2007

Vascular Plants of the Whipple Mountains

Sarah J. De Groot

Rancho Santa Ana Botanic Garden, Claremont, California

Follow this and additional works at: <https://scholarship.claremont.edu/aliso>

Part of the [Biodiversity Commons](#), and the [Botany Commons](#)

Recommended Citation

De Groot, Sarah J. (2007) "Vascular Plants of the Whipple Mountains," *Aliso: A Journal of Systematic and Floristic Botany*: Vol. 24: Iss. 1, Article 6.

Available at: <https://scholarship.claremont.edu/aliso/vol24/iss1/6>

VASCULAR PLANTS OF THE WHIPPLE MOUNTAINS

SARAH J. DE GROOT

Rancho Santa Ana Botanic Garden, 1500 N. College Avenue, Claremont, California 91711, USA
(sarah.degroot@cgu.edu)

ABSTRACT

The Sonoran and Mojave deserts meet just north of the Whipple Mountains, which are situated in southeast San Bernardino County, California, along the Colorado River and adjacent to Arizona. Vegetation from the Pleistocene to the present was inferred from previously published packrat midden data and the current floristic composition. Climate data suggest that summer rainfall is a factor underlying the vegetational differences between the western and eastern portions of the Sonoran desert. Plant collections in the area yielded primarily California Sonoran plants, but also several Mojave and Arizona Sonoran plants. A fair number of the Arizona Sonoran plants collected were on the western margins of their ranges. Three species new to California's flora were documented in this study: *Berberis harrisoniana*, *Delphinium scaposum*, and *Erigeron oxiphyllus*.

Key words: Arizona, biogeography, California, Colorado River, flora, midden, San Bernardino County, Sonoran Desert, vegetation, Whipple Mountains.

INTRODUCTION

Home to California's largest population of saguaro cactus (*Carnegiea gigantea* (Engelm.) Britton & Rose), the Whipple Mountains are located in southeast San Bernardino County, the eastern-most portion of California, and bordered on the east by the Colorado River (Brum 1973). The nearest services are available in Parker, Arizona, just across the river and southwest of the mountain range. Lake Havasu City is about 56 km (35 mi) north of Parker, across Lake Havasu from the town of Havasu Lake, California, which is just north of the study site. Lake Havasu is held by Parker Dam, which spans the Colorado River just south of Bill Williams River, 21 km (13 mi) north of Parker, and 23 km (14 mi) south of Lake Havasu City. There are only two main paved roads near the Whipple Mountains, California State Highway 62 which runs through the southern bajada between Vidal Junction and Parker, and US Highway 95 which joins Blythe and Needles, passing through Vidal and Vidal Junction (Fig. 1).

The mountains are situated in the Lower Colorado River Valley, in the northern limit of the Sonoran Desert, with the Mojave Desert immediately north of the mountains (Shreve 1964; Cronquist 1982; McLaughlin 1989, 1995). Shreve (1964) observed floristic differences between the eastern and western portions of the Sonoran Desert. Generally, it seems that some common plants in Arizona do not occur west of the Colorado River. To highlight these floristic distinctions, the east and west portions of the Sonoran Desert will be referred to as the Arizona and California Sonoran Desert, respectively.

Given the proximity of the Mojave and Arizona

Sonoran floristic elements, it is no surprise that some plants generally restricted to the Mojave or Arizona Sonoran deserts also occur in the study area, along with Colorado Desert plants. The Sonoran Desert as a whole has a rich flora of nearly 2600 species, 30% of which are endemic (Wells and Hunziker 1976). In spite of this unique biogeographic situation, little botanical exploration of the Whipple Mountains had been done beyond roadside collecting.

The study area encompasses about 129,500 hectares (320,000 acres; 500 square miles), including the Whipple Mountains Wilderness (administered by the Bureau of Land Management [BLM]), bajada and creosote flats around the mountains. The boundaries are placed approximately along watersheds, with Chemehuevi Wash forming the northern boundary and the Colorado River delimiting the eastern boundary. US Highway 95, the western boundary, roughly follows the drainages between the Turtle and Whipple ranges. The southern boundary traces Vidal Wash between US Highway 95 and the Colorado River. This wash empties into the river just south of the San Bernardino-Riverside county line (Fig. 1, 2). The study site spans 34°04'45" to 34°28'22"N and 114°07'48" to 114°39'17"W.

Most of area is managed by the Bureau of Land Management (BLM). Portions are also administered by the Colorado River Indian Tribes (CRIT), the Chemehuevi Indian Tribe, and the Metropolitan Water District of Southern California (MWD; Fig. 1).

The main obstacle to thoroughly covering the site is the rugged BLM Wilderness area in the center of the mountains, which covers 31,372 hectares (77,520 acres; 121 square miles), about one-fourth of the total area. No motor vehicles are permitted in this area, al-

Fig. 1. Topographic map showing land ownership in the Whipple Mountains. The study area boundary is shown by the broken black line. The California–Arizona state line follows the Colorado River, and the San Bernardino–Riverside county line is just below the study area. Reproduced with permission (©2004 DeLorme [www.delorme.com] TopoUSA®, vers. 5.0).

though several abandoned mining roads lead into the area and can be followed on foot. Vehicle-accessible roads do run along the periphery of the Wilderness area, however, and the bajadas and creosote flats have a wide network of roads and trails. Providing access on the eastern side is Parker Dam Road, MWD/Black Meadow Landing Road, Havasu Palms Road, and a powerline road administered by MWD. Highway access is provided by California State Highway 62, south of the mountains, and US Highway 95 on the western boundary of the study site.

