericarps).

   5. Facultative annual (potentially perennial); capsules more than 5 times longer than wide. _____**Corchorus**

   5' Ephemerals or perennials; capsules less than 3 times longer than wide.

6. Perennials; fruit a capsule of 5 persistent segments (carpels), the carpels splitting open at maturity but remaining attached. _____**Hibiscus**

6' Ephemerals and perennials; fruit a schizocarp, the segments (mericarps) separating (falling away) at maturity.

7. Lower leaves petioled, upper leaves of flowering branches sessile; flowering and fruiting branches and pedicels very slender.

8. Upper leaves perfoliate (clasping the stem and appearing as if skewered); fruits not inflated, breaking into 8 mericarps. _____**Briquetia**

8' Upper leaves of flowering branches ovate; fruits inflated like miniature paper lanterns, breaking apart into 10–12 mericarps. _____**Herissantia**

7' Lower and upper leaves petioled; pedicels usually not thread-like.

9. Lower and upper portions of each mericarp markedly dissimilar, the lower chamber indehiscent, the upper part dehiscent.

10. Mericarps 1-seeded, with 2 apical spines, upper (dehiscent) portion not flared. _____**Sida**

10' Mericarps 1–3-seeded, without apical spines, upper (dehiscent) portion of mericarps with flared membranous wings.

11. Slender shrubs; epicalyx absent. _____**Horsfordia**

11' Annuals or bushy perennials; epicalyx present, of 3 bracts. _____**Sphaeralcea**

9' Mericarps with a single chamber (not differentiated into upper and lower chambers).

12. Winter-spring ephemerals (annuals); epicalyx with inconspicuous filiform bracts; corollas white or pale pinkish, notched at the tip; mericarps 10 (11), 1-seeded. _____**Malva**

12' Non-seasonal annuals to perennials or shrubs; epicalyx none; corollas not white, the petals not notched; mericarps 5–10, 1- or 3-seeded.

13. Herbaceous perennials or shrubs; fruits 6–15 mm wide; mericarps 5–10, 3-seeded, not apically spined. _____**Abutilon**

13' Ephemerals or shrubs; fruits 5–7 mm wide; mericarps 5, 1-seeded, usually with 2 apical spines. _____**Sida**

Abutilon – *Pintapán, tintapán*

Herbaceous perennials or shrubs; herbage usually densely pubescent with stellate hairs. Pedicels jointed (best seen on fruiting pedicels, the fruits usually break off at the joint). Epicalyx none. Corollas often yellow or orange. Fruit a schizocarp; mericarps 5–10, with 3 seeds each.

1. Suffrutescent perennials; stems and petioles with stellate and simple hairs, the simple hairs 2 mm long. _____**Abutilon parishii**

1' Shrubs; stems and petioles with stellate and simple hairs, the simple hairs 1 (2) mm long.

2. Capsule segments (mericarps) 5, the tips blunt and rounded; calyx lobes not overlapping, the fruiting calyx shorter than the mericarps. ___**Abutilon incanum**

2' Mericarps 10, the tips slender and pointed; calyx lobes overlapping basally, the fruiting calyx about as long as the mericarps. _____**Abutilon abutiloides**

Abutilon abutiloides Jacquin

[*A. lignosum* (Cavanilles) G. Don. *A. scabrum* S. Watson]
Pintapán, tintapán

Shrubs often 1.5–2.5 m tall. Flowers orange; warm weather. Fruiting calyx about as long as the mericarps, the mericarps 10. Understory shrubs; canyon bottom and mostly on north-facing slopes, and also at Nacapule Spring.

Also found north of Bahía San Carlos (*Carnahan SC 1024*). Elsewhere in the Guaymas region one usually finds the similar-looking *A. californicum* Bentham, a Gulf of California segregate of the more widespread, inland, southern, and tropical *A. abutiloides* (Felger et al. 2015a; Fryxell 1988; Strong 1977).

Abutilon abutiloides, San Carlos

Carnahan 1536 (ARIZ, USON), *1569* (ARIZ, ASU, USON); *Felger 84-619, 85-1189* (ARIZ, MEXU). Nacapule Spring, *Carnahan 1595* (ARIZ, USON).

Abutilon incanum (Link) Sweet

[*A. pringlei* Hochreutiner]

Slender-stem shrubs. Petals pale orange with a maroon spot at base. Flowering and fruiting non-seasonally. Mostly canyon bottom and north-facing slopes.

30 Dec 2011, *Carnahan*, photo; *Felger 85-544A; Starr 718*.

Abutilon parishii S. Watson

Suffrutescent perennials or subshrubs, open and sparsely branched with slender stems. Leaves darker above, and densely pubescent with velvety, stellate hairs. Inflorescences slender-stemmed, sparsely branched terminal panicles rising to 1–1.8 m and well above the foliage, and also flowering from leaf axils. Flowers yellow; mostly in warmer weather, opening in the late afternoon. Mericarps

Abutilon incanum, Las Barajitas

Abutilon parishii, Santa Cruz County, Arizona

Abutilon parishii, Nacapule

5–8 (mean 6.8) for Nacapule; elsewhere, such as in the Sierra Libre, mericarps per capsule number 5–9 (10) (Van Devender et al. 1994).

Sandy soil and colluvium near mouth of canyon and scattered through the canyon bottom in open areas.

Gentle S-SE rhyolitic slope, *Bertelsen 92-154* (ARIZ, USON); 11 Mar 2015, *Carnahan*, photos; *Felger 92-1017*, *95-62A*, *95-122A*.

Ayenia

Shrubs or herbs, with stellate hairs. Leaves simple, the margins toothed or serrated. Flowers minute, maroon and intricately sculptured, with long pedicels. Petals 5, the tips united with the stamen tube. Fertile stamens 5, and sterile stamens (staminodes) 5. Capsules separating into five 1-seeded carpels.

1. Annuals or suffrutescent perennials; leaves 1–3.8 cm long, narrowly lanceolate. _____**Ayenia filiformis**

1' Shrubs; leaves 4–8+ cm long, ovate, often broadly so. _____**Ayenia jaliscana**

Ayenia filiformis S. Watson

[*A. compacta* Rose. *A. pusilla* of various authors, not *A. pusilla* Linnaeus.]

Annuals to short-lived suffrutescent perennials to 0.8–1.2 m tall, slender and few-branched. Leaves narrowly lanceolate, gradually drought-deciduous. Flowers minute, maroon. Growing and flowering mostly during warmer weather. Shaded places in the canyon bottom, canyon slopes, and nearby open desert.

28 Oct 2015, *Carnahan & Felger*, observation; *Felger 11965, 85-557*.

Ayenia jaliscana S. Watson

Shrubs 1–1.6 m tall, leaves broadly ovate, thin, gradually drought deciduous. Flowers minute, maroon; non-seasonal. Canyon bottom, often among *Coccoloba*, and north- and east-facing brushy slopes.

Carnahan 1537 (ARIZ, USON); *Felger 94-848, 95-29*.

Briquetia sonorae Fryxell

Subshrubs, 1–1.5 m tall, open and sparsely-branched with very slender stems. Leaves widely spaced, the blades thin, darker green and nearly glabrous above, lighter green with stellate hairs below, the margins toothed; vegetative leaves often 7–14 cm long, their petioles slender and often about as long as the blades, the upper leaves (on flowering branches) smaller, sessile, and perfoliate. Panicles and racemes long and slender. Corollas orange.

Ayenia filiformis, San Carlos

Ayenia jaliscana, Nacapule

Fruits ca. 1 cm wide, readily breaking into 8 mericarps, each 2-celled and each cell 1-seeded, the lower cell smaller and indehiscent, the upper cell larger, broader, and dehiscent. Seeds 1.9–2.2 mm long; seed of the lower cell

Briquetia sonorae, Nacapule

mostly glabrous, the seed of the upper cell densely and minutely hispid with often slightly hooked hairs.

Densely shaded, steep north-facing slopes near the canyon bottom, and along the canyon bottom adjacent to the north-facing canyon wall. Known otherwise from several major riparian canyons in the Sierra El Aguaje, Sierra Libre, and Sierra Bojihuacame southeast of Cd. Obregón (see Fryxell 1988).

8 Feb 2017, *Carnahan 2242* (ARIZ, USON); *Felger 84-575*, *85-1325*.

Corchorus olitorius Linnaeus

JUTE, NALTA JUTE, TOSSA JUTE, MOLOKHIA

Annual (the Nacapule plant) with firm stems and simple leaves. Flowers yellow. Fruits of slender, elongated capsules with a septum between each of the many seeds.

Corchorus olitorius, Nacapule

This ancient Old World plant is cultivated worldwide for jute, as a medicinal plant and leaf vegetable, and the seeds are also edible. Colmenero-Robles and Fernández-Nava (2003) and Colmenero-Robles et al. (2010) report it for Sinaloa. The Nacapule plant is a new record for Sonora. We found one small plant, fruiting in its first season, and removed it. *C. olitorius* is a potentially invasive species in thornscrub and tropical deciduous forest regions of Sonora. It is a fast-growing shrub to 3+ m tall and is also a facultative annual.

Gravelly small wash near trailhead to the canyon, 29 Oct 2015, *Felger 20151029-1*.

Herissantia crispa (Linnaeus) Brizicky

[*Abutilon crispum* (Linnaeus) Medikus. *Bogenardia crispa* (Linnaeus) Kearney]

TINTAPÁN

Short-lived perennials with slender stems to ca. 1 m long. Flowers pale yellow; non-seasonal, mostly during warm,

Herissantia crispa, San Carlos

moist weather. Fruits resembling a miniature paper lantern, the mericarps separating at maturity. Canyon bottom in open, sunny habitats, slopes, and open desert.

Felger 92-1047.

Hermannia pauciflora S. Watson

Herbaceous perennials to 30 cm from a semi-woody caudex. Flowers yellow; non-seasonal. Capsules ovoid, papery and with bristly-toothed wings. Mostly on north- and south-facing slopes, also canyon bottom and arroyos in the nearby open desert.

27 Oct 2015, *Carnahan*, photos; *Felger 84-99; Starr 212*.

Hibiscus biseptus S. Watson

Slender subshrubs. Stems with small stellate hairs in two vertical lines decurrent from the stipules, plus larger simple and 2- or 3-ray hairs. Leaves drought-deciduous. Flowers showy, yellow, flowering with warm weather. Canyon bottom, and north and south slopes.

Búrquez 94-255 (USON); 11 Nov 2014, *Carnahan*, photos; *Felger 85-557, 85-1335*.

Hermannia pauciflora, Arroyo Nacapule

Hermannia pauciflora, Las Barajitas

Horsfordia newberryi (S. Watson) A. Gray

Slender, few-branched shrubs, often reaching 1.5–2 m tall. Petals pale yellow-orange; flowering and fruiting at least spring and fall. Mostly on south-facing slopes; a desert species reaching its southern limits on the mainland in the Guaymas region (it occurs farther south in Baja California Sur; Rebman et al. 2016).

11 Mar 2015, *Carnahan*, photos; *Felger 85-562* (ARIZ, ASU, USON); *Phillips 75-170*.

Hibiscus biseptus, Santa Cruz County, Arizona

Horsfordia newberryi, Caborca

*Malva parviflora Linnaeus

MALVA; CHEESEWEED

Winter-spring ephemerals. Flowers white. Near the canyon entrance and at Nacapule Spring. First documented in Nacapule in 1995 in disturbed areas.

Canyon entrance, 11 Mar 2015, *Carnahan*, photo. Nacapule Spring, *Felger 95-55*.

Melochia tomentosa Linnaeus

[*M. arida* Rose. *M. speciosa* S. Watson. *M. tomentosa* var. *speciosa* (S. Watson) A. Goldberg]

MALVA ROSA; DOVE PLANT

Slender-stemmed shrubs to 1.5 m tall; gradually drought deciduous. Leaves simple, pubescent with deeply incised veins. Showy rose-lavender flowers; non-seasonal. Stamens 5. Fruits of capsules, pyramid-shaped with a prominent beak, and densely stellate pubescent. Canyon bottom, mostly in open, arid habitats and disturbed areas, also nearby open desert.

Horsfordia newberryi, Nacapule

The pubescence, carpel shape, and leaf texture tend to resemble var. *speciosa* (S. Watson) A. Goldberg during the summer rainy period but approach var. *tomentosa* during dry seasons.

11 Jan 2016, *Carnahan*, photo; *Felger 85-576; Starr 51.*

Malva parviflora, Santa Cruz County, Arizona

Melochia tomentosa, San Carlos

Sida

Herbaceous to somewhat shrubby plants. Epicalyx absent. Fruits schizocarps; mericarps usually with 2 apical spines, and 1-seeded.

1. Small herbaceous plants with weak stems; fruits 5 mm in diameter; mericarps 5. _____**Sida abutifolia**

1' Slender, few-branched shrubs; fruits 6–7 mm in diameter; mericarps 9. _____**Sida hyalina**

Sida abutifolia Miller

Perennial herbs with weak, often procumbent stems; herbage and calyces densely pubescent with short, stellate hairs and also longer, simple, spreading hairs. Flowers pale yellow-orange; warmer weather. Mericarps 5, not dehiscent, usually with 2 apical spines. Infrequent along the canyon bottom. Also in other riparian palm canyons in the Sierra El Aguaje.

Felger 85-870A.

Sida abutifolia, Santa Cruz County, Arizona

Sida hyalina Fryxell

Slender, few-branched shrubs 1–1.4 m tall; densely pubescent with short, stellate hairs. Flowers pale yellow-orange. Mericarps 9, the upper half dehiscent, with

Sida hyalina, Nacapule

Sphaeralcea ambigua, Nacapule

2 short, barbed spines apically. Canyon slopes, especially north-facing, and sometimes along the canyon bottom.

It appears to be closely related to *S. xanti* A. Gray of the Baja California peninsula and Sinaloa. *Sida xanti* is glandular-viscid whereas *S. hyalina* is not.

West of ridgetop between Nacapule Spring and north fork of Nacapule Canyon, *Carnahan 1602* (ARIZ, USON); North-facing canyon slope, *Felger 85-548, 85-870, 20151028-8* (ARIZ, ASU, USON).

Sphaeralcea – *Mal de ojo*; globe mallow

1. Subshrub perennials; mericarps 4–5.5 mm long, 2-seeded, the dehiscent section more than half as long as the body. _____**Sphaeralcea ambigua**

1' Ephemerals; mericarps 2 mm long, 1-seeded, the dehiscent section short and stubby, less than half as long as the body. _____**Sphaeralcea coulteri**

Sphaeralcea ambigua A. Gray

Mal de ojo; globe mallow

Perennial subshrubs; flowers orange. Locally uncommon, canyon bottom and sandy soil of bench above arroyo floodplain near canyon entrance. This desert species reaches its southern limits in the Guaymas region.

13 Dec 2013, *Carnahan*, photos; *Felger 95-61A*.

Sphaeralcea coulteri (S. Watson) A. Gray

Mal de ojo; annual globe mallow

Spring ephemerals, and perhaps also in summer. Flowers orange. Often locally abundant in the open desert and open areas in the canyon bottom.

Felger 85-234.

Waltheria indica A. Gray

Subshrubs 50–60 cm tall, woody at the base. Flowers yellow; non-seasonal. In 1995 a single colony, severely

Sphaeralcea coulteri, San Carlos

Waltheria indica, Nacapule

grazed by cattle, was found on a sandy bench near the canyon entrance. By 2015 it was common and widespread in the canyon including gravelly soils of the canyon bottom and rocky slopes.

Carnahan 1549 (ARIZ, USON), *1561* (ARIZ, USON); *Felger 95-58A*, *20151028-13*; *Wilder 10-473* (ARIZ, UCR).

MENISPERMACEAE • MOONSEED FAMILY

Cocculus diversifolius de Candolle

Perennial vines often woody at the base; nearly evergreen. Leaves shiny, dark green, tough and glabrous, ovate to lanceolate. Flowers small and yellow; flowering at least March and April. Fruits dark purple. Canyon bottom.

30 Dec 2011 & 11 Mar 2015, *Carnahan*, photos; *Felger 84-152; Van Devender 84-251*.

Cocculus diversifolius, Mex 16, east of Hermosillo

MOLLUGINACEAE • CARPETWEED FAMILY

Mollugo verticillata Linnaeus
CARPETWEED

Delicate, hot weather ephemerals. Flowers inconspicuous, green and white. Common on gravelly soil, mostly in open areas near canyon entrance and open desert, and less common on exposed, rocky slopes.

Carnahan 1552 (ARIZ, USON); *Felger 84-599, 85-1210.*

Mollugo verticillata, San Carlos

MORACEAE • FIG FAMILY

Ficus – *Higuera*; fig

1. Leaf blades about as wide as or wider than long, mostly cordate, orbicular to ovate. _____**Ficus palmeri**

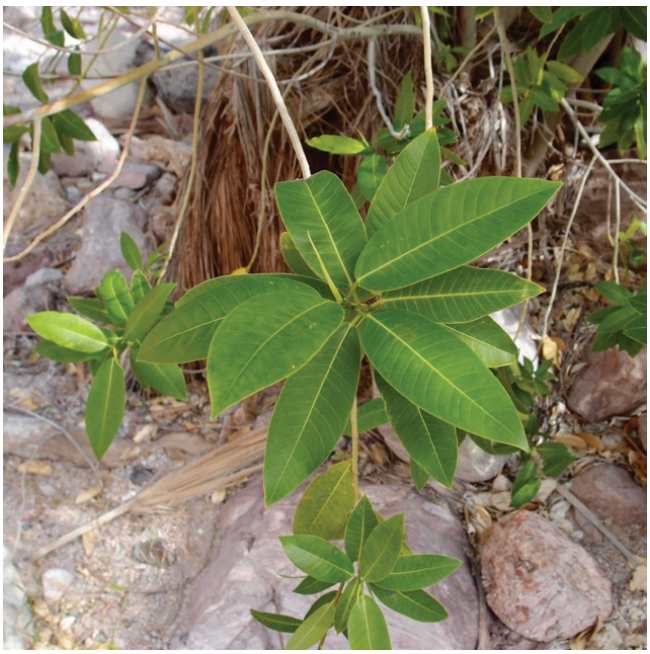
1' Most leaf blades at least twice as long as wide, mostly lanceolate to elliptic.

2. Herbage pubescent to scabrous; leaves mostly 11–22+ cm long, the blades dull and rather rough, the sheathing stipules often 4–8 cm long; figs single at nodes, 2.5 cm wide (at maturity). _____**Ficus insipida**

2' Herbage glabrous; leaves 5–10 (14) cm long, the blades smooth and lustrous, the sheathing stipules 0.8–1 (2.2) cm long; figs single or paired at nodes, ca. 1 cm wide. _____**Ficus pertusa**

Ficus insipida Willdenow
[*F. radulina* S. Watson]
CHALATE

Large shrubs and trees, the largest ones 10–12 m tall with massive, buttressed trunks and exposed, spreading, gnarled roots (Figure 6); evergreen or deciduous in extreme drought. Leaves 11–22+ cm long, dull green, broadly elliptic to ovate, the lower surfaces often scabrous. Figs solitary at the nodes, often 3 cm long and 2.5 cm wide, mottled green and yellow-green, ripening at various seasons, and edible.



Ficus insipida, Nacapule

Trees along the canyon bottom among the *Washingtonia* palms, and scattered shrub-sized plants on mostly

north-facing rock slopes in the upper west branch of the canyon. Also a few trees and shrub-sized *chalates* at Nacapule Spring. The buttressed trunks are unique among the trees of the Sonoran Desert region. This tropical-subtropical tree occurs in a few other riparian canyons in the Sierra El Aguaje. Cattle can severely damage young plants and the tree bark.

Carnahan SC 914 (ARIZ, USON); *Felger 84-117*; *Phillips 75-159*; *Yatskievych 82-147*. Nacapule Spring: 19 Jun 1960, *Felger 3392* (ARIZ, SD); small grove of large *Ficus* trees on steep east-facing slope, tree as wide as tall, trunk very thick and with short buttresses, 31 Oct 1960, *Felger 4078* (ARIZ, MEXU, NY, MO, RSA).

Ficus palmeri S. Watson

[*F. petiolaris* Kunth subsp. *palmeri* (S. Watson) Felger & Lowe]

Tescalama; cliff fig

Shrubs to trees 10+ m; canyon walls, cliffs, and rock faces. Seedlings germinate in rock crevices or cracks. The roots grasp the rock and cascade down over the surface, as if they had melted; if the roots reach the canyon floor or moist soil the plant develops into a tree. Root and stem bark yellowish white. Leaves often cordate or sometimes ovate-triangular, with conspicuous and often pink veins. Figs edible, ca. 1.5 cm diameter, paired (or one may fail to develop), subtended by 2 scales that may appear to be 3 due to splitting as the fig develops.

In the more arid, exposed habitats surrounding the canyon the plants resemble typical *F. palmeri*, with pubescent leaves and twigs, while in more mesic places, such as near the canyon bottom, the plants often approach *F. petiolaris*, with glabrous leaves and twigs. *Ficus palmeri* is widespread in the Gulf of California region of the

Ficus palmeri, San Carlos

Sonoran Desert and the only *Ficus* to extend well into the desert. *F. petiolaris* is characteristic of subtropical and tropical regions from eastern Sonora to Oaxaca. They meet and intergrade in the Guaymas region (Felger et al. 2001).

North-facing margin of canyon near spring-fed pools, 29 Oct 2015, *Carnahan 1566* (ARIZ, USON, puberulent twigs and scattered hairs on leaves), and *Carnahan 1567* (ARIZ, USON, glabrous except for tiny tufts at leaf-blade bases on some but not all leaves); *Felger 84-576*; *Phillips 75-178*.

Ficus pertusa Linnaeus

[*F. fasciculata* S. Watson. *F. padifolia* Kunth. *F. sonorae* S. Watson]

Nacapule, *nacapuli*; Central American banyan

The Spanish language names are based on the Yoeme (Yaqui) names for this tree: *naka'apuli* "ear lobe" or *nakapuri*.

Ficus pertusa, Nacapule

Trees and large shrubs; evergreen at permanent water, and facultatively and tardily drought-deciduous in the more xeric habitats. Leaves usually 5–12 cm long, shiny green, lanceolate, the tip acute-attenuate. Figs paired (or one in the pair may fail to develop), 8–10 mm wide, globose, at first green with red-brown spots or mottling, becoming darker when ripe, and with 2 scales subtending the fig, these splitting as the fig develops. The fruits are edible and delicious, and usually ripen in late summer and also in winter.

Trees in the canyon bottom among the *Washingtonia* groves and smaller trees or large shrubs on cliffs and north- and east-facing canyon walls. An enormous *nacapule* tree shaded Nacapule Spring in the 1960s although it was severely damaged by cattle in the 1980s and 1990s. Photos in 2007 showed a large, nearly dead nacapule tree at the spring, and in November 2015 there was a large, dead, collapsed tree at the spring as well as one large tree. This fig reaches its northern limits in riparian canyons of the Sierra El Aguaje.

Carnahan SC 935 (ARIZ, USON), *1568* (ARIZ, ASU, USON); *Felger 84-158, 84-601; Ibarra-Manríquez 5399* (ASU, UNAM); *Phillips 75-85*. Nacapule Spring, grove of *Ficus* trees, one very large, spreading tree ca. 20 m across and 13 m tall, 19 Jun 1960, *Felger 3391* (ARIZ, MEXU, MO).

Nama hispida, San Carlos

NAMACEAE • NAMA FAMILY

Nama hispida A. Gray var. **sonorae** C.L. Hitchcock

Moradita

Spring ephemerals. Leaves sessile or sub-sessile. Corollas lavender with a yellow throat. Canyon bottom near entrance and open desert. Variety *sonorae* occurs along the coast from the vicinity of San Carlos and Guaymas southward and var. *hispida* occurs in the desert to the north.

Felger 85-235 (ARIZ, USON); *Reina-G. 95-158* (USON).

NYCTAGINACEAE • FOUR O'CLOCK FAMILY

1. Stems mostly weak and prostrate-trailing; flowers in clusters of 3, the cluster resembling a single flower; fruits with a single deep cavity formed by a pair of inrolled wings. _____**Allionia**

1' Stems erect to spreading, sometimes decumbent or prostrate but not trailing; flowers often clustered but each flower conspicuously separate; fruits not grooved or with 3 to 5 furrows or grooves.

2. Fruits less than 4 mm long, without peg-like glands; ephemerals or weakly perennial herbs; herbage or flowering branches pubescent and/or glandular-sticky; plants mostly less than 1 m tall; flowers pink or red-purple. __**Boerhavia**

2' Fruits 8–10 mm long, with conspicuous, peg-like sticky glands; perennials, usually semi-woody at base; stems and leaves glabrous; plants often 1 m or more tall; flowers yellow-green. _____**Commicarpus**

Allionia incarnata Linnaeus

[*A. incarnata* var. *nudata* (Standley) Munz. *A. incarnata* var. *villosa* (Standley) Munz]

Trailing windmills

Short-lived herbaceous perennials with trailing stems. Flowers bright lavender-pink. Flowers in 3s, the 3 easily separated flowers resembling a single flower, the perianth of each flower forming a wedge-shaped third of the cluster; flowering in warmer months. Fruits elliptic, one side smooth, the other with inrolled wings forming a deep cavity; the fruits are unique among Sonoran Desert nyctages in being bilaterally symmetrical. Arid habitats at canyon entrance and the nearby open desert (Felger 1999).

Allionia incarnata, San Carlos

Boerhavia – *Juanilipín, juanimipili*; spiderling

The flowers open in the early morning, usually shortly after sunrise, and generally collapse with daytime heat, usually by mid-morning during hot weather. The stamens collapse onto the stigma as the flower fades (apparently self-fertilizing if the flower has not been cross-pollinated).

Boerhavia coccinea and *B. gracillima* flowers remain open longer than the other local boerhavias.

1. Perennials, also often flowering in first season; flowers (perianth) bright or dark reddish purple; fruits glandular or pubescent.

2. Leaves mostly along entire length of the plant; flowers usually in clusters of several or more; fruits sticky with gland-tipped hairs. _____**Boerhavia coccinea**

2' Leaves mostly in the lower half of the plant; flowers solitary (perhaps 2 or 3); fruits minutely pubescent, not glandular-sticky. _____**Boerhavia gracillima**

1' Annuals; flowers (perianth) pink; fruits glabrous.

3. Flowers in umbellate or sub-umbellate clusters, or sometimes single. _____**Boerhavia triquetra**

3' Flowers on elongated racemes.

4. Perianth mostly 2–3 mm wide. _**Boerhavia spicata**

4' Perianth mostly 5–7 mm wide. __**Boerhavia xanti**

Boerhavia coccinea Miller

[*B. caribaea* Jacquin]

Scarlet spiderling

Perennials, also flowering in the first season; roots thickened. Plants leafy more or less throughout. Inflorescences axillary or diffuse and much-branched. Flowers in sub-umbellate clusters of several or more at ends of slender branchlets or peduncles. Perianth bright reddish purple. Fruits sticky with gland-tipped hairs, narrowly obovate and prominently ribbed.

27 Oct 2015, *Carnahan 1540* (ARIZ, USON).

Boerhavia gracillima Heimerl

Herbaceous perennials with hard, knotty bases, also flowering in the first season. Leaves mostly in the lower part of the plant; leaves firm, semi-succulent, becoming reddish in winter and spring. Flowers solitary (perhaps sometimes in clusters of 2 or 3), dark reddish purple. Fruits minutely pubescent, not glandular. North-facing slopes and less often in the canyon bottom.

Carnahan 1559 (ARIZ, ASU, USON); *Felger 84-149, 84-617*.

Boerhavia coccinea, Santa Cruz County, Arizona

Boerhavia gracillima, Nacapule

Boerhavia triquetra, Bahía San Pedro

Boerhavia xanti, Nacapule

Boerhavia spicata Choisy

[*B. coulteri* (Hooker f.) S. Watson. *B. palmeri* S. Watson 1889, not *B. palmeri* S. Watson 1883. *B. spicata* var. *palmeri* S. Watson. *B. watsonii* Standley. *Senkenbergia coulteri* Hooker f.]

Juanilipín; SPIDERLING

Summer-fall ephemerals. Plants viscid and moderately pubescent. Flowers on elongated racemes, the perianth pink, usually 2–3 mm wide. Canyon bottom and slopes, especially in open areas, and the open desert. *B. spicata* is distinguished from *B. xanti* by having notably smaller corollas.

Phillips 75-78.

Boerhavia triquetra S. Watson

[*B. intermedia* M.E. Jones. *B. triquetra* var. *intermedia* (M.E. Jones) Spellenberg. *B. maculata* Standley]

Juanilipín; SPIDERLING

Summer-fall ephemerals. Flowers in small umbellate or sub-umbellate clusters at the ends of slender branchlets. Perianth pink, 2.1–3 mm wide in the morning when fresh. Fruits 5-angled, 2.5–2.9 mm long, narrowly obovate. Seasonally abundant; canyon bottom and slopes, especially in open areas, and the open desert.

Burgess 6528; *Carnahan 1550* (ARIZ, USON); *Starr 219*.

Boerhavia xanti S. Watson

Plants viscid and moderately pubescent with small white hairs or herbage mostly glabrate. Inflorescences racemose, the perianth pink, 5–7 mm wide. Fruits 5-angled, 2.6–2.8 mm long, and narrow.

Boerhavia xanti has the largest flowers of any *Boerhavia* in western Sonora. It is distinguished from *B. spicata* by broader sulci on the fruit as well as larger flowers; perhaps flower size is influenced by moisture conditions. There are specimens of intermediate character and the differences seem minor. Separating the two taxa without

fresh flowers seen or pressed (in the morning before the perianth collapses) is problematic.

29 Oct 2015, *Carnahan 1555* (ARIZ, USON).

Commicarpus scandens (Linnaeus) Standley

[*Boerhavia scandens* Linnaeus]

Perennials to 2 m tall, often supported by or growing through other shrubs, the stems slender and brittle with long internodes. Leaves semi-succulent, tardily drought-deciduous. Flowers pale yellow-green; warmer months. Fruits 1 cm long, club-shaped, with viscid, knobby glands that cause the fruit to stick to clothing, feathers, or fur. Canyon bottom and mostly north- and east-facing slopes.

Felger 84-127, *85-1204* (ARIZ, MEXU, RSA, TEX, UC); *Phillips 75-154*.

Forestiera angustifolia, La Navaja

Commicarpus scandens, Estero Soldado

OLEACEAE • OLIVE FAMILY

Forestiera angustifolia Torrey

Desert olive

Much-branched shrubs 2–3 m tall, with rigid branches. Leaves opposite, 15–25 mm long, relatively thick, linear-oblong to elliptic, dark green above, lighter green below and markedly glandular-punctate; tardily drought-deciduous. Flowers minute, male and female flowers on separate plants. Fruits often 10 mm long, fleshy, bluish black at maturity. Flowering and fruiting recorded in winter months, and fruits also seen in March. Fairly common along the canyon bottom.

Widely scattered in riparian canyons in the Sierra El Aguaje. The leaves are generally larger than those of *F. angustifolia* from elsewhere.

Arroyo Nacapule, 250 m SE of canyon entrance, *Carnahan 1632* (ARIZ, ASU, USON); *Felger 84-171, 85-856* (ARIZ, ASU, CAS, MO, TEX, USON).

ONAGRACEAE • EVENING PRIMROSE FAMILY

Ludwigia

1. Plants often 1+ m tall, conspicuously pubescent; sepals and petals usually 4. _____**Ludwigia octovalvis**

1'Plants usually less than 30 cm tall, glabrous or essentially so; sepals and petals usually 5. __**Ludwigia peploides**

Ludwigia octovalvis (Jacquin) P.H. Raven subsp. **octovalvis**

[*Jussiaea octovalvis* (Jacquin) Swartz. *J. suffruticosa* Linnaeus var. *octofila* (de Candolle) Munz]

Warm-weather annuals to herbaceous perennials 1 (2.5) m tall. Stems slender, amazingly tough, the bark shredding. Sepals 4, becoming red—a striking feature after the petals fall; petals 4, pale yellow, falling at a touch; occasional flowers with 3 sepals and 3 petals may occur on the same plant with the usual 4-merous flowers. Emergent from shallow water or on wet soil in the upper part of the canyon beneath *Washingtonia* palms.

Carnahan 1544 (ARIZ, ASU, USON); *Felger 84-170, 85-1498*.

Ludwigia peploides (Kunth) P.H. Raven subsp. **peploides**

[*Jussiaea peploides* Kunth. *J. repens* Linnaeus var. *peploides* (Kunth) Grisebach]

Creeping water-primrose

Wetland plants. Known in the canyon from a small population of delicate submerged plants, rooted in mud in water 40+ cm deep, growing with submerged phase of *Echinodorus berteroi*.