PHYSICAL SETTING

Topography

Elevations range from around 102 to 1259 m (335 to 4131 ft), and habitats include windblown ridges,

riparian zones, creosote bush bajadas and rocky canyons (Fig. 3–9). The eastern portion of the range contains spectacular volcanic rock bluffs with sheer sides over 40 m (130 ft) high. Ridges at higher elevations farther west are steep and blanketed with loose pieces of granite and gneiss from crumbling outcrops (Fig. 5). The highest elevation is 1259 m (4131 ft), along a ridge on the northwest side of the mountains ($34^{\circ}18'52''\text{N}$, $114^{\circ}24'37''\text{W}$). Savahia Peak, a dark volcanic knife-edge promontory at the western end of the mountains ($34^{\circ}16'33''\text{N}$, $114^{\circ}31'56''\text{W}$), is just over 800 m (2700 ft; Fig. 6).

Perhaps the most fascinating point of physiographic interest in the site is Monument Peak ($34^{\circ}16'51''\text{N}$, $114^{\circ}15'15''\text{W}$; Fig. 3). This short spire reaches only 748 m (2450 ft) in elevation, yet due to its location it forms a magnificent silhouette against the sky and can

Fig. 2. Satellite image of the Whipple Mountains, with the study area boundary shown by the broken white line. White dots indicate the position of packrat midden sites. Source for midden sites: T. Van Devender pers. comm. Reproduced with permission (©2004 DeLorme [www.delorme.com] TopoUSA®, vers. 5.0).

be seen for miles from south of the mountains (see Ives 1861). It marks the northern corner of the Colorado River Indian Reservation.

The Colorado River is a primary drainage for the Colorado Plateau and the Sonoran Desert. The lowest elevation in the site, 102 m (335 ft), is found along the Colorado River at the south end of the study area, where Vidal Wash joins the Colorado, just below the San Bernardino-Riverside county line (34°04'45"N, 114°26'05"W). Vidal Wash drains the southeast side of the Turtle Mountains and southern slopes of the Whipple Mountains. Chemehuevi Wash, which drains not only the north slopes of the Whipple Mountains, but also the Chemehuevi Mountains, Stepladder Mountains, and the northern part of the Turtle Mountains, flows into the Colorado just south of the town of Havasu Lake (34°28'22"N, 114°24'20"W).

Several washes drain directly from the Whipple Mountains into the Colorado River. These include Bennet Wash (confluence near Bass Point), Bowman's Wash (near the former town site of Crossroads), Copper Basin Wash (near Echo Point), Black Metal Wash (following Black Meadow Landing Road), Whipple Wash (empties just south of Havasu Palms), and Copper Canyon (mostly on the Chemehuevi Indian Reservation). Whipple Wash is the largest of these drainages and has its head near the Mountains' highest peak, at about 1050 m (3450 ft) elevation.

Climate

The Whipple Mountains experience a temperate, warm desert environment, typical of the Lower Colorado River Valley. The average temperature ranges

Fig. 3–9. Topography of the Whipple Mountains.—3. Monument Peak, with the Colorado River in the foreground.—4. Desert pavement with creosote bush scrub, southern bajada.—5. Windblown ridge just north of the highest peak.—6. Savahia Peak, with *Ferocactus cylindraceus* in the foreground.—7. Gene Wash.—8. Canyon of upper Whipple Wash.—9. Bluff in the southern part of the range. Photographs by author.

Fig. 10–11. Temperature and precipitation data.—10. Average high and low temperatures for Parker, Arizona.—11. Average precipitation for Parker, Arizona. Sources: Fig. 10: *www.weather.com*; Fig. 11: US Historical Climatology Network, NOAA.

from 5°C (41°F) in January to 42°C (108°F) in July, as recorded at Parker, Arizona (Fig. 10; Rowlands 1995a). The record high at Parker was 53°C (127°F, in 1905) and the record low was –12°C (10°F, in 1894; from *www.weather.com*).

Average precipitation is 119.5 mm (4.70 in) per year, with rain from both winter storms and summer monsoons. The monsoons, which occur between June and October, contribute about 36% of the annual rainfall (Fig. 11; see also Van Devender 1990; Van Devender et al. 1990; Rowlands 1995a). The warm phase of El Niño/Southern Oscillation may increase summer rainfall (Higgins et al. 2002). Chubascos, or tropical storms that form off of Mexico's west coast, occasionally reach the California deserts in August or September, where they can cause severe flash flooding (Rowlands 1995a). Twenty-year running averages for Parker, Buckeye, and Indio indicate little change in precipitation over the past 90 years (De Groot 2004).

Geology

The bulk of the mountains is composed of Precambrian rock, probably nearly two billion years old (Fig.

12; Bishop 1964; Norris 1995). The gneiss-like formations at higher elevations may be around this age (Norris 1995). At least some of these rocks probably were deposited first as marine sedimentary rocks of a Cordilleran geocline, and later were subjected to metamorphism and intrusion by granitic magmas (Norris 1995).

During the Miocene (25–8 million years ago [mya]), the Lower Colorado River Valley was subjected to geothermal heating, while at the same time the Pacific plate drifted northwest. The lower layers of the Earth's crust stretched, but the surface cracked, forming several detachment faults in and around the Whipple Mountains (Fig. 12; Norris 1995; Scarborough 2000). The core of the mountains was probably at least partly fluid at this time (see also Scarborough 2000). The reddish Tertiary volcanic rock composing the eastern bluffs and various prominent points around the mountains was laid down at about this time (Fig. 12; Blake 1856; Bishop 1964; Norris 1995; Scarborough 2000).