Ludwigia octovalvis, Nacapule

Ludwigia peploides, Álamos

Submerged aquatic plants are usually the juvenile phase; adult plants are emergent from shallow water or grow on wet soil. Leaves alternate and petioled; leaf blades elliptic, with pinnate venation; stipules scale-like or perhaps none. Flowers with 5 sepals, and 5 bright yellow petals (6-merous flowers sometimes occur with this species).

Perched pool at west end of canyon, about halfway up waterfall sequence, 29 Oct 2015, *Carnahan 1556* (ARIZ, USON).

PAPAVERACEAE • POPPY FAMILY

Argemone ochroleuca Sweet

Cardó; Mexican prickly-poppy

Annuals with prickly stems, leaves, buds and capsules. Flowers pale yellow; warmer months. Open areas of the gravelly-sand wash in the lower part of the canyon. A weedy species, not common at Nacapule.

Ames 12 Mar 1977; *Starr 488*.

Argemone ochroleuca, Felger, La Balandrona

PASSIFLORACEAE • PASSION VINE FAMILY (INCLUDES TURNERACEAE)

1. Vines with tendrils; flowers not yellow. ____**Passiflora**

1' Dwarf shrubs, not vining and without tendrils; flowers yellow. _____**Turnera**

Passiflora – *Flor de la pasión*; passion flower

1. Plants densely pubescent; flowers white and blue, 4.5–5 cm wide. _____**Passiflora arida**

1' Plants glabrous; flowers not blue, 2 cm wide. _____**Passiflora mexicana**

Passiflora arida (Masters & Rose) Killip var. **arida**

[*P. foetida* Linnaeus var. *arida* Masters & Rose]

Desert passion vine

Perennials with semi-vining to vining stems 1–1.5 m often growing over shrubs. Herbage densely whitish-woolly

Passiflora arida, San Carlos

(not glandular-sticky). Flowers white and blue, at various seasons. Fruit pulp sweet and delicious. Scattered, mostly in drier habitats in the canyon bottom, south-facing slopes, and at the canyon entrance.

11 Nov 2014, *Carnahan*, photos; *Felger 84-1211*.

Passiflora mexicana de Jussieu

Perennial vines overtopping trees and shrubs; glabrous. Leaves deeply bi-lobed, variable in size and width depending on shade, season, age, and soil moisture; with prominent, dot-like nectaries (mimicking butterfly eggs).

Passiflora mexicana, Cañón Los Anegados

Flowers ca. 2 cm wide and ill-scented; sepals green, the petals inconspicuous, in young flowers the corona filaments whitish, becoming pink or reddish or lavender with age, the style, stigmas, and young stamens green. Fruits 1–1.5 cm wide, blackish when ripe. Common in moist habitats along the canyon bottom.

16 Dec 2012, *Carnahan*, photo; *Felger 85-845*; *Palmer 260 in 1897* [12 Oct] (the label reads "Guaymas," but according to McVaugh [1956: 220] this collection is from "Nacapuly"); *Phillips 75-147*; *Wilder 10-466*.

Turnera diffusa, El Baviso

Turnera diffusa Willdenow

DAMIANA

Small, aromatic shrubs with rigid, woody stems. Herbage with coarse white hairs interspersed with small golden glands. Leaves alternate, 1–2.8 cm long, coarsely toothed. Flowers aromatic, bright yellow to yellow-orange, visited by bees and butterflies.

Locally common on open, W-facing rocky slope along north fork of canyon, 29 Nov 2015, *Carnahan 1605* (ARIZ, ASU, USON).

PETIVERIACEAE • PIGEON-BERRY FAMILY

Rivina humilis, Sánchez-Escalante, La Pintada

Rivina humilis Linnaeus

CHILE DE COYOTE; PIGEON BERRY

Bushy perennials often 1–1.5 m, the stems slender and brittle, the leaves thin and quickly wilting. Flowers white; mostly with summer rains. Fruits fleshy, red. Shaded canyon bottom with *Coccoloba* and *Vallesia*.

Felger 85-1168 (ARIZ, CAS, MEXU, MO, UC), *92-1051*; *Phillips 75-151*.

PHRYMACEAE • LOPSEED FAMILY (INCLUDES SCROPHULARIACEAE, IN PART)

Erythranthe floribunda (Douglas ex Lindley) G.L. Nesom

[*Mimulus floribundus* Douglas ex Lindley]

Cool-season ephemerals; herbage slimy with glandular hairs. Corollas yellow. Seasonally and locally common in wet soil beneath *Washingtonia* palms in the upper part of the canyon and at Nacapule Spring.

Felger 84-605, 85-238 (ARIZ, HCIB, USON).

Erythranthe floribunda, El Baviso

PHYTOLACCACEAE, *Rivina*, see PETIVERIACEAE

PLANTAGINACEAE • PLANTAIN FAMILY (INCLUDES SCROPHULARIACEAE, IN PART)

1. Plants glabrous; lower leaves in a basal rosette; corollas blue with a prominent, slender spur. _____**Nuttallanthus**

1' Plants glandular pubescent.

2. Leaves incised or toothed. _____**Stemodia**

2' Leaves entire.

3. Herbage viscid-sticky; stems and pedicels not vining; leaves ovate to broadly lanceolate, prominently petioled; pedicels shorter than the flowers or fruits. _____**Pseudorontium**

3' Herbage not viscid-sticky; stems and pedicels twining; leaves linear, sessile or nearly so; pedicels longer than the flowers or fruits. _____**Sairocarpus**

Nuttallanthus texanus (Scheele) D.A. Sutton

[*Linaria canadensis* (Linnaeus) Dumont de Courset var. *texana* (Scheele) Pennell. *L. texana* Scheele]

Toadflax

Winter-spring ephemerals, the first leaves in a basal rosette. Flowers blue with a conspicuous spur. Sandy soil in open desert and canyon bottom including near the canyon entrance.

Felger 85-246 (ARIZ, UCR), *95-117* (ARIZ, USON).

Nuttallanthus texanus, San Carlos

Pseudorontium cyathiferum, San Carlos

Pseudorontium cyathiferum (Bentham) Rothmaler

[*Antirrhinum cyathiferum* Bentham]

Desert snapdragon

Non-seasonal ephemerals, often branched near the base; herbage viscid-sticky; leaf blades about as wide as long. Corollas blue-purple. Canyon bottom, slopes, and open desert.

Carnahan 1558; *Felger 85-1193, 95-54.*

Sairocarpus costatus (Wiggins) D.A. Sutton

[*Antirrhinum costatum* Wiggins]

Spring ephemerals with elongated stems usually unbranched or few-branched above; herbage not viscid; leaves linear. Pedicels twining if touching another stem or leaf; corollas white with pink-purple guidelines. Gravelly soil in open areas in canyon bottom and rocky slopes.

Felger 85-241 (ARIZ, ASU), *95-115.*

Sairocarpus costatus, El Baviso

Stemodia durantifolia (Linnaeus) Swartz var. **durantifolia**

FULGENCIA

Annuals to short-lived perennials to ca. 50 cm; first leaves in a basal rosette. Pedicels 1–12 mm long; sepals 6–8 mm long; corollas 8–10 mm long, dark blue. Wet soil at pools and stream in upper part of canyon beneath *Washingtonia* palms.

11 Nov 2014, *Carnahan*, photos; *Felger 84-107*; *Starr 48*; *Wilder 10-492* (ARIZ, MO, UCR, USON).

Stemodia durantifolia, Álamos

Plumbago zeylanica, Nacapule

PLUMBAGINACEAE • PLUMBAGO FAMILY

Plumbago zeylanica Linnaeus

[*P. scandens* Linnaeus]

ESTRENINA, *PLUMBAGO*

Herbaceous perennials; tardily drought-deciduous. Rachis, bracts, and calyx with stipitate glands that stick to almost anything; the calyx glands begin exuding at anthesis. Flowers white; non-seasonal with moist conditions. Mostly in shaded habitats along the canyon bottom and north-facing slopes.

30 Dec 2011, *Carnahan*, photo; *Felger 85-258*.

POLEMONIACEAE • PHLOX FAMILY

Dayia sonorae (Rose) J.M. Porter

[*Gilia sonorae* Rose. *Ipomopsis sonorae* (Rose) A. Grant]

Sonoran gilia

Diminutive spring ephemerals. Flowers small, pale pink. Often cryptic among ephemeral grasses. Canyon entrance and the adjacent open desert.

Felger 85-233, 95-104.

Dayia sonorae, Arroyo Nacapule

POLYGONACEAE • BUCKWHEAT FAMILY

1. Vines with tendrils. _____ **Antigonon**

1' Woody shrubs without tendrils. _____ **Coccoloba**

Antigonon leptopus Hooker & Arnott

San miguelito; queen's wreath

Robust perennial vines from tuberous roots, often covering shrubs and trees; tardily drought- and winter-deciduous. Showy pink bracts and flowers, the panicles terminating in tendrils; non-seasonal but most vigorously with summer rains. Abundant in the canyon bottom and on rocky slopes. Widely cultivated in Sonora and elsewhere.

11 Nov 2014, *Carnahan*, photo; *Felger 3388, 11884*; *Quinn & Sundt 1024.*

Antigonon leptopus, Nacapule

Coccoloba goldmanii Standley

Shrubs to 3–4 m tall, with multiple hardwood stems. Essentially evergreen although the larger leaves fall during

Coccoloba goldmanii, Nacapule

drought. Leaf blades 5.5–17 cm wide, nearly orbicular, rather tough, glabrous or with pubescent veins on the lower surfaces. Flower stalks (peduncle and raceme) 7–30 cm long, slender, pendent, appearing terminal. Male and female flowers on separate plants; pedicels 2 mm long, the perianth 4–4.5 mm wide; mostly June and July. Female flowers solitary. Male flowers usually in clusters of 3, the sepals pale green, the filaments, anthers, ovary, style and stigma white. Fruits 5.6–6.8 mm long, 4.8–5.7 mm wide, rounded and hard, ripening October to December. Canyon bottom, in the portion shaded during the winter months, and on north-facing slopes below cliffs; closely associated with *Vallesia laciniata*.

Also in other riparian canyons in the Sierra El Aguaje. Otherwise only known from widely scattered riparian canyons in southeastern Sonora, southwestern Chihuahua, and northern Sinaloa.

Búrquez-M. 94-241 (USON); 28 Nov 2015, *Carnahan*, photos; *Felger 8038, 85-839*; *Phillips 75-150*; *Van Devender 84-257*.

PORTULACACEAE • PORTULACA FAMILY

Portulaca – *Verdolago*; purslane

1. Roots tuberous; leaves generally terete (rounded in cross-section; appearing flat when dry); leaf axils and flower clusters densely white-hairy; flowers to 25 mm wide, the petals coppery orange. _____**Portulaca suffrutescens**

1' Roots not tuberous; leaves flattened; plants glabrous (except a few inconspicuous hairs); flowers 3–7 mm wide, the petals yellow.

2. Fruits not collar-winged, the capsules opening below the middle, the lid often longer than the capsule body. _____**Portulaca oleracea**

2' Fruits with a distinctive collar-like wing 1–2 mm wide surrounding the capsule rim, the capsules opening above the middle, the capsule lid shallow and saucer-like. _____**Portulaca umbraticola**

*Portulaca oleracea Linnaeus

VERDOLAGO; PURSLANE

Hot-weather ephemerals, succulent and glabrous. Leaves flattened, spatulate to obovate. Flowers yellow. Canyon bottom in open, disturbed places, and the nearby open desert.

Portulaca oleracea, San Carlos

Portulaca suffrutescens, Sánchez-Escalante, La Balandrona

27 Oct 2015, *Carnahan*, photo; *Carnahan 1572*; *Felger 85-1215, 85-1309*.

Portulaca suffrutescens Engelmann

Hot-weather ephemerals (perennials elsewhere), succulent and with tuberous roots, sometimes growing and flowering with winter-spring rains. Leaves terete. Inflorescences hairy, the flowers relatively large with orange petals. Canyon bottom in gravelly soil in open areas, arid slopes usually with shallow soil, and the open desert.

Felger 85-1308, 85-1506.

Portulaca umbraticola, Santa Cruz County, Arizona

Portulaca umbraticola Kunth subsp. **lanceolata** (Engelmann) J.F. Matthews & Ketron

[*P. lanceolata* Engelmann]

Hot-weather ephemerals, succulent. Leaves flat. Flowers with yellow centers and red-tipped tepals. Capsules with a collar-like wing 1–2 mm wide, the lid shallow, saucer-like, and opening above the middle; seeds dull gray.

Bertelsen 92–150; *Felger 84-128*, *85-1215*.

PRIMULACEAE • PRIMROSE FAMILY

Bonellia macrocarpa (Cavanilles) B. Ståhl & Källersjö subsp. **pungens** (A. Gray) B. Ståhl & Källersjö

[*Jacquinia pungens* A. Gray. *J. macrocarpa* Cavanilles subsp. *pungens* (A . Gray) B. Ståhl]

San juanico

Small trees with a thick trunk and dense evergreen crown of stiff, spine-tipped leaves. Corollas and petal-like staminodes orange-red, readily falling with the attached stamens. Fruits 2–2.5 cm long, ovoid, hard-shelled; mesocarp fleshy-gelatinous, sweet and edible (Felger & Moser 1985). Canyon bottom.

26 Jan 2016, *Carnahan*, photos; *Felger 92-1020; Phillips 75-84*.

Bonellia macrocarpa, near La Navaja

Forchhammeria watsonii, male flowers, near Nacapule

RESEDACEAE • MIGNONETTE FAMILY

Forchhammeria watsonii Rose

Jito, palo jito; lollipop tree

Unarmed trees to 5–6 m tall with a thick trunk and dense evergreen crown; leaves of young plants narrowly linear, those of the mature tree much broader. Male and female flowers on separate trees. Male flowers yellow, the stamens mostly 16–24 in number, 4–5 mm long. Female flowers 2–3 mm long, maroon, with reduced stamens. Fruits ca. 1 cm, purplish to reddish orange, fleshy with an edible, sweet pulp. Mass flowering March and April; fruiting May and June and sometimes in November.

Scattered along the canyon bottom, and more common in the nearby open desert.

This tree has earned the name lollipop tree because of its shape, the result of cattle eating the lower branches—there is usually a dense crown and single, bare trunk. In places without cattle grazing the trees often have leafy branches to the ground.

Hall et al. (2004) show that *Forchhammeria* should no longer be classified as Capparaceae, and Stevens (2012) places it in the Stixideae, a group of 4 genera and 20 species in the Resedaceae.

11 Jan 2016, *Carnahan*, photos; *Ibarra-Manríquez 5441* (ASU, MEXU); *Van Devender 84-243; Wiseman 77-64*.

RHAMNACEAE • BUCKTHORN FAMILY

1. Vines often with tendrils; fruits 3-winged _____**Gouania**

1' Shrubs, without tendrils; fruits not winged.

2. Leaves widest well above middle; petals none; fruits 3–4.5 mm long. _____**Condalia**

2' Leaves widest at or below middle; petals present but often deciduous; fruits 5 mm long or more.

3. Ovary partially inferior; fruits 5–6 mm long, dry and dehiscent, 3-seeded. _____**Colubrina**

3' Ovary superior; fruits 8–10 mm long, fleshy and indehiscent, 1-seeded. _____**Ziziphus**

Colubrina

1. Leaves dull gray-green, conspicuously pubescent. _____**Colubrina californica**

1' Leaves bright green, glabrous or glabrate, or sometimes sparsely pubescent. _____**Colubrina viridis**

Colubrina californica I.M. Johnston

[*C. texensis* (Torrey & A. Gray) A. Gray var. *californica* (I.M. Johnston) L.D. Benson]

California snakewood

Much-branched hardwood shrubs 2–3.5+ m tall. Leaves dull green, pubescent, and drought-deciduous. Flowers small, yellow-green. Small, localized population along

Colubrina californica, Nacapule

Colubrina viridis, San Carlos

Condalia globosa, Nacapule

canyon floor near the entrance. It reaches its southern limit in the Guaymas region; the next nearest record is from central Sonora, near Ures (Turner et al. 1995).

28 Oct 2015, *Carnahan*, photo; *Felger 84-570, 94-850*.

Colubrina viridis (Jones) M.C. Johnston

[*Phyllanthus viridis* M.E. Jones. *Colubrina glabra* S. Watson]

GRANADILLA, GRANADITA, PALO COLORADO, SIDRA

Shrubs with rigid, hardwood trunks and branches. Leaves bright green, glabrous or sparsely puberulent when young, quickly drought-deciduous, and appearing with each rainy period. Flowers small, yellow-green, the floral disk awash in nectar at anthesis; mass flowering with summer-fall rains and at other seasons. Canyon bottom near the entrance, south-facing slopes, and the open desert.

13 Dec 2013, *Carnahan*, photos; *Felger 85-864; Starr 199*.

Condalia globosa I.M. Johnston var. **globosa**

CRUCERILLA; BITTER CONDALIA

Hardwood shrubs with rigid branches and thorn-tipped twigs. Long-shoot leaves petioled and larger; short-shoots very reduced, with crowded (fascicled), sub-sessile and smaller leaves. Flowers small, yellow-green, the disk at anthesis awash with sticky, glistening nectar. Occasional along the canyon bottom and in the nearby desert. Plants of var. *pubescens* I.M. Johnston, distinguished by pubescent leaves, are common in the nearby San Carlos–Guaymas region.

Arroyo Nacapule, *Carnahan 1644* (ARIZ, USON); *Felger 11878*.

Gouania rosei Wiggins

HUIROTE

Large vines overtopping shrubs and trees. Flowers greenish white; at least in summer. Fruits ca. 5 mm wide,

Gouania rosei, Nacapule

Ziziphus obtusifolia, Sánchez-Escalante, La Pintada

triangular with narrow wings; fruits seen in fall and winter. Canyon bottom and north-facing slopes.

11 Nov 2014, *Carnahan*, photos; *Felger 84-93; Phillips 75-156; Starr 218*. Nacapule Spring, *Felger 4081* (ARIZ, CAS, SD).

Ziziphus obtusifolia (Torrey & A. Gray) A. Gray var. **canescens** (A. Gray) M.C. Johnston

[*Z. lycioides* A. Gray var. *canescens* A. Gray. *Condalia lycioides* (A. Gray) Weberbauer var. *canescens* (A. Gray) Trelease. *Condaliopsis lycioides* (A. Gray) Suessenguth var. *canescens* (A. Gray) Suessenguth]

Bachata, *barchata*; GRAYTHORN

Large, sprawling, briar-like shrubs. Nearly leafless during dry seasons, and with sparse foliage in wetter seasons. Flowers inconspicuous, attracting many insects. Fruits ca. 1 cm long, edible but hardly worth the bother.

Fine 77-1.

RUBIACEAE • MADDER FAMILY

Hintonia latiflora, San Carlos

1. Plants unarmed. _____ **Hintonia**

1' Twigs armed with sharp spines. _____ **Randia**

Hintonia latiflora, Nacapule

Hintonia latiflora (de Candolle) Bullock

[*Coutarea latiflora* de Candolle. *C. pterosperma* (S. Watson) Standley. *Portlandia pterosperma* S. Watson]

Copalquín

Slender shrubs or small trees to 4 (6) m tall, the bark corky-ridged. Leaves produced mostly with summer rains and gradually drought-deciduous. Flowers showy, 6–9 cm long, white with green on the tube; summer rainy season. Fruits of woody capsules (1.5) 2–3 cm long with low ribs and wart-like lenticels. Mostly in winter-shaded niches; canyon bottom, and lower north- and east-facing slopes. The bark is much esteemed for its medicinal properties and is often harvested in Sonora.

Carnahan SC 912 (ARIZ, USON); *Felger 84-129, 85-850.*

Randia

1. Nodes with 4 spines; fruits 3 cm in diameter, leathery, not hard-shelled, falling soon after ripening, green or blackish. _____**Randia sonorensis**

Randia sonorensis, Nacapule

1' Nodes with 2 spines; fruits 1.5–2.5 cm in diameter, hard-shelled, often persistent, conspicuously mottled green and white. _____**Randia thurberi**

Randia sonorensis Wiggins

Papache borracho

Shrubs to ca. 4 m tall, the twigs tipped with 4 stout, straight spines; leaves drought-deciduous, appearing after rains. Flowers white, in May; the fruits ripening November and December. Canyon bottom and lower north-facing slopes. The fruits are about twice as large as those of *R. thurberi* and the exocarp soft and leathery.

Carnahan SC 1038; *Felger 84-121, 85-1328; Van Devender 28 Dec 1982.*

Randia thurberi S. Watson

Papache, papache borracho

Shrubs with rigid, woody branches and paired spines; leaves drought-deciduous. Flowers white and fragrant; with summer rains. Fruits 1.5–2.5 cm diameter, globose, hard-shelled, conspicuously mottled green and white, ripening at least in spring; mesocarp (pulp) black, sweet and edible (Felger & Moser 1985). Canyon bottom, south-facing slopes, and the open desert.

Felger 85-871A, 85-876.

Randia thurberi, San Carlos

RUTACEAE • RUE OR CITRUS FAMILY

Zanthoxylum

1. Leaf rachis winged; flowers and fruits on short stalks. _____**Zanthoxylum fagara**

1' Leaf rachis not winged; flowers and fruits on conspicuous stalks. _____**Zanthoxylum mazatlanum**

Zanthoxylum fagara (Linnaeus) Sargent

[*Z. sonorense* Lundell]

Shrubs 2.5–3 m tall, with stiff branches and sharp, rose-like internodal spines; gradually drought deciduous. Leaves odd-pinnate, 3.5–10.5 cm long, the rachis winged; leaflets (3) 5–9; crushed leaves with a lemon-like fragrance. Flowers inconspicuous. Capsules splitting to reveal hard, shiny black seeds; fruits ripening October–December. Scattered along canyon bottom, north-facing slopes, and nearby arroyos.

Búrquez-M. 94-250 (USON); 8 Feb 2017, *Carnahan*, photos; *Felger 84-166, 85-1227* (ARIZ, MEXU).

Zanthoxylum fagara, La Navaja

Zanthoxylum mazatlanum Sandwith

Hardwood shrubs 2–3 m tall, often with a well-developed trunk; stems armed with sharp, rose-like internodal spines to 1 cm long. Nearly evergreen or gradually drought deciduous in pre-summer drought; crushed leaves with a citrus-like fragrance but the odor quickly dissipating. Leaves odd-pinnate, the leaf rachis not winged; long-shoot leaves 7–14.5 cm long, with 5–9 leaflets; short-shoot leaves 3.8–8 cm long, with 3–7 leaflets. Inflorescences few-flowered, shorter than the leaves; flowers inconspicuous. Fruits with 1 or 2 carpels. Capsules splitting to reveal hard, shiny black seeds, often partially covered with a thin, red, aril-like endocarp. Flowering with summer rains, the fruits mostly ripening September and October (November).

Scattered on the steep, lower, mostly north-facing canyon slopes, and along the canyon bottom, especially near the north-facing canyon wall in the area shaded during winter months. There are probably at least several hundred plants in the Nacapule population. These grow in dense riparian scrub, intermixed with *Celtis reticulata, Coccoloba goldmanii, Coursetia glandulosa, Gouania rosei, Passiflora mexicana, Sapindus saponaria, Vallesia laciniata, Verbesina felgeri*, and *Zanthoxylum fagara*.

Zanthoxylum mazatlanum also occurs at other large riparian canyons in the Sierra El Aguaje, and there are widely scattered records in southern Sonora such as near

Zanthoxylum mazatlanum, Nacapule

Álamos. In Sinaloa it is known from the northern part of the state and the type locality near Mazatlán. Specimens from the Mazatlán region differ from the Sonora–northern Sinaloa plants by their much longer and denser ferruginous hairs on young leaves and twigs, many-flowered pistillate inflorescences, and by having only 1-carpelled rather than both 1- and 2-carpelled fruits.

Búrquez-M. 94-252 (USON); fruiting, 27 Oct 2015, *Carnahan*, photos; *Daniel 2004* (ASU); *Felger 84-167, 84-577, 85-829, 85-868* (ASU); *Phillips 75-148*.

SALICACEAE • WILLOW FAMILY

Salix gooddingii C.R. Ball
Sauz; Goodding willow

Tree; leaves short petioled, the blades narrowly lanceolate, green on both surfaces. In 2013, a single young, staminate tree was found in the canyon. In 2015 it was about 8 m tall. The nearest known population is along the Río Yaqui, although it is sometimes planted as a landscape and shade tree in San Carlos.

Boulders at base of cliff near waterfall, tree, 8 m, leaves to 13.5 cm x 11 mm, petioles reddish, 11 Nov 2014, *Carnahan SC 913*; 28 Oct 2015, *Felger 20151028-9* (ARIZ, ASU, USON).

Salix gooddingii, Nacapule

Phoradendron brachystachyum, Bahía San Pedro

SANTALACEAE • SANDALWOOD FAMILY (INCLUDES VISCACEAE)

Phoradendron – *Toji*; mistletoe

1. Stems leafy, the leaves more than 1 cm long._____ _____**Phoradendron brachystachyum**

1' Stems appearing leafless, the leaves scale-like, less than 0.5 cm long. _____**Phoradendron californicum**

Phoradendron brachystachyum (de Candolle) Nuttall

[*P. diguetianum* van Tieghem. *P. globuliferum* Trelease]
Toji

Upright clumps of green, leafy stems. Parasitic on *Bonellia macrocarpa*, *Celtis pallida*, and sometimes on *Phaulothamnus spinescens*. Leaves dimorphic, some branches or plants with relatively narrow, elongated, and thinner leaves, others with broader, shorter, and thicker leaves. These differences seem to be influenced by growth rate, season and flowering time.

Growing on *Phaulothamnus*, *Daniel 2348* (ASU); *Van Devender 84-256*.

Phoradendron californicum Nuttall

Toji; DESERT MISTLETOE

Stems arching to drooping, often festooning desert trees such as ironwood (*Olneya*) and mesquite (*Prosopis*). Stems terete; leaves scale-like, 1–2.5 mm long. Flowers yellow or green, at various seasons but especially mid-winter; male flowers highly fragrant and attracting honeybees and other insects. Berries globose, 4.5–5.5 mm wide, white to pale reddish; eagerly eaten by phainopeplas, the primary agents of dispersal.

Phoradendron californicum, near Loreto, BCS

Daniel 1965 (ASU).

SAPINDACEAE • SOAPBERRY FAMILY

1. Vines or scandent plants; inflorescences with tendrils; flowers bilateral.

2. Fruits globose, inflated, balloon-like capsules. _____**Cardiospermum**

2' Fruits flattened samaras, indehiscent. _____**Serjania**

1' Trees or shrubs; without tendrils; flowers radial.

3. Shrubs; leaves simple. _____**Dodonaea**

3' Trees with a well-formed trunk; leaves pinnate with more than 3 leaflets. _____**Sapindus**

Cardiospermum corindum Linnaeus

Farolitos, tronador, globitos; BALLOON VINE

Perennial vines; drought deciduous. Flowers white; various seasons. Fruits hollow, resembling small paper lanterns. Canyon bottom, slopes, and open desert.

30 Dec 2011, *Carnahan*, photo; *Felger 85-1200; Starr 200*.

Cardiospermum corindum, Nacapule

Dodonaea viscosa, Nacapule

Dodonaea viscosa Jacquin

[*D. angustifolia* Linnaeus f. *D. viscosa* var. *angustifolia* (Linnaeus f.) Bentham]

Tarachiqui; HOP BUSH

Shrubs, the herbage, especially the young shoots, resinous-sticky; evergreen to very tardily drought-deciduous. Flowers inconspicuous, yellow-green; fruits 3-winged, papery. Occasional in the canyon bottom and on rocky slopes.

Felger 11899; *20151028-16* (ARIZ, ASU, USON).

Sapindus saponaria Linnaeus

Amolillo, jaboncillo; SOAPBERRY

Slender, unarmed trees to 8 m with a well-developed trunk; evergreen to ultimately drought-deciduous in extreme drought. Leaves pinnate, the rachis conspicuously winged. Flowers small, cream-white, at various seasons

Sapindus saponaria, San Carlos

including November and December. Fruit a firm, globose, 1-seeded berry, 1–1.5 cm diameter. Canyon bottom.

13 Dec 2013, *Carnahan*, photos; *Felger 85-1504*; *Starr 200.*

Serjania palmeri S. Watson

Robust, sprawling perennial vines, woody toward the base with leafy stems to 5 m long. Leaves divided into many small segments; tardily drought-deciduous. Flowers white. Localized and scattered, near the streambed and lower slopes; also on rocky slopes of Arroyo Nacapule.

28 Oct 2015, *Carnahan*, photos; *Felger 85-1218, 94-875*.

Serjania palmeri, Nacapule

SAPOTACEAE • SAPODILLA FAMILY

Sideroxylon occidentale (Hemsley) T.D. Pennington

[*Bumelia occidentalis* Hemsley]

Bebelama

Large shrubs or trees to 6+ m, with very hard wood and checkered bark. Branches rigid, the twigs often thorn-tipped. Flowers white; probably at various seasons including July. Scattered along the canyon floor and on north-facing slopes.

11 Jan 2016, *Carnahan*, photos; *Felger 85-257; Phillips 75-140*.

Sideroxylon occidentale, San Carlos

SCROPHULARIACEAE, in part, see PHRYMACEAE and PLANTAGINACEAE

SIMMONDSIACEAE • JOJOBA FAMILY

Simmondsia chinensis (Link) C.K. Schneider
Jojoba

Shrubs; evergreen to very tardily drought-deciduous during prolonged drought. Dioecious, the male flowers yellow-green, visited by honeybees; flowering in mid-winter. South-facing slopes, canyon bottom and arroyo near canyon entrance, and open desert.

11 Jan 2016, *Carnahan*, observation; *Felger 85-549A, 85-549B.*

Simmondsia chinensis, Arroyo La Pirinola

SOLANACEAE • POTATO FAMILY

1. Shrubs with stellate hairs. _____**Solanum**

1' Herbaceous plants or shrubs, glabrous or pubescent with simple hairs.

2. Hardwood shrubs. _____**Lycium**

2' Herbaceous plants.

3. Corollas 12–16 cm long; fruits prickly spinescent. _____**Datura**

3' Corollas less than 4 cm long; fruits not spiny.

4. Corollas tubular; fruit a capsule (dry). _____**Nicotiana**

4' Corollas as broad as or broader than long or deep (not tubular); fruit a berry (fleshy).

5. Fruiting calyx not inflated; corollas ca. 0.5 (1) cm wide; fruits bright red when ripe. ____**Capsicum**

5' Fruiting calyx inflated like a paper lantern; corollas 1–2+ cm wide; fruits green. _____**Physalis**

Capsicum annuum, Nacapule

Capsicum annuum Linnaeus var. **glabriusculum** (Dunal) Heiser & Pickersgill

[*C. annuum* var. *aviculare* (Dierbach) D'Arcy & Eschbaugh, nom. illegit.]

Chiltepín

Subshrubs 1–1.3 m tall with slender, brittle stems. Flowers white, with warmer weather. Fruits red when fully ripe and very hot to the taste. Below east- and north-facing cliffs and slopes and occasional in canyon bottom near the *Washingtonia* palms.

28 Oct 2015, *Carnahan*, photos; *Felger 84-581, 85-251.*

Datura discolor Bernhardi

Toloache; desert datura

Non-seasonal ephemerals but responding poorly to cooler weather. Flowers large, white, nocturnal. Infrequent along the canyon bottom, generally in disturbed areas and nearby open desert.

11 Jan 2016, *Carnahan*, photos; *Felger 85-577*.

Datura discolor, La Navaja

Lycium

1. Flowers slender, longer than wide, the corolla tube narrowly cylindrical, the lobes lavender. _____ _____**Lycium andersonii**

1' Flowers as wide as or wider than long, the corolla tube conspicuously expanded (widened) above, the corollas (including lobes) white. _____**Lycium berlandieri**

Lycium andersonii A. Gray var. **andersonii**

[*L. andersonii* var. *deserticola* (C.L. Hitchcock) Jepson. *L. andersonii* var. *pubescens* S. Watson. *L. andersonii* var. *wrightii* A. Gray]

Salicieso; desert wolfberry

Thorny shrubs; drought-deciduous, the leaves narrow. Flowers tubular, the corollas lavender; December–January and at other seasons. Fruits bright orange. Canyon bottom, slopes, and the open desert.

Felger 84-169.

Lycium andersonii, Caborca

Lycium berlandieri, Las Barajitas

Lycium berlandieri Dunal var. **longistylum** C.L. Hitchcock

SALICIESO

Thorny shrubs; drought-deciduous, the leaves often larger and broader than those of *L. andersonii*. Flowers campanulate, white, in December and January. Canyon bottom at entrance.