Copper ore may be found in the mountains, today primarily in old mine tailings. Gold, silver, and manganese ores were also present, but to a lesser extent (Bishop 1964; Vredenburg et al. 1981). These ore deposits were probably from intrusions, occurring perhaps during the Mesozoic (Norris 1995).

Soils near the river and in the plains around the range are composed of Quaternary alluvium or Pleistocene non-marine rocks (Fig. 12; Marcou 1856). On the eastern side of the mountains there are some Tertiary non-marine deposits, which probably include the red sandstones around lower Bowman's Wash (Bishop 1964). Flats along the river may have alkaline soils, often with salt deposits on the surface. Washes flow over beds of coarse sand, between boulders, or over exposed bedrock. On the higher slopes, soils are generally thin, rocky, and lack organic material.

Near the Colorado River, there are several small systems of stabilized sand dunes. It appears that there is little aeolian activity in these dune systems since vegetation covers most of the surface (Bowers 1986; Whitford 2002). The river was undoubtedly the sand source for these dunes. However, many dams now impede sediment transport downstream, and without this sand source dune building progresses imperceptibly or has stopped (Clarke and Rendell 1998).

Occasionally, microphytic crusts may be encountered. These are aggregations of cyanobacteria, lichens, algae, liverworts, or mosses that form stabilizing crusts over soil surfaces (McAuliffe 2000). These organisms are active only a few days following a rain before lapsing back into dormancy (McAuliffe 2000).

One feature of note is desert pavement, which is common in the bajadas and plains around the mountains. Removal of fine particles by wind is one of the oldest theories; however, evidence of its occurrence is

Fig. 12. Geologic map of the Whipple Mountains area. Redrawn from Bishop 1964.

rare, and instead fine particles may be removed by water runoff (Cooke 1970). This is plausible since desert pavement soils are usually quite impervious to water (Musick 1975). Cooke (1970) postulated that pavements were originally formed by runoff and by cycles of wetting and drying, which pushed coarser particles upwards. Today, pavements are subjected to creep, runoff, and superficial disintegration, which cause few changes to the established mosaic. Creep occurs when pavement soils are saturated, and particles may shift or slide slightly. Superficial disintegration includes weathering processes of heat/cold cycles, freeze/thaw cycles, and salt weathering (Cooke 1970).

Desert varnish (or rock varnish) is another prominent geologic feature. According to Armstrong (1997) and McAuliffe (2000), bacteria that live on rock surfaces get energy from oxidizing manganese and iron that occur in the rock. These manganese and iron oxides mix with clay minerals to form blackish (manganese oxide) or reddish (iron oxide) coatings over rocks. Since these coatings are laid down slowly, they have been used in dating of landforms and artifacts in the desert (Cooke 1970; Armstrong 1997; McAuliffe 2000).

HISTORY

General Human History

At the time of European contact, much of the land along the Colorado River near the Whipple Mountains was occupied by the Chemehuevi Tribe (Ives 1861). They raised crops of grain and vegetables, and also hunted (Whipple 1856; Whipple et al. 1856). Mojave Indians also resided in the Colorado Valley and raised corn, beans, wheat, squash, peas, and other crops (Whipple 1856).

Juan de Oñate was perhaps the first European to pass by the Whipple Mountains, when he explored in western Arizona and along the Colorado River in 1604 (Huachuca History Program; Gudde 1998). In 1776, Friar Francisco Garcés traveled up the Colorado River from the confluence with the Gila River to the junction with the Mojave River (near present-day Needles) and later returned along the same route (Beck and Hasse 1974). Mountain men James Ohio Pattie and Peter Skene Ogden also traveled along the Colorado River between Needles and Yuma in 1826 and 1829–1830, respectively (Beck and Hasse 1974).

In the fall of 1851, Brevet Captain Lorenzo Sitgreaves of the US Army Corps of Topographical En-

gineers led an overland expedition from Santa Fé down the Zuñi and Colorado rivers to Yuma. They reached the Colorado above the Bill Williams River (near present-day Parker Dam; Kern 1852). The report did not specifically refer to the Whipple Mountains, but described the Colorado River Valley as dry and weedy, “the most perfect picture of desolation” (Sitgreaves 1854: 18).

Lieutenant Amiel Weeks Whipple, of the Corps of Topographical Engineers and the mountains’ namesake, passed by the area in 1854 while surveying for a route for a railroad, roughly following the 35th parallel. The expedition struck the Colorado River at its confluence with Bill Williams River, then continued upstream to the Needles area before heading west (Whipple 1856; Ives 1861; Durham 1998). Whipple described the range as “a pile of black mountains . . . upon both sides” of the Colorado River (Whipple 1856: 109).

First Lieutenant Joseph Christmas Ives, also of the Topographical Engineers, had accompanied Whipple in 1853–1854 (Whipple 1856). He led a steamboat expedition in 1857 and 1858 up the Colorado River from Yuma to Las Vegas, and further explored the Grand Canyon area on foot (Ives 1861). About the Grand Canyon, Ives wrote:

The region last explored is, of course, altogether valueless. It can be approached only from the south, and after entering it there is nothing to do but leave. Ours has been the first, and will undoubtedly be the last, party of whites to visit this profitless locality. It seems intended by nature that the Colorado River, along the greater portion of its lonely and majestic way, shall be forever unvisited and undisturbed (Ives 1861: 110).

In contrast, when Ives was approaching the Whipple Mountains, he wrote:

We are now at the verge of the foot-hills of a continuous chain of mountains, that crosses the Colorado ten miles above, and has been in sight for many days. Among the group of fantastic peaks that surmount the chain is a slender and perfectly symmetrical spire that furnishes a striking landmark, as it can be seen from a great way down the river in beautiful relief against the sky (Ives 1861: 55).