Felger 94-882; *Wilder 10-476* (ARIZ, MO, UCR, USON).

Nicotiana obtusifolia Martens & Galeotti

[*N. palmeri* A. Gray. *N. trigonophylla* Dunal. *N. trigonophylla* var. *palmeri* (A. Gray) M. E. Jones]

TABAQUILLO DE COYOTE, *TABACO DE COYOTE*; DESERT TOBACCO

Herbaceous perennials with sticky, glandular-pubescent herbage and calyces. Flowers cream white, remaining open during the day; flowering response non-seasonal. Germinating during the winter-spring season.

Nicotiana obtusifolia, San Carlos

13 Dec 2013, *Carnahan*, photos; *Felger 85-574; Phillips 75-83*.

Physalis – *Tomatillo*

1. Herbage clammy (slimy) with glandular hairs; corollas pale yellow with maroon spots in the center; anthers purplish. _____**Physalis pubescens**

Physalis crassifolia, Pinacates

Physalis pubescens, La Navaja

1' Herbage dry, not slimy, glabrate or with non-glandular hairs; corollas of a single color, purple or yellow; anthers yellow.

2. Corollas yellow. _____**Physalis crassifolia**

2' Corollas purple. _____**Physalis purpurea**

Physalis crassifolia Bentham

[*P. versicolor* Rydberg. *P. crassifolia* Bentham var. *versicolor* (Rydberg) Waterfall. *P. versicolor* var. *microphylla* Rydberg]
Tomatillo del desierto; DESERT GROUND CHERRY

Bushy, herbaceous perennials and also flowering in the first season. Corollas and anthers pale yellow; warmer months. Uncommon and scattered in gravelly soil along the canyon bottom and near the canyon entrance.

Arroyo bottom near canyon entrance, 13 Dec 1992, *Felger 92-1018*.

*Physalis pubescens** Linnaeus

[*P. pubescens* var. *integrifolia* (Dunal) Waterfall]
Tomatillo

Annuals; densely glandular-pubescent and slimy to the touch. Stems semi-succulent with swollen nodes; herbage pale green, the leaf blades thin and quickly wilting. Corollas pale yellow with 5 dark-maroon spots in the center, the anthers dark colored. Canyon bottom in wet soil, abundant beneath the *Washingtonia* palms, and at Nacapule Spring.

Felger 84-580, 85-240; *Keil 16581* (UCR).

Physalis purpurea Wiggins

Tomatillo

Annuals to herbaceous perennials. Corollas purple, the anthers yellow and scarcely changing color in drying. Mostly along the canyon bottom, sometimes on lower north-facing slopes, and at Nacapule Spring. Endemic to

Physalis purpurea, San Carlos

the Guaymas region; usually in less xeric habitats than *P. crassifolia*.

Other than the distinctive flower color, we find it difficult to distinguish *P. purpurea* from *P. crassifolia*.

Carnahan 1594 (ARIZ, USON); *Felger 85-245; Starr 717; Van Devender 28 Dec 1982*.

Solanum hindsianum Bentham

MARIOLA, MALA MUJER

Spiny shrubs to 2 m tall. Flowers showy with lavender corollas and large yellow anthers; non-seasonal. Common at canyon entrance and open desert, occasional on slopes, and along the canyon bottom.

13 Dec 2013, *Carnahan*, photos; *Felger 92-1031*.

STEGNOSPERMATACEAE

Stegnosperma halimifolium Bentham

[*S. watsonii* D.J. Rogers]

CHAPACOLOR

Large shrubs; nearly evergreen. Flowers white, fragrant, in terminal or axillary racemes; non-seasonal. Fruits red

Solanum hindsianum, Nacapule

Stegnosperma halimifolium, San Carlos

and semi-fleshy, drying as capsules. Mostly in the canyon bottom near the entrance, and at the spring.

30 Dec 2011, *Carnahan*, photos; *Felger 92-1057*; *Keil 16593* (UCR); *Starr 203*.

STERCULIACEAE, see MALVACEAE

TALINACEAE

Talinum paniculatum (Jacquin) Gaertner

[*T. chrysanthum* Rose & Standley]

Perennial from thick, fleshy, tuberous roots, and also flowering in the first season; appearing only during the summer rainy season. Stems and leaves succulent, the leaves quickly drought-deciduous; by late September only the dry skeletons of the inflorescences remain. Flowers in loose, open panicles 30–100 cm long, small, pink to dark red-purple, open about three hours in the late afternoon. Canyon slopes and along the canyon bottom.

Felger 85-841.

Talinum paniculatum, San Carlos

LEFT: *Talinum paniculatum*, Santa Cruz County, Arizona

TROPAEOLACEAE • NASTURTIUM FAMILY

****Tropaeolum majus** Linnaeus

Nasturtium

Annuals with orange flowers. A small colony was found in the canyon bottom along the former road, but it has not established. Cultivated in the Guaymas–San Carlos region.

Felger 95-121.

Tropaeolum majus, San Carlos

URTICACEAE • NETTLE FAMILY

Parietaria hespera Hinton var. **californica** Hinton

DESERT PELLITORY

Winter-spring ephemerals with delicate semi-succulent stems and quickly-wilting leaves. Mostly in shaded habitats including the canyon floor, north-facing slopes, and open desert.

Felger 92-1033; *Reina-G. 95-148* (USON).

Parietaria hespera, Nacapule

VERBENACEAE • VERVAIN FAMILY

1. Stems including twigs rigid and not brittle, the twigs thorn tipped; inflorescences racemose, the flowers pedicellate, the corollas more than 1 cm wide, lavender; fruits fleshy. _____**Citharexylum**

1' Stems including twigs slender and brittle, not rigid and not spinescent; inflorescences spicate or capitate; corollas less than 1 cm wide, whitish, yellow, orange, or pale lavender; fruits dry or fleshy.

2. Flowers in head-like globose clusters, the corollas yellow, turning orange; fruits fleshy. _____**Lantana**

2' Flowers in elongated cone-like structures, the corollas cream-white to pale lavender with a yellow center; fruits dry. _____**Lippia**

Citharexylum flabellifolium S. Watson

Shrubs with rigid, thorn-tipped twigs; short-shoot leaves produced after rains, and soon drought deciduous. Flowers lavender and showy; non-seasonal. Canyon entrance and adjacent open desert.

27 Oct 2015, *Carnahan*, photo; *Felger 93-4*; *Starr 221*; *Warren 18 Aug 1975.*

Lantana camara Linnaeus

[*L. horrida* Kunth]

CONFITURILLA, CONFITURÍA

Spindly shrubs often growing through other shrubs; stems slender and brittle with small prickles. Corollas at first bright yellow, becoming orange with age. Fruits small, round, fleshy drupes turning black or dark bluish

Citharexylum flabellifolium, San Carlos

Lantana camara, San Carlos

when ripe. Flowering during hot weather, especially following summer-fall rains.

Felger 96-75 (ARIZ, BRIT, TEX, USON).

Lippia palmeri S. Watson

[*L. palmeri* var. *spicata* Rose]

Orégano

Shrubs with aromatic herbage; leaves appearing after rains, gradually drought deciduous. Flowers in small, cone-like inflorescences, the corollas cream-white to pale lavender with a yellow center, the sepals and bracts pale to darker purple; non-seasonal. Canyon entrance and adjacent open desert. The leaves are widely used in Sonora as oregano (see Felger & Moser 1985).

Felger 85-260; Starr 21.

Lippia palmeri, near Nacapule

VIOLACEAE • VIOLET FAMILY

Hybanthus fruticulosus (Bentham) I.M. Johnston

[*H. fruticulosus* var. *flavescens* (Dowell) I.M. Johnston]

Herbaceous perennials to ca. 50 cm tall; drought deciduous. Flowers white with a pale yellowish throat, following rains at various seasons. Canyon floor, north-facing slopes, and less common on south-facing slopes and arroyos in the adjacent open desert. Variegated fritillary (*Euptoieta claudia*) caterpillars were seen feeding on this plant in Oct 2015.

Daniel 2333 (ASU); *Felger 85-871*; *Wilder 10-488* (ARIZ, ASU).

Hybanthus fruticulosus, San Carlos

Cissus verticillata, San Carlos

VITACEAE • GRAPE FAMILY

Cissus verticillata (Linnaeus) Nicolson & C.E. Jarvis

[*Viscum verticillatum* Linnaeus. *Cissus sicyoides* Linnaeus]

Rank-growing perennial vines from tuberous roots. Juvenile growth colorful and very different from adult growth. Stems semi-succulent with swollen nodes. Leaves simple, ovate, succulent, glabrous or pubescent, with finely bristle-toothed margins. Inflorescences of cymes. Berries 1-seeded. Scattered on rocky slopes.

South-facing rocky slope, near canyon entrance, *Felger 85-556*.

ZYGOPHYLLACEAE • CALTROP FAMILY

1. Woody shrubs or small trees. _____**Guaiacum**

1' Summer annuals. _____**Kallstroemia**

Guaiacum coulteri A. Gray

[*G. palmeri* Vail. *G. coulteri* var. *palmeri* (Vail) I.M. Johnston]

Guayacán

Shrubs to small trees with extremely hard wood; nearly evergreen. Flowers indigo blue; spectacular, mass flowering in dry season of early summer. Seeds large, enclosed in a thin, bright red aril. Canyon bottom, slopes, and nearby open desert.

11 Jan 2016, *Carnahan*, observation; *Felger 85-867; Ibarra-Manríquez 5412* (ASU, MEXU); *Starr 489*.

Guaiacum coulteri, Bahía San Pedro

Kallstroemia

1. Petals yellow, 4–6 mm long; sepals usually deciduous; beak of fruit less than 5 mm long; fruiting pedicels 1–2.5 cm long. _____**Kallstroemia californica**

1' Petals bright orange with a darker base, (15) 20–35 mm long; sepals persistent; beak of fruit (5) 8–12 mm long; fruiting pedicels (2) 3–7 cm long. _____ _____**Kallstroemia grandiflora**

Kallstroemia californica (S. Watson) Vail

[*K. californica* var. *brachystylis* (Vail) Kearney & Peebles]

California caltrop

Summer ephemerals. Flowers small and yellow. Gravelly soils at canyon entrance and open desert.

Carnahan 1553 (ARIZ, ASU, USON).

Kallstroemia californica, Nacapule

Kallstroemia grandiflora Torrey

Baiburín, baiburina; ORANGE CALTROP

Summer ephemerals. Flowers showy, orange. Gravelly soils at canyon entrance and open desert.

Felger 84-597 (ARIZ, MEXU).

Kallstroemia grandiflora, Las Barajitas

MONOCOTS

ALISMATACEAE • WATER PLANTAIN FAMILY

Echinodorus berteroi (Sprengel) Fassett

[*Alisma berteroi* Sprengel. *Echinodorus rostratus* (Nuttall) Engelmann]

Annuals or perhaps sometimes perennials. Young plants fully submerged, later leaves floating, and usually finally emergent aquatics or on damp soil. Leaves of juvenile, submerged plant (*Carnahan 1577*) 7.2–20.5 x 1.4–5 cm. Flowers white. It was first found in the canyon in 1994, and possibly grew from a bird-transported seed. Common in standing water in roadside ditches and other swampy habitats in the region, especially south of Guaymas.

Perched pool in the upper, west part of the canyon, 29 Oct 2015, *Carnahan 1577* (ARIZ, ASU, USON); *Felger 94-865*.

Echinodorus berteroi, Nacapule

ARACEAE (INCLUDES LEMNACEAE)

Lemna aequinoctialis Welwitsch
DUCKWEED

Minute floating annuals in small, temporary or permanent pools. Leaves (fronds) uniformly green, flat, 1–6 mm long, 1–few in groups.

16 Dec 2012, *Carnahan*, photo; 29 Oct 2015, *Carnahan 1578*.

Lemna aequinoctialis with frog tadpole, Nacapule

ARECACEAE (PALMAE) • PALM FAMILY

For additional information including descriptions, nomenclature, and distributions of the palms in Sonora, see Felger & Joyal (1999) and Felger et al. (2001).

1. Petioles unarmed; leaves strongly costapalmate (petiole appears to extend into the blade), the blades not flat; fruits depressed globose, wider than long. _____**Sabal**

1' Petioles armed with stout spines, at least on young to half-grown plants; leaf blades flat or moderately costapalmate; fruits globose to longer than wide.

2. Leaves dull gray-green to silvery lepidote; sepals entire; fruits more than 1.5 cm in diameter. _____**Brahea**

2' Leaf blades shiny green on both sides; sepal margins ragged; fruits less than 1 cm long. _____**Washingtonia**

Brahea brandegeei, San Carlos

Sabal uresana, San Carlos

Brahea brandegeei (Purpus) H.E. Moore

[*Erythea brandegeei* Purpus. *E. clara* L.H. Bailey. *E. elegans* Franceschi ex Beccari. *Brahea clara* (L.H. Bailey) Espejo & López-Ferrari. *B. elegans* (Franceschi ex Beccari) H.E. Moore. *B. roezlii* sensu Wiggins 1964, not *B. roezlii* Linden]

Palmilla; Western hesper palm

Palma taco

Trunks to 10 (15+) m tall; petioles with stout spines, the blades moderately costapalmate, relatively flat, tough, dull green to gray or bluish (glaucous), and densely to moderately silvery-lepidote. Inflorescences longer than the leaves. Flowers white; early summer prior to the rains. Fruits rounded, 2 cm diameter, ripe in April.

Canyon bottom, intermixed with the other two palms, and common on rock slopes including cliffs to peak elevations in the surrounding mountains.

Brahea brandegeei also occurs in Baja California Sur; the relationship with the Sonoran populations remains an intriguing question. Klimova et al. (2017) indicate the Sonoran populations may not be conspecific with *B. brandegeei* of the Baja California peninsula, and might better be placed with the enigmatic *B. elegans*. Four species of *Brahea* occur in Sonora (Felger & Joyal 1999).

Nacapule Canyon, 30 Mar 1934, *Bailey 4* (BH); 14 Apr 1936, *Bailey 263* (BH); *Felger 3382, 11985*; *Parfitt 3027*, *3030* (ASU); *Starr 490*; *Yatskievych 82-48*.

Sabal uresana Trelease

Palma del taco, *palma blanca*; Sonoran palmetto

Trunks to 10+ m tall; leaves reaching 3 m long, the petioles entire, the blades conspicuously costapalmate, decurved (not flat), relatively tough, and glaucous. Inflorescences shorter than the leaves. Flowers white; April to June, mostly in May. Fruits depressed-globose, 18–20 mm wide, ripening in August.

Canyon bottom along permanent water and extending into areas of temporary water. The fruit, called *taco*, is eaten in Sonora.

11 Apr 1934, *Bailey 26* (BH); 29 Oct 2015, *Carnahan & Felger*, observation.

Washingtonia robusta H.A. Wendland

[*W. sonorae* S. Watson]

Palma de abanico; Mexican fan palm

This is the tallest palm native to Sonora, and the tallest tree in the canyon where it reaches ca. 20 m. Petioles of younger trees with stout spines, those of the taller trees essentially entire, the blades flat and shiny green. Inflorescences longer than the leaves. Flowers white; May and June. Fruits ellipsoid, 7.5–9 mm long, blackish, often ripening in fall, the pericarp sweet like a date.

Streambed in the upper canyon where it locally outnumbers the other palms. Also at several other oases in the Sierra El Aguaje and otherwise native only to Baja California Sur.

Washingtonia robusta, Nacapule

This is one of the most widely cultivated palms in the world, especially in Mediterranean and subtropical regions. It is planted extensively at San Carlos and Guaymas.

Mar 1934, *Bailey 3* (BH), *262* (BH); 11 Nov 2014, *Carnahan*, photos; 29 Oct 2015, *Carnahan & Felger*, observation; *Felger 3118, 92-1027*.