The Whipple Mountains, together with the Buckskin Mountains across the Colorado River, are referred to as the Monument Mountains in the report and map. Ives gave the name Mount Whipple to “a high peak” of the mountains, visible from the north side (Ives 1861: 60; probably the butte at 34°20′46″N, 114°19′30″W). The name Whipple Mountains was first applied to the range on the USGS Parker quadrangle of 1902–1903 (Gudde 1998).

The Atchison, Topeka & Santa Fe Railroad runs along the south side of the mountains, and arrived in Parker around 1910 (Vredenburg et al. 1981).

Remnants of mines can be found throughout the mountains. Many of these were active between 1880

and 1920 (Vredenburg et al. 1981; Sheridan 2000). Copper ore was the primary product, but gold, silver, and manganese ores were also found (Bishop 1964; Preston 1974; Vredenburg et al. 1981; Sheridan 2000). Vredenburg et al. (1981) suggest that soldiers stationed along the river probably discovered the first veins, and some mining began as early as 1862, mostly in Copper Basin or the area of Havasu Palms. The Black Metal Silver Mine near Black Metal [Meadow?] Landing began operation around 1879, worked by Pete McGuire and the Levi brothers. Just to the north, John S. Jennings pulled gold ore from the Klondike Mine between 1897 and 1911. In Copper Basin, the Grand Central and Copper Basin mines began operation around 1881, producing both copper and silver ores. During both World Wars, several mines near Monument Peak produced manganese ores. The American Eagle Mine, in the western part of the mountains, was active between 1875 and 1919, employing up to five men and having a shaft 300 feet deep by 1908. Nearby, the D&W mine, named for its discoverers, Dayton and Wilbur, employed three shifts of men at times, boasted a 700-foot deep shaft, and had water available on the third level. It was active only between 1906 and 1916, and usually closed between June and September due to heat (Vredenburg et al. 1981).

One prominent resident of the area was Wyatt Earp. He and his wife, Josephine, lived in Parker, Calzona (near today’s Big River), and Vidal between 1905 and 1928 (Boyer 1976; Reidhead 2002). Earp filed about 100 claims, probably in the southern part of the Whipple Mountains, under the name Happy Day Mining Company (Boyer 1976). He found enough gold and copper to earn a living by prospecting, at one point having a shaft 100 feet deep (Boyer 1976; Vredenburg et al. 1981). He also kept a cabin in Drennan, now called Earp in his honor, across the river from Parker (Durham 1998; Reidhead 2002).

The Colorado River Indian Reservation was established on 3 March 1865 (Okimoto 2001). It covers over 97,125 hectares (240,000 acres; 375 square miles) of land in the Colorado Valley. Primary tribes represented are the Mojave, Chemehuevi, Hopi, and Navajo. Headgate Rock Dam, completed in 1941, allows for the diversion of water into the valley for irrigation (Okimoto 2001). A large portion of the reservation’s present income is from agriculture (Charles Land pers. comm.).

The Colorado River Project was approved in 1931. Crossroads became a boomtown of 2000–3000 people in the 1930s during the construction of Parker Dam (Schweich 2004). The 98 m (320 ft)-tall dam was completed in 1938 and includes four hydroelectric generators. When finished, Lake Havasu formed behind Parker Dam. Its name was given when a Mojave Indian chief used the words “*ahá havasúu*,” or *blue wa-*

Table 1. Botanical collectors in the Whipple Mountains area, based on herbarium specimens from RSA-POM, CAS/DS, UC/JEPS, UCR, and ARIZ.

1910	J. Grinnell
1912	W. L. Jepson
1915	F. Shreve
1918	R. S. Ferris
1920	P. A. Munz & R. D. Harwood
1922	L. M. Newlon
1928	R. S. Ferris
1931	G. J. Harrison, T. H. Kearney, H. J. Fulton
1932	C. B. Wolf
1932	F. W. Peirson
1932	R. S. Ferris & R. Bacigalupi
1934	M. B. Dunkle
1935	F. W. Peirson
1935	M. B. Dunkle
1936	M. D. Clary
1937	F. Shreve
1937	J. C. Roos
1937	R. M. Perkins & H. de Forest
1938	R. M. Perkins & H. de Forest
1939	A. Nelson & R. A. Nelson
1939	A. M. Alexander
1939	A. M. Alexander & L. Kellogg
1939	C. B. Wolf
1939	E. C. Jaeger
1939	R. S. Woglum
1940	A. M. Alexander & L. Kellogg
1940	C. B. Wolf
1940	E. C. Jaeger
1940	R. S. Woglum
1941	E. C. Jaeger
1941	P. A. Munz
1941	R. S. Woglum
1941	R. S. Woglum & E. M. Harvey
1942	R. A. Darrow
1949	D. D. Keck, H. G. Baker, P. Dansereau, H. Nordenskiöld
1949	J. C. Roos
1949	J. C. Roos & L. Roos
1949	J. H. Thomas
1949	N. C. Cooper
1951	J. F. Brenckle
1952	G. Monson
1952	L. C. Wheeler
1952	R. L. Dressler
1954	R. K. Vickery
1955	J. Ingram
1956	G. Day
1956	P. C. Everett & E. K. Balls
1957	G. Gugisberg
1957	L. C. Wheeler
1958	E. K. Balls
1958	L. C. Wheeler
1958	P. C. Everett & E. K. Balls
1958	P. H. Raven
1958	R. Alava
1958	R. Bacigalupi & R. S. Ferris
1958	R. S. Ferris & R. Bacigalupi
1960	W. M. Klein & R. K. Benjamin
1962	R. Bacigalupi, L. Heckard, P. C. Hutchinson
1965	R. J. Barr
1966	F. C. Vasek
1967	R. J. Barr
1968	N. Meng
1968	R. C. Wilson

Table 1. Continued.

1970	F. C. Vasek
1970	N. D. Atwood
1971	F. C. Vasek
1972	Faulkner
1973	F. C. Vasek
1973	J. F. Emmel
1974	A. & B. Phillips, T. R. Van Devender, J. I. Mead
1974	B. G. Phillips & A. M. Phillips III
1974	B. G. Phillips, T. R. Van Devender, A. M. Phillips III
1974	G. Helmkamp
1974	J. F. Emmel
1974	J. M.
1974	J. R. Shevock
1974	R. F. Thorne
1974	T. R. Van Devender
1974	W. R. O.
1974	W. R. O. & J. M.
1975	R. M. Turner & D. E. Brown
1978	A. C. Sanders
1978	A. C. Sanders & R. Twitchell
1978	Faulkner
1978	N. Farrell & S. Crowley
1978	R. Twitchell
1978	R. C. Rollins & K. W. Rollins
1978	Sears
1980	A. C. Sanders
1980	A. C. Sanders & J. Zabriskie
1982	A. Borden
1982	R. D. Goeden & D. W. Ricker
1983	A. C. Sanders
1983	J. F. Emmel
1984	R. D. Goeden
1985	Anonymous
1985	D. Charlton
1986	D. Charlton
1986	G. Helmkamp
2001	C. McGaugh
2001	J. L. Anderson & C. Bobinski
2001	J. M. Porter
2003	S. J. De Groot et al.
2004	S. J. De Groot et al.

ter in the Mojave language, to describe it (Durham 1998; Gudde 1998).

The 242-mile Colorado River Aqueduct, administered by the Metropolitan Water District of Southern California, was completed in 1941 and brings water to Lake Mathews (near Temecula/Perris) and San Vicente Reservoir (near San Diego; Beck and Hasse 1974; Mount 1995). Water is pumped from Whitset Intake, at 139 m (455 ft) elevation just upstream from Parker Dam, through the Colorado River Tunnel into Gene Reservoir, about 2.4 km (1.5 mi) west of Parker Dam. From here, it passes through Gene Pumping Station and the Copper Basin Tunnel to Copper Basin Reservoir, a few miles further west, at 313 m (1028 ft). In total the water is raised 175 m (573 ft). After flowing through the Whipple Mountain Tunnel to the west portal on the southeast side of the mountains, the water

flows by gravity about 97 km (60 mi) to Iron Mountain Pumping Station, at 274 m (900 ft) elevation.

Botanical Collectors

Herbarium specimens (743 collections, prior to this study) indicate that several botanists made a number of collections in the Whipple Mountains, but no collector systematically explored the entire area (Table 1). The earliest collections were made along the Colorado River, by J. Grinnell in 1910 and Willis Linn Jepson in 1912. Carl Wolf traveled through the area for three days in 1932, collecting at Earp, in Copper Basin, along the Colorado River, at the American Eagle Mine, and at the West Well (Hank's Well). Annie Alexander and Louise Kellogg made two trips, one in 1939 and another in 1940, making collections in Copper Basin, Crossroads, Gene Wash, and a canyon in the northern part of the range. Andrew Sanders made four trips, in 1978, March 1980, November 1980, and 1983, making collections primarily on the eastern side of the mountains. David Charlton and G. Helmkamp made collections in 1986 and probably penetrated the deepest into the BLM Wilderness area (4 miles up Whipple Wash from the powerline road). Arthur Phillips and Thomas Van Devender made collections of extant taxa in 1974 while sampling packrat middens in the southern portion of the range.

Other collectors include Philip A. Munz (in 1920 and 1941), Roxanna S. Ferris (mostly in 1928), Meryl B. Dunkle (1935; Munz and Keck 1959), Frank W. Peirson (also in 1935), Russell Woglum (1939 and 1940), G. Gugisberg (1957), and J. Mark Porter (2001). Most specimens were collected along highways or 4-wheel drive roads, with 82.4% of the collections made in the months of March, April, or May. It is also interesting to note that collection activity lags behind precipitation by about two months, presumably the time necessary for annuals to flower.

John M. Bigelow collected the type specimen of *Oenothera brevipes* A. Gray (= *Camissonia brevipes* (A. Gray) Raven) in "gravelly hills on and near the Colorado, February 17 and 20," 1854, during the Whipple Expedition (1854, *Bigelow s.n.*, lectotype GH; "isotype" US, NY; Torrey 1856: 87). Although "California" is noted on the label and the party camped along the Colorado near the mouth of the Bill Williams River on 20 February, the expedition did not cross the Colorado River into California until 27 February, near present-day Needles (Whipple 1856). Consequently, the specimen was probably collected in Arizona along the Bill Williams River, where the expedition traveled between 1 and 20 February.

VEGETATION HISTORY

Early History

The warm temperatures of the Paleocene (65 million years ago [mya]) allowed temperate evergreen and

tropical rainforests to cover much of North America (Van Devender 2002a,b). During the Eocene (54–35 mya), deciduous forests developed as a result of warmer temperatures and increased seasonality of precipitation (Van Devender 2002b). Many adaptations of present-day desert plants evolved during this time (Van Devender 2002a,b). Grasses diversified in the Oligocene (36.6–23.7 mya; Van Devender 2000).