ASPARAGACEAE (INCLUDES AGAVACEAE)

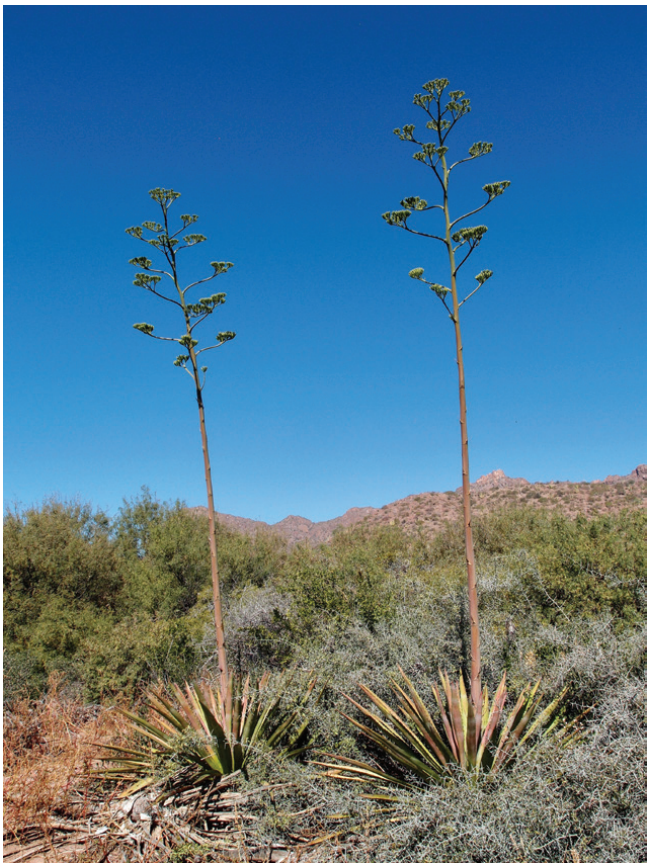
1. Leaves thick and succulent with a stout terminal spine, the leaf margins entire or with small to large prickles, these usually not curved. _____**Agave**

1' Leaves relatively flat, not succulent, the leaf tip not spinescent, often frayed and fibrous, the leaf margins with a row of curved spines. _____**Dasylirion**

Agave – *Maguey*; century plant

1. Leaf margins entire with a terminal spine only, inflorescences spicate (without branches or the branches small and inconspicuous). _____**Agave chrysoglossa**

1' Leaf margins spiny; inflorescences paniculate (branched).



Agave angustifolia, Bahía San Pedro

2. Leaves linear, usually less than 10 cm wide, uniformly blue-green. _____**Agave angustifolia**

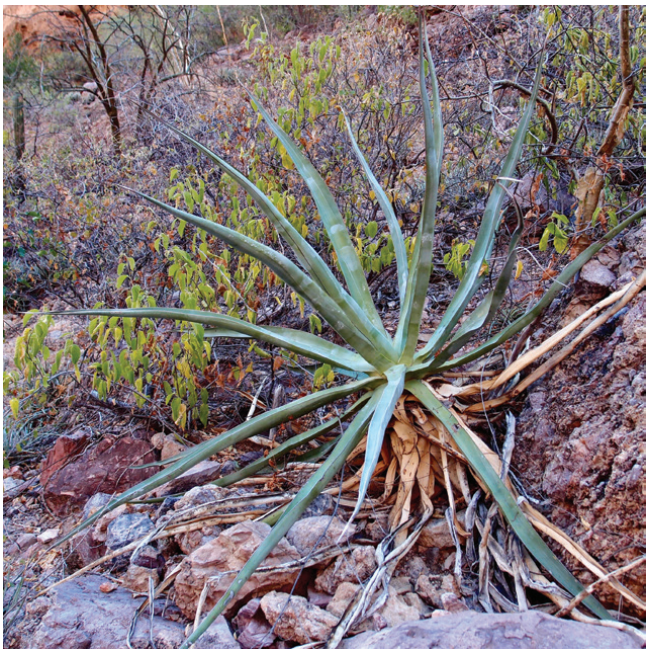
2' Leaves oblanceolate to obovate or ovate, usually 12–20 cm wide, with ashy-colored cross-bands. _____**Agave colorata**

Agave angustifolia Haworth var. **angustifolia**

[*A. owenii* I.M. Johnston. *A. pacifica* Trelease. *A. vivipara* Linnaeus var. *vivipara* (see Forster 1992). *A. yaquiana* Trelease]

Bacanora, maguey; NARROW-LEAF CENTURY PLANT

Usually suckering to form small colonies. Leaves sword-like, glaucous, with marginal spines. Inflorescences



Agave chrysoglossa, Nacapule

paniculate. Flowers yellow-green, at dusk producing a strong odor like overripe apricots; February. Scattered in the open desert adjacent to the canyon.

About 0.5 km SE of canyon entrance, 29 Oct 2015, *Carnahan & Felger*, observation.

Agave chrysoglossa I.M. Johnston

Amole

Solitary or occasionally offsetting (suckering) in the canyon (commonly forming offsets in cultivation). Leaves slender, thick, green to moderately glaucous, and with entire margins. Inflorescences large and spicate. Flowers yellow; late March to May. Mostly on shaded rock slopes and cliffs.

15 Jan 1970, *Boutin & Brandt 2822* (HNT); 13 Dec 2013, *Carnahan*, photos; 28 Oct 2015, *Carnahan & Felger*, observation.

Agave colorata, Nacapule

Dasylirion gentryi, Devlin Houser, Nacapule

Agave colorata Gentry

Maguey; BANDED CENTURY PLANT

Solitary or sometimes producing a few offsets. Leaves to 60 cm long, 12–20 cm wide, thick, oblanceolate to obovate or ovate, glaucous gray and often with ashy or pinkish-brown to reddish bands (cross-zoned), the margins spiny. Inflorescences paniculate. Flowers yellow; late spring to June. Scattered on north-facing slopes and infrequent on other slopes, and at higher elevations.

Boutin & Kimnach 3273 (HNT); SW-facing rocky ridge along N fork of canyon, 28 Nov 2015, *Carnahan*, photos; *Gentry 19881, 23560*; *Phillips 75-161*.

Dasylirion gentryi Bogler

Sotol

Large rosette-forming plant. Leaves about 1 m long, green, relatively thin, firm but flexible. Leaf margins with many sharp, slender, and recurved spines. Male and female flowers presumably on different plants.

A single plant, with a trunk about half a meter tall, was found in the canyon. *Sotol* is probably more common at higher elevations. Also known from the north end of the Sierra El Aguaje, higher elevations on Isla Tiburón, and Sierra del Viejo south of Caborca (Felger & Wilder 2012). Flowers and fruits from these populations are unknown. *D. gentryi* resembles *D. wheeleri* S. Watson ex Rothrock but differs in part by having greener and narrower leaves that are not waxy. *D. gentryi* is otherwise known from mountains in southwestern Chihuahua and southeastern Sonora.

Carnahan 1648 (ARIZ, ASU, USON); North fork of canyon, 28.021593°N, 111.054756°W, 28 Dec 2015, *Devlin David Houser*, photos.

BROMELIACEAE • PINEAPPLE FAMILY

Hechtia montana Brandegee

Amole

Rosette-forming perennials, usually suckering profusely. Leaves silvery-green, sometimes reddish, semi-succulent, the margins with sharp, recurved spines. Male and female flowers on separate plants, the staminate and pistillate inflorescences distinctive, to 1 m tall. Flowers inconspicuous; August. Rock slopes and cliffs, often with *Euphorbia ceroderma*.

16 Dec 2012, *Carnahan*, photos; 28 Oct 2015, *Carnahan & Felger*, observation; *Turner 79-307*; *Yatskievych 82-152*.

Hechtia montana, Nacapule

Commelina erecta, Nacapule

COMMELINACEAE • SPIDERWORT FAMILY

Commelina erecta Linnaeus

Hierba del pollo; DAY FLOWER

Common summer-growing herbaceous perennials, and sometimes growing with winter-spring rains. Flowers blue, deliquescing with daytime heat. Canyon bottom and north-facing slopes.

Carnahan 1546 (ARIZ, USON); *Felger 84-98*.

CYPERACEAE • SEDGE FAMILY

1. Small delicate plants; leaves or flowering stalks filiform (thread-like); flowering stems with 1 (2) spikelet(s).

   2. Spikelets terminal, 1–8 mm long; achenes 0.5–7 mm long, with a prominent whitish terminal tubercle. _**Eleocharis**

   2' Spikelets appearing lateral (the larger bract looks like a continuation of the stem), less than 5 mm long; achenes ca. 0.5 mm long, without a terminal tubercle. _____**Cyperus subsquarrosus**

1' Plants small and delicate to robust; leaves filiform or not; inflorescences with 2 or more spikelets.

   3. Spikelets somewhat rounded to flattened, the spikelet scales 2-ranked (distichous), not spiraled. _____**Cyperus**

   3' Spikelets not flattened, the spikelet scales spiraled.

      4. Annuals; perianth bristles none. _____**Fimbristylis**

      4' Perennials; perianth of 3 broad, paddle-shaped scales and 3 bristles. _____**Fuirena**

Cyperus – *Coquillos*; sedge, flat sedge

1. Delicate annuals; spikelets not flattened, the spikelet scales spiraled._____**Cyperus subsquarrosus**

1' Annuals or perennials; spikelets somewhat rounded to mostly moderately to strongly flattened, the spikelet scales 2-ranked (distichous), not spiraled.

   2. Robust plants mostly (15) 30+ cm tall; scales straight, the tips awnless and not recurved. _____**Cyperus odoratus**

   2' Small, delicate plants mostly 3–10 cm tall; flowers subtended by scales with recurved awn tips._____ _____**Cyperus squarrosus**

Cyperus odoratus Linnaeus

[*C. ferax* Richard. *C. speciosus* Vahl. *Mariscus ferax* (Richard) C.B. Clarke. *Torulinium odoratum* (Linnaeus) S.S. Hooper]

Fragrant sedge

Cyperus odoratus, Nacapule

Herbaceous perennials or facultative annuals, with triangular stems. Spikes slender and not flattened, the styles 3-branched. Flowering at various seasons. Locally common in water pools of upper canyon beneath *Washingtonia* palms.

Carnahan 1609 (ARIZ, ASC); *Felger 84-246; Phillips 75-163; Van Devender 28 Dec 1982*; Ca. 1 m tall, *Wilder 10-481* (ARIZ, UCR).

Cyperus squarrosus, San Carlos

Cyperus subsquarrosus, Nacapule

Cyperus squarrosus Linnaeus

[*C. aristatus* Rottbøll. *Mariscus squarrosus* (Linnaeus) C.B. Clarke]

Dwarf sedge

Diminutive ephemerals. Felger (1999: 39) reported, "Wet soil at edge of pools in the upper canyon. I noted it during spring 1984 but have not seen it in the canyon since then." There are no other records of it in the canyon. It is common in seasonally wet soils in nearby localities.

Cyperus subsquarrosus (Muhlenberg) Bauters

[*Lipocarpha micrantha* (Vahl) G.C. Tucker]

Small-flower halfchaff sedge

Dwarf, hot-weather annuals. Stems very slender, the longest bract beneath the inflorescence resembles an extension of the stem, the inflorescence thus appears lateral. Inflorescences of 1 spikelet (potentially 2 or 3 spikelets in this species), less than 5 mm long. Achenes ca. 0.5 mm long, obovate, rounded in cross-section (not ridged or flattened), without a terminal tubercle. A wetland plant, found at a seep running down a rock slope in the west fork of the canyon.

29 Oct 2015, *Carnahan 1579* (ARIZ, ASC, USON).

Eleocharis geniculata (Linnaeus) Roemer & Schultes

[*E. capitata* R. Brown. *E. caribaea* (Rottbøll) Blake]

Tulillo; spikerush

Small annuals. Achenes black, with a white, terminal tubercle. Edges of pools beneath *Washingtonia* palms, seeps in the upper canyon, and at Nacapule Spring.

Carnahan 1545 (ARIZ, USON); *Felger 3384, 84-125*; *Wilder 10-483* (ARIZ, UCR). Nacapule Spring, *Carnahan 1601* (ARIZ, ASC, USON).

Eleocharis geniculata, Bahía San Pedro

Fuirena simplex, Nacapule

Fimbristylis dichotoma (Linnaeus) Vahl

[*F. annua* (Allioni) Roemer & Schultes. *F. laxa* Vahl]

Warm-weather ephemerals. Achenes ca. 1 mm long, lens-shaped, white with an iridescent sheen like ancient glass. Emergent from pools along the stream beneath *Ficus insipida* and *Washingtonia*. Locally common in October 1984, but not documented in the canyon since then.

Felger 84-155.

Fuirena simplex Vahl

Umbrella-grass

Herbaceous perennials; grass-like stems rounded in cross-section. Achenes ca. 1 mm long, 3-angled. Emergent from pools beneath *Washingtonia* palms; locally common.

Daniel 1976 (ASU); *Felger 3385, 84-615*; *Quinn 6*; *Wilder 10-486*.

POACEAE (**GRAMINEAE**) • GRASS FAMILY

1. Plants bamboo-like, more than 1 m tall.

2. Plants to about 1.8 m tall; larger leaf blades 5–10 cm long; panicles generally shorter than the leaves. __**Lasiacis**

2' Plants usually more than 2 m tall; larger leaf blades more than 15 cm long; panicles usually longer than the leaves. _____**Phragmites**

1' Plants not bamboo-like, not more than 1 m tall.

3. Perennials with conspicuous stolons.

4. Panicles racemose; spikelets in clusters of 3, each with 2 or 3 florets. _____**Bouteloua diversispicula**

4' Panicles of digitately arranged slender spikes; spikelets with 1 floret. _____**Cynodon**

3' Annuals or perennials, without conspicuous stolons.

5. Spikelets subtended by bristles or enclosed in bristly or spiny burs.

6. Spikelets in sharp-spined burs, or in fascicles with many bristles, the bur or fascicle falling as a unit.__**Cenchrus**

6' Spikelets not enclosed in burs or fascicles; with a single bristle below each spikelet; the spikelets breaking off above the bristles. _____**Setaria**

5' Spikelets not subtended by bristles and not enclosed in bristly or spiny burs.

7. At least some spikelets with awns.

8. Coarse, tufted perennials with awns 4.5–7 cm long. _____**Heteropogon**

8' Annuals and perennials, the awns not more than 2 cm long.

9. Spikelets or florets with 3 terminal awns (drought-stressed *Aristida adscensionis* rarely with 1 reduced awn).

10. Spikelets clearly 1-flowered, the awns 12–20 mm long. _____**Aristida**

10' Spikelets 2- to several-flowered, the upper florets reduced and with awns not more than 8 mm long._ _____**Bouteloua**

9' Spikelets with 1–several awns, not 3-awned as above.

11. Spikelets with a single awn 11–14 mm long. _____**Aristida ternipes**

11' Awns less than 8 mm long.

12. Panicles racemosely branched. _____**Bouteloua**

12' Panicles digitately branched. _____**Dactyloctenium**

7' Spikelets not awned.

13. Annuals; spikelets with long, silky, white or pink hairs. _____**Melinis**

13' Annuals or perennials; spikelets glabrous or not bearing long silky hairs.

14. Spikelets with (1) 2 or more distinct, bisexual florets (spikelets not panicoid).

15. Spikelets 2.2–3.4 mm long, with (1) 2 or 3 florets, glumes equal or subequal, often as long as or longer than the florets. _____**Dinebra**

15' Spikelets 3–10+ mm long, usually with 6–20+ florets, glumes unequal, shorter than the florets. _____**Eragrostis**

14' Spikelets appearing 1-flowered (the spikelets panicoid, with one bisexual floret and one sterile floret represented by a prominent, sterile lemma).

16. Panicles digitately branched. _____**Digitaria**

16' Panicles racemosely branched.

17. Plants variously hairy but panicle branches, branchlets, and spikelets glabrous; spikelets 2.7–3.1 mm long; prominent veins of spikelets longitudinal only. _____**Panicum**

17' Plants hairy, including panicle branches, branchlets and spikelets; spikelet 3.3–3.7 mm long; prominent veins of spikelets longitudinal and transverse on upper part of spikelet, forming a net-like pattern._____**Urochloa**

Aristida

Annuals and perennials; growing and flowering non-seasonally depending on soil moisture.

1. Annuals; panicles with short, ascending branches; spikelets 3-awned (sometimes reduced in drought); awns flattened (use magnification). _**Aristida adscensionis**

1' Perennials; panicles usually with well-developed, spreading branches; spikelets 1- or 3-awned; awns terete.

2. Spikelets 3-awned; awn column well developed, distinct from body of lemma, relatively long and twisted at maturity; anthers 0.8–1 mm long. _____**Aristida divaricata**

2' Spikelets 1-awned, the awn column short and not differentiated from body of lemma, usually not twisted; anthers 1.2–2.4 mm long. _____**Aristida ternipes** var. **ternipes**

Aristida adscensionis, Bahía San Pedro

Aristida adscensionis Linnaeus

[*A. bromoides* Kunth]

Zacate tres barbas, zacate de semilla; six-weeks three-awn

Non-seasonal ephemerals. Spikelets with 3 flattened awns. Widespread, mostly in open, xeric habitats; canyon bottom, slopes, and open desert.