The early Miocene (30–15 mya) was a time of geologic uplifts and volcanic activity in North America (Van Devender 2002b), although this activity may have occurred earlier in the Oligocene (Van Devender 2002a). The uplifts of the Sierra Madre, Rocky Mountains, Transverse, and Peninsular ranges created rain shadows in the Sonoran Desert region (Axelrod 1995). The several detachment faults in and around the Whipple Mountains were created at this time (Norris 1995; Scarborough 2000). Common desert plants may have speciated in the early to middle Miocene, in thornscrub plant communities further south (Van Devender 2000, 2002a,b). A middle Miocene (15–8 mya) drying trend created much of the Sonoran Desert, and desert vegetation existed by the late Miocene (8–5 mya; Axelrod 1995; Van Devender 2000, 2002a,b).

The marine deposits of the Imperial and Bouse Formations were laid down in the Pliocene (5–1.8 mya) as a result of ocean expansion. At this time the climate was warm and received summer rainfall (Van Devender 2000, 2001, 2002a). Lake deposits in the Vidal Valley date to around this time (Bishop 1964).

The region cooled again in the Pleistocene (1.8 mya–10,500 years before present [ybp]; Van Devender 2000, 2002b). Glaciers covered much of the continent, pinyon-juniper forests covered much of the Sonoran desert, and desert or tropical plants, like *Cercidium* spp. or *Carnegiea gigantea*, were likely restricted to refugia farther south during glaciation (Wells and Hunziker 1976; Van Devender 1977, 2002a).

Midden Data

Middens are hardened deposits of organic materials collected by packrats (*Neotoma* spp.). The dried plants contained in middens allow a glimpse of the vegetation in the area when the midden was occupied (Wells and Berger 1967; McAuliffe and Van Devender 1998). The age of the midden is usually determined by radiocarbon dating of organic matter, which can provide records of plants as far back as 51,000 ybp (Van Devender 1990, 2002a; Thomas Van Devender pers. comm.). Four sites in the Whipple Mountains have yielded both Pleistocene and Holocene middens (see Fig. 2; Van Devender 1990; Thomas Van Devender pers. comm.).

Late Pleistocene.—Woodland composed of *Juniperus californica*, *Pinus monophylla*, *Yucca brevifolia*, and

Table 2. Occurrences of fossil plants from 13,810 years before present (ybp) to present.

	Pleistocene 13,810– 10,500 ybp	Early Holocene 10,500– 9000 ybp	Middle Holocene 9000–4500 ybp	Late Holocene 4500–0 ybp
<i>Pinus monophylla</i>	+			
<i>Yucca brevifolia</i>	+			
<i>Yucca whipplei</i>	+	+		
<i>Juniperus californica</i>	+	+		
<i>Artemisia tridentata</i>	+			
<i>Artemisia confertifolia</i>	+			
<i>Cercocarpus intricatus</i>	+			
<i>Coleogyne ramosissima</i>	+			
<i>Nolina bigelovii</i>	+	+	+	+
<i>Ephedra nevadensis</i>	+	+	+	+
<i>Crossosoma bigelovii</i>	+	+	+	+
<i>Salvia mohavensis</i>	+	+	+	+
<i>Vulpia octoflora</i>	+	+	+	+
<i>Bouteloua aristidoides</i>	+	+	+	+
<i>Larrea tridentata</i>	+	+	+	+
<i>Achnatherum speciosum</i>	+	+	+	+
<i>Poa bigelovii</i>		+	+	+
<i>Bromus arizonicus</i>		+	+	+
<i>Pleuraphis rigida</i>		+	+	+
<i>Dasyochloa pulchella</i>		+	+	+
<i>Encelia farinosa</i>	+	+	+	+
<i>Peucephyllum schottii</i>	+	+	+	+
<i>Acacia greggii</i>	+	+	+	+
<i>Ambrosia dumosa</i>		+	+	+
<i>Parkinsonia floridum</i>			+	+
<i>Hyptis emoryi</i>			+	+
<i>Aristida purpurea</i> var. <i>nealleyi</i>			+	+
<i>Aristida ternipes</i> var. <i>hamulosa</i>			+	
<i>Bouteloua barbata</i>			+	+

(from Van Devender 1990; Van Devender et al. 1990).

Y. whipplei existed in the Whipple Mountains in late Pleistocene, 13,810–10,500 ybp, with *P. monophylla* occurring as low as 510 m (1670 ft; Table 2; Wells and Berger 1967; Van Devender and Spaulding 1979; Cole 1986; Van Devender 1990, 2002a; Anderson and Van Devender 1991; Lanner and Van Devender 1998). *Juniperus californica* and *Y. brevifolia* were found as low as 260 m (850 ft; Wells and Hunziker 1976). *Quercus turbinella* or *Q. palmeri* probably were associated with these woodland plants at higher elevations (Wells and Hunziker 1976). Additionally, *Artemisia tridentata*, *A. confertifolia*, *Cercocarpus intricatus*, and *Coleogyne ramosissima* were scattered in the area (Van Devender and Spaulding 1979; Van Devender 1990; Van Devender et al. 1990). *Acacia greggii*, *Aloysia wrightii*, *Bouteloua aristidoides*, *Crossosoma bigelovii*, *Encelia farinosa*, *Ephedra aspera*, *Nolina bigelovii*, *Salvia mohavensis*, and *Vulpia octoflora* were also present at this time and still occur in the area (see Appendix 2; Van Devender 1990; Van Devender et al. 1990; Anderson and Van Devender 1991;

USDA 2004; Thomas Van Devender pers. comm.). Many of these plants are now more common in the Mojave Desert and Great Basin, and today's Sonoran plants were scarce in middens (see Van Devender 1977; Van Devender and Spaulding 1979; Cole 1986). In the nearby Kofa Mountains in Arizona, *Castela emoryi* grew at 550 m (1800 ft) with juniper and Joshua tree, while today it occurs rarely in desert lowlands in the area (e.g., near Chemehuevi Wash; Van Devender and Spaulding 1979). *Larrea tridentata* arrived in the late Pleistocene (ca. 11,000 ybp), and creosote bush communities occurred below 300 m (984 ft) in the Lower Colorado valley (Wells and Hunziker 1976; Van Devender 1977, 2002b; Rowlands 1995a). These individuals were diploids (Hunter et al. 2001). The winter climate was similar to the present, but summers were cooler, and most precipitation fell in winter (Van Devender 1977, 1990, 2002a; Van Devender and Spaulding 1979).

Holocene.—The early Holocene, from about 10,500 to 9000 ybp, probably received little or no summer rainfall (Van Devender and Spaulding 1979; Van Devender 1990). Van Devender and Spaulding (1979) also report that *Pinus monophylla* and *Yucca brevifolia* most likely retreated north out of the Whipple Mountains by 10,000 ybp. Prominent species of the modern flora were present, including *Acacia greggii*, *Achnatherum speciosum* [= *Stipa speciosa*], *Ambrosia dumosa*, *Bromus arizonicus*, *Dasyochloa pulchella* [= *Erioneuron pulchellum*], *Encelia farinosa*, *Larrea tridentata*, *Opuntia basilaris*, *Peucephyllum schottii*, *Pleuraphis rigida* [= *Hilaria rigida*], and *Poa bigelovii* (Table 2; Van Devender 1977, 1990, 2002b; Van Devender et al. 1990; Thomas Van Devender pers. comm.). *Carnegiea gigantea* expanded to the northern edge of its present range during this time and also may have arrived in the Whipple Mountains, but there are no records of it from middens in the area. At this time it was generally more common than it is today throughout the rest of its present range (Van Devender 2002a). Creosote-bursage (*Larrea tridentata*, *Ambrosia dumosa*) communities were well developed in lower areas along the Colorado River (Van Devender and Spaulding 1979).

The middle Holocene, from 9000 to 4000 ybp, had essentially hot summers, some summer rainfall (perhaps greater than today), and occasional winter freezes (Van Devender 1990; Van Devender et al. 1990). *Yucca whipplei* and *Juniperus californica* ceased to exist in the area by 8000 ybp (Van Devender and Spaulding 1979; Van Devender 1990). Documented new arrivals during this period include *Aristida purpurea* var. *nealleyi* [= *A. cf. glauca*], *A. ternipes* var. *hamulosa*, [= *A. hamulosa*], *Bouteloua barbata*, *Parkinsonia florida*, *Fouquieria splendens*, and *Hyptis emoryi*, as well as

other desert scrub plants (Van Devender 1977, 1990; Van Devender and Spaulding 1979; Van Devender et al. 1990). Hexaploid *Larrea tridentata* individuals were found in packrat middens in the Whipple Mountains as recent as about 3900 ybp, and at present the range probably contains a mix of hexaploid and tetraploid plants (Hunter et al. 2001).

Essentially modern desert plant communities and the modern climate regime of hot summers and little rainfall were established about 4500 ybp, with a wet period around 1000 ybp (Van Devender 1990, 2001, 2002a, 2002b; Anderson and Van Devender 1991). *Bouteloua barbata* and *Dasyochloa pulchella* [= *Erioneuron pulchellum*] were the only grasses found in midden samples of this age (Van Devender et al. 1990). *Parkinsonia microphylla* and *Olneya tesota* also may have arrived during this time (Table 2; Van Devender 2001).

Recent History

Much of the riparian area bordering the river supported cottonwood-willow habitat during the time of early exploration (Sitgreaves 1854; Bigelow 1856; Ives 1861; Alexander 1939). This habitat is now scarce due to development. Ives (1861) writes that there was little vegetation in the Chemehuevi Valley other than isolated patches of mesquite near the river. Although Sitgreaves' report (1854: 18) states that the county was "barren and devoid of interest," it does mention some plants that were found along the Colorado River: "Some large cotton-wood trees [*Populus augustifolia*, *P. monilifera*] grow directly upon the river banks, but the growth of the rest of the valley is small, consisting chiefly of mezquit [*Algarobia glandulosa*] = *Prosopis glandulosa*], tornilla [*Prosopis odorata*] = *P. pubescens*], willow [*Salix* spp.], and a singular tree with smooth, pale green bark, and leaves so diminutive as to require a close proximity to discern them [perhaps *Parkinsonia microphylla*]. The shrubs are the arrow-wood [*Tessaria borealis*] = *Pluchea sericea*], wild sage [probably *Hyptis* or *Salvia*], hediondilla, or creosote plant, and grease weed [*Atriplex canescens*]. . ." (21–22, 39–40). Also mentioned are "*Cereus giganteus*" (= *Carnegiea gigantea*), *Phoradendron californicum*, "*Machaeranthera canescens*" (= *Machaeranthera asteroides*), "*Arundo phragmites*" (= *Phragmites communis*), a tall clumped grass (perhaps *Pleuraphis rigida*), and a smaller kind of grass with crusts of salt on its leaves (perhaps *Distichlis*; Sitgreaves 1854: 22, 160, 161; see also Bigelow 1856; Whipple 1856). Additionally, Bigelow (1856: 14) mentions an "aromatic shrub" belonging to "Ambrosiae, of Compositae," which the mules ate (perhaps *Ambrosia dumosa*).