Felger 92-1045; *Van Devender 28 Dec 1982.*

Aristida divaricata Humboldt & Bonpland ex Willdenow

Tres aristas barbado, tres aristas abierto; poverty three-awn, poverty grass

Aristida divaricata, El Baviso

Aristida ternipes var. *ternipes*, Santa Cruz County, Arizona

Tufted perennials and also flowering in first season; often 0.5–1 m tall, with mostly open and divaricately branched panicles. Spikelets 3-awned. Mostly among rocks in the canyon including slopes; not on the open desert.

N fork of canyon, S-facing rock slope, 29 Nov 2015, *Carnahan 1591* (ARIZ, USON).

Aristida ternipes Cavanilles var. **ternipes**

[*A. scabra* (Kunth) Kunth]

Zacate araña; SPIDER-GRASS

Tufted perennials and also flowering in the first season; often to 1 m tall, open and divaricately branched panicles. Spikelets 1-awned (the 2 lateral awns not developing or very short). Abundant and widespread but mostly absent from more densely vegetated habitats; canyon bottom, slopes, and open desert.

Felger 84-103, *85-551* (ASU); *Reina-G. 95-102*; *Van Devender 28 Dec 1982*.

Bouteloua – Grama grass

1. Perennials with conspicuous and usually arching stolons. _____**Bouteloua diversispicula**

1' Annuals or perennials, without conspicuous stolons.

2. Annuals or perennials; panicle branches (spicate branches) readily deciduous and not conspicuously pectinate.

3. Annuals mostly with weakly developed roots; spicate branches very slender, especially at base, dart-shaped, few-flowered, the lower florets appressed. _____**Bouteloua aristidoides**

3' Perennials with well-developed wiry roots; spicate branches not dart-shaped. ___**Bouteloua repens**

2' Annuals; spicate branches persistent and conspicuously pectinate (comb-shaped).

4. Plants not papillose-hispid. _**Bouteloua barbata**

Bouteloua aristidoides, Santa Cruz County, Arizona

Bouteloua barbata var. *barbata*, San Carlos

4' Plants, especially the outer glumes, papillose-hispid. _____**Bouteloua parryi**

Bouteloua aristidoides (Kunth) Grisebach

[*Dinebra aristidoides* Kunth. *Bouteloua aristidoides* var. *arizonica* M.E. Jones]

Aceitilla, *zacate liebrero*; six-weeks needle grama

Summer-fall ephemerals. Abundant, mostly in open, arid habitats; canyon bottom, slopes, and open desert.

As soon as the grain ripens and the plants dry, *Pogonomyrmex* ants stream out along their pathways and carry home the whole, disarticulated spikelets. At their nests they remove the grain and pile the chaff in crater-like mounds around the entrances to their subterranean colonies.

Felger 85-1318, *85-1188* (ARIZ, USON); *Van Devender 28 Dec 1982*.

Bouteloua barbata Lagascea var. **barbata**

Navajita barbada, *navajita anual*, *zacate liebrero*; six-weeks grama

Hot weather ephemerals, sometimes with weak regrowth in winter or spring. Spicate branches (6) 10–25 (30) mm long, pectinate (comb-shaped), arched to straight. Widespread across the open desert. Resembling *B. parryi* but without bulbous-based hairs. First found in the Nacapule region in 2015.

Desertscrub near parking lot and canyon entrance, 29 Oct 2015, *Carnahan 1562* (ARIZ, ASU, USON).

Bouteloua diversispicula J.T. Columbus

[*Cathestecum brevifolium* Swallen]

Grama china, zacate de raíz

Low, spreading perennials with slender stolons. Non-seasonal, but flowering most vigorously during the warmer months except during drought. Gravels near the canyon

Bouteloua diversispicula, Las Barajitas

Bouteloua repens, San Carlos

entrance, hillsides including hot, south-facing slopes, and open desert.

Burgess 6529; *Carnahan 1574* (ARIZ, ASU, USON); Rocky slopes and desert flats near entrance to canyon, glumes reddish, lemmas greenish, 11 Aug 1985, *Felger 85-855* (ARIZ, MO); *Felger 85-1311*.

Bouteloua parryi (E. Fournier) Griffiths

[*Chondrosum parryi* E. Fournier. *Bouteloua gentryi* Gould. *B. parryi* var. *gentryi* (Gould) Gould]

Parry's grama

Hot-weather ephemerals, sometimes with weak regrowth in winter or spring. Spicate branches including the glumes and awns often dark purple-brown, the anthers orange. Open desert near the canyon mouth. Resembling *B. barbata* but differing by the long, usually bulbous-based hairs on the spikes.

1 km SE of canyon, *Felger 95-73*; *Starr 220*.

Bouteloua repens (Kunth) Scribner & Merrill

[*B. filiformis* (E. Fournier) Griffiths]

Zacate navajita, *navajita pelillo*; slender grama

Tufted perennials, also sometimes flowering in the first season but the spikelets not maturing; flowering mostly during warmer months. Spicate branches 10–20 mm long and relatively broad, not comb-shaped, deciduous at maturity. Slopes, soil pockets in rocks, and open areas along the canyon floor.

Burgess 6377; *Carnahan 1542* (ARIZ, USON); *Felger 85-1306, 96-80* (ASU, BRIT, USON); *Toolin 1938*.

Cenchrus

1. Spikelets enclosed in fascicles with many bristles, these not spinescent. _____**Cenchrus ciliaris**

Cenchrus ciliaris, Las Barajitas

Cenchrus echinatus, San Carlos

1' Spikelets enclosed in burs with sharp spines. ____ _____**Cenchrus echinatus**

*Cenchrus ciliaris Linnaeus

[*Pennisetum ciliare* (Linnaeus) Link]

Zacate buffel, *buffel*; buffelgrass

Tufted perennials and flowering in the first season. This invasive grass, well established in the Guaymas region since at least the 1980s, was first documented along the road at the canyon entrance in 1992. Scattered and uncommon in the canyon and at Nacapule Spring, although abundant in disturbed habitats in nearby San Carlos.

Along road in canyon bottom, *Felger 92-1056*. Nacapule Spring, 29 Nov 2015, *Carnahan 1598* (ARIZ, USON).

*Cenchrus echinatus Linnaeus

[*C. insularis* Scribner]

Zacate toboso; southern sandbur

Warm-weather annuals, often weedy. Panicles spike-like with 18–40 burs. Burs with sharp spines plus a basal ring of often 30–50 small, slender bristles; larger spines flattened, 3.5–6 mm long. One large colony found beneath *Washingtonia* palms.

19 Nov 1984, *Felger 84-587*; Canyon bottom in sandy soil beneath palms, 28 Dec 1985, *Felger 85-1497*.

*Cynodon dactylon (Linnaeus) Persoon var. dactylon

Zacate inglés, *zacate bermuda*; Bermuda grass

Creeping perennials with long stolons and scaly rhizomes; mostly in the warmer months. In the 1980s it was common in moist, alkaline soils along the main the canyon bottom. In 2015 it was locally common in the north fork of the canyon and at Nacapule Spring.

Cynodon dactylon, Santa Cruz County, Arizona

Dactyloctenium aegyptium, San Carlos

Near water, canyon bottom, 19 Oct 1984, *Felger 84-112*; North fork of canyon, 28 Nov 2015, *Curtis Latham Smith*, observation. Nacapule Spring, 29 Nov 2015, *Carnahan 1599* (ARIZ, USON).

*Dactyloctenium aegyptium (Linnaeus) Willdenow

Zacate de cuervo; crowfoot grass

Warm-weather ephemerals, sometimes persisting through the winter. Canyon bottom in wet soil and also at Nacapule Spring, especially in disturbed, formerly grazed habitats.

Felger 84-590, *85-1184* (ARIZ, MEXU); Wash SE of canyon, *Felger 95-41*.

Digitaria ciliaris, Cañón de Robinson

*Digitaria ciliaris (Retzius) Koeler

[*D. adscendens* (Kunth) Henrard. *D. sanguinalis* (Linnaeus) Scopoli var. *ciliaris* (Retzius) Parlatore]

Zacate cangrejo; southern crabgrass

Warm-weather ephemerals and occasionally in winter or spring, the plants rather open and sparsely branched. Canyon bottom near water and especially common in gravelly soil where previous cattle grazing altered the vegetation.

Dinebra panicea, Santa Cruz County, Arizona

Gravelly wash below the canyon entrance, *Carnahan 1570* (ARIZ, USON); *Felger 84-591, 85-1207*.

Dinebra panicea (Retzius) P.M. Peterson & N. Snow subsp. **brachiata** (Steudel) P.M. Peterson & N. Snow

[*Leptochloa brachiata* Steudel. *L. filiformis* (Persoon) P. Beauvois. *L. panicea* (Retzius) Ohwi subsp. *brachiata* (Steudel) N.W. Snow]

Desparramo rojo; red sprangletop

Summer ephemerals, highly variable in size. Widespread; canyon bottom, slopes, and open desert and arroyos.

Felger 84-162, *85-1227-J* (ASU, CAS, MEXU, RSA, TEX, USON).

Eragrostis pectinacea, Santa Cruz County, Arizona

Eragrostis pectinacea (Michaux) Nees var. **pectinacea**

[*E. pectinacea* var. *miserrima* (E. Fournier) J. Reeder, see Felger et al. 2014.]

Zacate lluvia; Carolina lovegrass

Summer ephemerals. Stems and inflorescences delicate and filmy, the pedicels slender, mostly appressed to sometimes spreading. Widespread, especially along the canyon bottom.

Carnahan 1571; *Felger 84-592*.

Heteropogon contortus (Linnaeus) Beauvois ex Roemer & Schultes

Zacate colorado; tanglehead

Robust tufted perennials; old dry leaves rust-colored and persistent. Inflorescences of solitary, spike-like 1-sided racemes (the awns are all on one side). Spikelets in pairs very different from each other. Sessile, bisexual spikelet with a stout, hairy awn, 4.5–7+ cm long, twisted and twice bent when mature, tawny brown with a needle-sharp base. Reproductive during warmer months.

Heteropogon contortus, Las Barajitas

South-facing rocky slope near canyon entrance, 9 Mar 1985, *Felger 85-554* (ARIZ, ASU, MEXU, SD, USON).

Lasiacis ruscifolia (Kunth) Hitchcock var. **ruscifolia**

Carrizito

Perennials 1.2–1.8 m tall with slender, bamboo-like stems. Leaf blades ovate-lanceolate to ovate, larger leaves with blades 5–10 cm long, 1–3.5 cm wide. Panicles generally shorter than the leaves, few- to perhaps many-flowered (panicles often many-flowered and much larger in subtropical and tropical regions). Spikelets 3 mm in diameter, the ripe fruits somewhat fleshy, rounded, blackish, and oily. Flowering mostly during the warmer months. Steep, north-facing rocky slopes below cliffs and shaded, densely vegetated north-facing portions of the canyon bottom.

Felger 84-572, *85-1325*; Shaded canyon bottom adjacent to north-facing canyon wall, 13 Dec 1992, *Felger 92-1060*.

Lasiacis ruscifolia, El Baviso

Melinis repens, Nacapule

*Melinis repens** (Willdenow) Zizka

[*Rhynchelytrum repens* (Willdenow) C.E. Hubbard. *R. roseum* (Nees) Stapf & C. E. Hubbard. *Tricholaena rosea* Nees]

Espiga, zacate rosado; Natal grass

Non-seasonal annuals in gravels along the canyon bottom. First documented in the canyon in 1994 and abundant in 2015.

Panicum hirticaule, Santa Cruz County, Arizona

16 Dec 2012, *Carnahan*, photo; *Felger 94-846*; Occasional, *Wilder 10-485* (ARIZ, UCR).

Panicum hirticaule J. Presl var. **hirticaule**

[*P. pampinosum* Hitchcock & Chase]

Summer ephemerals, highly variable in size, the roots weakly developed. Widespread and common; canyon bottom often in open areas, slopes, and open desert.

Carnahan 1543 (ARIZ, ASU, USON); *Felger 84-174, 85-1213*.

Phragmites australis (Cavanilles) Trinius ex Steudel subsp. **berlandieri** (E. Fournier) Saltonstall & Hauber

[*P. berlandieri* E. Fournier. *P. karka* (Retzius) Trinius ex Steudel]

Carrizo; COMMON REED, REEDGRASS

Phragmites australis subsp. *berlandieri*, Nacapule

Phragmites australis subsp. *berlandieri*, Nacapule

Bamboo-like grass to 4 m tall, with strong rhizomes and tough roots. Major stems stout, more than 1 cm diameter, and also often producing numerous smaller stems as slender as 1.7 mm diameter. Panicles terminal and

Setaria leucopila, Las Barajitas

plume-like. Spikelets several-flowered, the upper florets reduced, rachillas with long silky white hairs, glumes unequal in length, lemmas and paleas glabrous. The fruits usually break off below the long-bearded rachillas, which aid in wind dispersal. Birds flying between wetlands and waterholes are the likely dispersal agents.

Two well-established colonies about 30 m apart, with some scattered plants between them in the canyon bottom among *Ficus insipida*, *F. pertusa,* and *Washingtonia* palms. This native reedgrass also occurs in several other widely scattered canyons and wetland sites in the Sierra El Aguaje. Elsewhere in Sonora it has mostly been replaced by the non-native giant reedgrass, *Arundo donax*.

North fork of canyon, 28 Nov 2015, *Carnahan 1592* (ARIZ, ASU, USON).

Urochloa arizonica, Santa Cruz County, Arizona

Setaria – Bristlegrass

1. Perennials, the roots stout and coarse; spikelets globose, widest at the middle; sterile paleas present. _____**Setaria leucopila**

1’ Annuals; spikelets more or less diamond shaped, widest below the middle; sterile paleas absent. _____**Setaria liebmannii**

Setaria leucopila (Scribner & Merrill) K. Schumann

Zacate temprano; WHITE-HAIRED BRISTLEGRASS

Coarse, tufted perennials. Mostly growing and fruiting in warm, generally moist times of the year. Spikelets subtended by a single bristle. Canyon bottom and slopes. *Setaria leucopila* is part of the *S. macrostachya* complex and the distinctions between them seem problematic (Felger et al. 2011; Felger & Wilder 2012).

Felger 84-589, 85-1495.

Setaria liebmannii E. Fournier

Cola de zorra; summer bristlegrass

Summer ephemerals. Spikelets subtended by a single bristle. Widespread: canyon bottom, slopes, open desert, and arroyos, and Nacapule Spring.

Felger 84-165, 84-1219. Nacapule Spring, *Carnahan 1600* (ARIZ, ASU, USON).

TYPHACEAE • CATTAIL FAMILY

Typha domingensis Persoon

Tule; cattail

Perennials, emergent from shallow, permanent water beneath *Ficus insipida*. Several young plants found in the mid-1980s but these failed to establish. In 2015 one small colony was found in the west fork and another colony was found among *Washingtonia* palms in the north fork of the canyon. Cattails are common in wetland habitats at San Carlos and elsewhere in the region.

Small pool in upper, west fork of canyon, 29 Oct 2015, *Carnahan 1560* (ARIZ, USON); North fork of canyon, 29 Nov 2015, *Carnahan 1608* (ARIZ, USON).

Urochloa arizonica (Scribner & Merrill) Morrone & Zuloaga

[*Brachiaria arizonica* (Scribner & Merrill) S.T. Blake. *Panicum arizonicum* Scribner & Merrill]

Piojillo de Arizona; Arizona signal-grass

Hot-weather ephemerals. Canyon bottom, slopes, and nearby open desert.

Felger 84-139, 85-1313.

Typha domingensis, Nacapule

Nacapule Canyon, north fork

ACKNOWLEDGEMENTS

The San Diego Natural History Museum, Wallace Genetic Foundation, and Wallace Research Foundation provided support for the original publication. Generous support at the University of Arizona Herbarium (ARIZ) and Herbario de la Universidad de Sonora (USON) have made this work possible. We thank the staff of herbaria that provided loans or images of specimens, including CAS, DES, MEXU, MO, RSA, SD, TEX, UC, and US. Online resources from Southwest Environmental Information Network (SEINet), Tropicos, and BajaFlora of the botany department of the San Diego Natural History Museum have been especially valuable. Scott E.K. Bennett, U.S. Geological Survey, Seattle, contributed the geology. Many colleagues and others have provided significant information, reviews, accompanied us in the field, and helped in numerous ways. We thank all, including Kelly W. Allred, the late Daniel F. Austin, Scott E.K. Bennett, C. David Bertelsen, Michael Thomas Bogan, Alberto Búrquez-Montijo, Carianne Funicelli Campbell, Thomas F. Daniel, Miguel Dávila-Pacheco, Christopher J.S. Davis, Mark A. Dimmitt, George McNeil Ferguson, Walter Frank Fertig, Ana Luisa Figueroa Carranza, Lloyd Findley, Mark Fishbein, Juan Pablo Gallo Reynoso, Judy Ann Gibson, Powell (Gil) B. Gillenwater III, Myron William Kimnach, Max Licher, Angelina Martínez Yrízar, Michelle "Shelley" McMahon, Guy L. Nesom, Jon P. Rebman, Frank W. Reichenbacher, Ana Lilia Reina-Guerrero, Marisa Rice, the late Alexander Russell, the late Jean Russell, Andrew Michael Salywon, Andrew C. Sanders, Silke Schneider, Curtis Latham Smith, Barbara Straub, Thomas R. Van Devender, James (Jim) Thomas Verrier, Benjamin T. Wilder, Michael F. Wilson, Robert Hazard Winston, and George Yatskievych. For photos and other illustrations we thank Michael Thomas Bogan, Alberto Búrquez-Montijo, Michael H. Darin, David Devlin Houser, and Juan Ezequiel Nuñez. Richard Felger extends gratitude to the Wallace Research Foundation for support. We thank Walter Fertig, Ben Wilder, and an anonymous reviewer for substiantially improving the manuscript.

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APPENDIX

Checklist of the Nacapule flora. SU = summer/hot-weather ephemerals or annuals; WI = winter-spring/cool-season ephemerals; NS = non-seasonal ephemerals; HP = herbaceous perennials; VI = perennial vines; SH = shrubs; TR = trees; SC = succulent plants; WL = wetland plants; * = non-natives; ** = non-natives not established.

Species	SU	WI	NS	HP	VI	SH	TR	SC	WL
PTERIDOPHYTES									
PSILOTACEAE									
Psilotum nudum				HP					WL
PTERIDACEAE									
Astrolepis sinuata				HP					
Cheilanthes lozanoi				HP					
Myriopteris pringlei				HP					
Notholaena lemmonii				HP					
MAGNOLIIDS									
ARISTOLOCHIACEAE									
Aristolochia watsonii				HP					
EUDICOTS									
ACANTHACEAE									
Aphanosperma sinaloensis				HP					
Carlowrightia arizonica				HP					
Carlowrightia pectinata				HP					
Elytraria imbricata				HP					
Holographis virgata						SH			
Justicia californica						SH			
Justicia candicans						SH			
Justicia sonorae				HP					
Ruellia californica						SH			
Tetramerium nervosum				HP					
ACHATOCARPACEAE									
Phaulothamnus spinescens						SH			
AMARANTHACEAE									
Amaranthus fimbriatus	SU								
Amaranthus watsonii			NS						
*Chenopodiastrum murale		WI							
Chenopodium neomexicanum			NS						
Froelichia interrupta				HP					
Iresine alternifolia						SH			

Iresine latifolia						SH			
Tidestromia lanuginosa	SU								
APOCYNACEAE									
Asclepias leptopus				HP					
Asclepias subulata				HP					
Funastrum heterophyllum					VI				
Haplophyton cimicidum				HP					
Mandevilla nacapulensis						SH			
Marsdenia edulis					VI				
Metastelma arizonicum					VI				
Polystemma cordifolium					VI				
Vallesia glabra						SH			
Vallesia laciniata						SH			
ASTERACEAE									
Ambrosia ambrosioides						SH			
Ambrosia confertiflora				HP					
Ambrosia cordifolia						SH			
Baccharis sarothroides						SH			
Bebbia juncea						SH			
Brickellia coulteri						SH			
Brickellia rhomboidea						SH			
Coreocarpus sonoranus				HP					
*Eclipta prostrata			NS						WL
Encelia farinosa						SH			
*Erigeron canadensis	SU								
Gamochaeta sphacelata		WI							
Gymnosperma glutinosum				HP					
Heliopsis anomala				HP					
Hofmeisteria crassifolia				HP				SC	
Koanophyllon palmeri				HP					
*Lactuca serriola		WI							
Lagascea decipiens						SH			
Logfia filaginoides		WI							
Pectis rusbyi	SU								
Perityle californica		WI							
Perityle emoryi		WI							
Perityle palmeri				HP					
Pleurocoronis laphamioides						SH			
Pluchea salicifolia						SH			WL
Porophyllum pausodynum				HP					

Senecio lemmonii		WI							
*Sonchus oleraceus		WI							
Thymophylla concinna		WI							
Trixis californica						SH			
Verbesina felgeri						SH			
Viguiera dentata				HP					
BORAGINACEAE									
Johnstonella angustifolia		WI							
Johnstonella grayi		WI							
BRASSICACEAE									
Descurainia pinnata		WI							
Dryopetalon runcinatum		WI							
*Sisymbrium irio		WI							
BURSERACEAE									
Bursera fagaroides							TR		
Bursera laxiflora							TR		
Bursera microphylla							TR		
CACTACEAE									
Carnegiea gigantea							TR	SC	
Cylindropuntia fulgida						SH		SC	
Cylindropuntia versicolor						SH		SC	
Echinocereus llanuraensis				HP				SC	
Echinocereus scopulorum				HP				SC	
Ferocactus emoryi						SH		SC	
Lophocereus schottii						SH		SC	
Mammillaria grahamii				HP				SC	
Mammillaria johnstonii				HP				SC	
Opuntia gosseliniana						SH		SC	
Pachycereus pringlei							TR	SC	
Peniocereus striatus				HP				SC	
Stenocereus thurberi							TR	SC	
CANNABACEAE									
Celtis pallida						SH			
Celtis reticulata							TR		
CLEOMACEAE									
Cleome tenuis	SU								
*Corynandra viscosa			NS						
CONVOLVULACEAE									
Cuscuta americana			NS						
Cuscuta desmouliniana	SU								

Cuscuta tuberculata	SU								
Cuscuta umbellata	SU								
Evolvulus alsinoides				HP					
Ipomoea cholulensis	SU								
Ipomoea hederacea	SU								
Ipomoea ternifolia	SU								
Jacquemontia agrestis	SU								
Jacquemontia pringlei					VI				
CORDIACEAE									
Cordia parvifolia						SH			
Cordia sonorae							TR		
CUCURBITACEAE									
**Citrullus lanatus			NS						
Ibervillea sonorae					VI			SC	
Vaseyanthus insularis		WI							
EUPHORBIACEAE									
Acalypha californica						SH			
Adelia obovata						SH			
Argythamnia lanceolata				HP					
Argythamnia serrata			NS						
Croton sonorae						SH			
Dalechampia scandens					VI				
Euphorbia capitellata				HP					
Euphorbia ceroderma						SH		SC	
Euphorbia pediculifera				HP					
Euphorbia polycarpa				HP					
Euphorbia setiloba			NS						
Euphorbia tomentulosa						SH			
Jatropha cordata							TR		
Jatropha cuneata						SH			
Pleradenophora bilocularis						SH			
Tragia jonesii					VI				
FABACEAE									
Astragalus nuttallianus		WI							
Calliandra californica						SH			
Coulteria pumila						SH			
Coursetia caribaea				HP					
Coursetia glandulosa						SH			
Dalea pringlei				HP					
Dalea purpusii				HP					

Desmanthus covillei						SH			
Desmodium procumbens	SU								
Diphysa occidentalis						SH			
Erythrostemon palmeri						SH			
Galactia wrightii					VI				
Haematoxylum brasiletto						SH			
Havardia sonorae							TR		
Indigofera jamaicensis				HP					
Lysiloma divaricatum							TR		
Macroptilium atropurpureum					VI				
Marina parryi			NS						
Mariosousa willardiana							TR		
Mimosa distachya						SH			
Nissolia schottii					VI				
Olneya tesota							TR		
Parkinsonia microphylla							TR		
Parkinsonia praecox							TR		
Phaseolus filiformis			NS						
Prosopis glandulosa							TR		
Rhynchosia precatoria					VI				
Senna covesii				HP					
Sphinctospermum constrictum	SU								
Tephrosia tenella			NS						
Vachellia californica							TR		
Vachellia campechiana						SH			
Vachellia farnesiana						SH			
Zapoteca formosa						SH			
FOUQUIERIACEAE									
Fouquieria diguetii						SH			
Fouquieria macdougalii							TR		
Fouquieria splendens						SH			
HELIOTROPIACEAE									
Euploca procumbens				HP					
HYDROPHYLLACEAE									
Phacelia scariosa		WI							
KRAMERIACEAE									
Krameria erecta						SH			
Krameria sonorae						SH			
LAMIACEAE									
Condea albida						SH			

Vitex mollis						SH			
LOASACEAE									
Eucnide cordata						SH			
Eucnide rupestris			NS						
Mentzelia aspera			NS						
LORANTHACEAE									
Psittacanthus sonorae				HP				SC	
Struthanthus palmeri				HP					
MALPIGHIACEAE									
Callaeum macropterum					VI				
Cottsia californica					VI				
Cottsia gracilis					VI				
Echinopterys eglandulosa						SH			
Galphimia angustifolia				HP					
MALVACEAE									
Abutilon abutiloides						SH			
Abutilon incanum						SH			
Abutilon parishii				HP					
Ayenia filiformis			NS						
Ayenia jaliscana						SH			
Briquetia sonorae				HP					
**Corchorus olitorius	SU								
Herissantia crispa				HP					
Hermannia pauciflora				HP					
Hibiscus biseptus				HP					
Horsfordia newberryi						SH			
*Malva parviflora		WI							
Melochia tomentosa						SH			
Sida abutifolia				HP					
Sida hyalina						SH			
Sphaeralcea ambigua				HP					
Sphaeralcea coulteri		WI							
Waltheria indica				HP					
MENISPERMACEAE									
Cocculus diversifolius					VI				
MOLLUGINACEAE									
Mollugo verticillata	SU								
MORACEAE									
Ficus insipida							TR		WL
Ficus palmeri							TR		

Ficus pertusa							TR		WL
NAMACEAE									
Nama hispida		WI							
NYCTAGINACEAE									
Allionia incarnata				HP					
Boerhavia coccinea				HP					
Boerhavia gracillima				HP					
Boerhavia spicata	SU								
Boerhavia triquetra	SU								
Boerhavia xanti	SU								
Commicarpus scandens				HP					
OLEACEAE									
Forestiera angustifolia						SH			
ONAGRACEAE									
Ludwigia octovalvis				HP					WL
Ludwigia peploides			NS						WL
PAPAVERACEAE									
Argemone ochroleuca			NS						
PASSIFLORACEAE									
Passiflora arida					VI				
Passiflora mexicana					VI				
Turnera diffusa						SH			
PETIVERIACEAE									
Rivina humilis				HP					
PHRYMACEAE									
Erythranthe floribunda		WI							WL
PLANTAGINACEAE									
Nuttallanthus texanus		WI							
Pseudorontium cyathiferum			NS						
Sairocarpus costatus		WI							WL
Stemodia durantifolia				HP					WL
PLUMBAGINACEAE									
Plumbago zeylanica				HP					
POLEMONIACEAE									
Dayia sonorae		WI							
POLYGONACEAE									
Antigonon leptopus					VI				
Coccoloba goldmanii						SH			
PORTULACACEAE									
*Portulaca oleracea	SU							SC	

Portulaca suffrutescens	SU							SC	
Portulaca umbraticola	SU							SC	
PRIMULACEAE									
Bonellia macrocarpa							TR		
RESEDACEAE									
Forchhammeria watsonii							TR		
RHAMNACEAE									
Colubrina californica						SH			
Colubrina viridis						SH			
Condalia globosa						SH			
Gouania rosei					VI				
Ziziphus obtusifolia						SH			
RUBIACEAE									
Hintonia latiflora							TR		
Randia sonorensis						SH			
Randia thurberi						SH			
RUTACEAE									
Zanthoxylum fagara						SH			
Zanthoxylum mazatlanum						SH			
SALICACEAE									
Salix gooddingii							TR		WL
SANTALACEAE									
Phoradendron brachystachyum				HP					
Phoradendron californicum				HP					
SAPINDACEAE									
Cardiospermum corindum					VI				
Dodonaea viscosa						SH			
Sapindus saponaria							TR		
Serjania palmeri					VI				
SAPOTACEAE									
Sideroxylon occidentale							TR		
SIMMONDSIACEAE									
Simmondsia chinensis						SH			
SOLANACEAE									
Capsicum annuum				HP					
Datura discolor			NS						
Lycium andersonii						SH			
Lycium berlandieri						SH			
Nicotiana obtusifolia				HP					
Physalis crassifolia				HP					

*Physalis pubescens			NS						
Physalis purpurea				HP					
Solanum hindsianum						SH			
STEGNOSPERMATACEAE									
Stegnosperma halimifolium						SH			
TALINACEAE									
Talinum paniculatum				HP				SC	
TROPAEOLACEAE									
**Tropaeolum majus		WI							
URTICACEAE									
Parietaria hespera		WI							
VERBENACEAE									
Citharexylum flabellifolium						SH			
Lantana camara						SH			
Lippia palmeri						SH			
VIOLACEAE									
Hybanthus fruticulosus				HP					
VITACEAE									
Cissus verticillata					VI				
ZYGOPHYLLACEAE									
Guaiacum coulteri							TR		
Kallstroemia californica	SU								
Kallstroemia grandiflora	SU								
MONOCOTS									
ALISMATACEAE									
Echinodorus berteroi			NS						WL
ARACEAE									
Lemna aequinoctialis			NS						WL
ARECACEAE									
Brahea brandegeei							TR		
Sabal uresana							TR		
Washingtonia robusta							TR		WL
ASPARAGACEAE									
Agave angustifolia						SH		SC	
Agave chrysoglossa						SH		SC	
Agave colorata						SH		SC	
Dasylirion gentryi						SH			
BROMELIACEAE									
Hechtia montana				HP				SC	

COMMELINACEAE									
Commelina erecta				HP					
CYPERACEAE									
Cyperus odoratus				HP					WL
Cyperus squarrosus			NS						WL
Cyperus subsquarrosus	SU								WL
Eleocharis geniculata			NS						WL
Fimbristylis dichotoma	SU								WL
Fuirena simplex				HP					WL
POACEAE									
Aristida adscensionis			NS						
Aristida divaricata				HP					
Aristida ternipes				HP					
Bouteloua aristidoides	SU								
Bouteloua barbata	SU								
Bouteloua diversispicula				HP					
Bouteloua parryi	SU								
Bouteloua repens				HP					
*Cenchrus ciliaris				HP					
*Cenchrus echinatus	SU								
*Cynodon dactylon				HP					
*Dactyloctenium aegyptium	SU								
*Digitaria ciliaris	SU								
Dinebra panicea	SU								
Eragrostis pectinacea	SU								
Heteropogon contortus				HP					
Lasiacis ruscifolia				HP					
*Melinis repens			NS						
Panicum hirticaule	SU								
Phragmites australis				HP					WL
Setaria leucopila				HP					
Setaria liebmannii	SU								
Urochloa arizonica	SU								
TYPHACEAE									
Typha domingensis				HP					WL
	SU	**WI**	**NS**	**HP**	**VI**	**SH**	**TR**	**SC**	**WL**
TOTAL: 310 species	**37**	**26**	**25**	**83**	**23**	**85**	**31**	**25**	**22**
	11.9%	**8.4%**	**8.1%**	**26.8%**	**7.4%**	**27.4%**	**10.0%**	**8.1%**	**7.1%**

Proceedings of the Desert Laboratory on Tumamoc Hill, University of Arizona

The Proceedings of the Desert Laboratory continues discoveries of desert biomes. The focus is arid domains worldwide, especially the Sonoran Desert region, including terrestrial and marine habitats. The journal is open access and peer-reviewed connecting to the roots of the Carnegie Desert Botanical Laboratory on Tumamoc Hill. The Proceedings of the Desert Laboratory, University of Arizona, are monographic to concise in length. Submissions are welcomed from all disciplines including social, biological, and earth sciences.

CONTRIBUTIONS:

Proceedings of the Desert Laboratory
Published by the Desert Laboratory on Tumamoc Hill
University of Arizona, Tucson