PRESENT VEGETATION

Nine plant communities (as defined by Holland and Keil 1995; Rowlands 1995b) were recorded in the Whipple Mountains. Creosote bush scrub is the dominant vegetation type on lower mountain slopes below 915 m (3000 ft) elevation and over bajadas and valleys of the Sonoran Desert (see Fig. 4; Shreve 1964; Holland and Keil 1995; Rowlands 1995b). It is the primary vegetation type on the plains of mixed Quaternary alluvium around the mountains. Dominant species include *Larrea tridentata*, *Ambrosia dumosa*, and *Encelia farinosa*; also common are *Ferocactus cylindraceus* var. *cylindraceus*, *Cylindropuntia bigelovii*, *C. echinocarpa*, *O. basilaris* var. *basilaris*, and *Pleuraphis rigida* (see also Holland and Keil 1995). In the Whipple Mountains, *L. tridentata* has been collected between 91 and 1055 m (300 and 3460 ft). *Pleuraphis rigida*, often considered restricted to lower plains, dunes, and bajadas (Shreve 1964), was collected just over 1097 m (3600 ft) on a ridge. Common plants not found on lower bajadas but associated with *L. tridentata* at higher elevations are *Agave deserti*, *Echinocereus engelmannii*, *Ephedra aspera*, *Ephedra fasciculata*, *Lycium fremontii*, and *Nolina bigelovii*.

The bluffs of Tertiary volcanic rock on the eastern side of the mountains are sparsely vegetated, possibly a consequence of a lack of penetration by water or roots (Shreve 1964). In most places, sloping piles of boulders obscure the bases of these bluffs. A few common species that are encountered among or on these rocks include *Eucnide urens*, *Machaeranthera pinna-tifida* subsp. *gooddingii*, *Peucephyllum schottii*, and *Pleurocoronis pluriseta* (see also Rowlands 1995b). These plants may also be found on red Tertiary sedimentary deposits in the vicinity of Bowman's Wash.

Only a few small areas along the Colorado River support sand dune plants. Prominent species here are *Abronia villosa*, *Dicoreia canescens*, *Ephedra trifurca*, *Hesperocallis undulata*, *Oenothera deltoides* subsp. *deltoides*, *Palafoxia arida* var. *arida*, *Pleuraphis rigida*, and *Tiquilia palmeri*. Occasionally some of these plants may be found in sandy washes. This community is probably the most threatened since most dune areas in the mountains are designated off-highway vehicle (OHV) areas.

One unique community in the Whipple Mountains is the foothill paloverde-saguaro woodland (Rowlands 1995b). This vegetation type is restricted to the rocky slopes on the eastern side of the mountains, near the river, and plant density is low (104 *Carnegiea gigantea* individuals in 6 square miles; Brum 1973). Besides *C. gigantea* and *Parkinsonia microphylla*, the shrubs present are typical of creosote bush scrub.

Floodplains and small basins along the Colorado River are home to alkali sink plant communities. These

plants tolerate up to 2.5% salts in the soil (Rowlands 1995b). *Allenrolfea occidentalis*, *Atriplex canescens*, *A. lentiformis* subsp. *lentiformis*, *A. polycarpa*, *Distichlis spicata*, and *Suaeda moquinii* may be found in these areas.

Many drainages from the mountains support desert wash communities. Characteristic trees in larger washes through the bajadas are *Olneya tesota* and *Psoralea argophylla*. Common in all washes are *Acacia greggii*, *Ambrosia salsola* var. *salsola*, *Bebbia juncea*, *Brandegeeia bigelovii*, *Parkinsonia florida*, *Hyptis emoryi*, *Lycium andersonii*, and *Phoradendron californicum*. *Sporobolus airoides* is found in washes usually above 305 m (1000 ft), where it is frequently associated with exposed granitic bedrock. In the springtime, washes support a colorful diversity of annuals. Non-native *Tamarix chinensis* is occasionally encountered in mountain washes.

Common shrubs in Chemehuevi Wash are *Acacia greggii*, *Ambrosia salsola* var. *salsola*, *Chilopsis linearis*, and *Ericameria paniculata*, which approximate cheesebush scrub (Rowlands 1995b). Although *Acacia greggii* and *Ambrosia salsola* var. *salsola* are found in smaller washes throughout the mountains, they are usually not as prolific as observed in Chemehuevi wash, where *Chilopsis linearis* and *Ericameria paniculata* are restricted. The trees, *Parkinsonia florida* and *Psoralea argophylla*, are typical of large desert washes.

A few canyons contain year-round running water, and support desert riparian communities. *Baccharis sergilloides*, *Pluchea sericea*, *Populus fremontii*, *Prosopis glandulosa* var. *torreyana*, and *Washingtonia filifera* are found along with non-natives *Nerium oleander*, *Phoenix dactylifera*, and *Tamarix chinensis* (see Fig. 7). *Washingtonia filifera* may have naturalized from cultivated plants in human developments along the river, since it is found only in canyons close to the river (except a single individual in Whipple Wash). Aquatic plants, such as *Myriophyllum sibiricum*, *Najas marina*, *Potamogeton nodosus*, and *P. pectinatus* may be encountered.

Much of the Colorado River bottom habitat has been lost due to development, but a few areas still support this plant community. Typical plants include *Pluchea sericea*, *Populus fremontii*, *Prosopis glandulosa* var. *torreyana*, *P. pubescens*, *Salix gooddingii*, *S. exigua*, and *Typha domingensis*. Portions of this habitat have been invaded by *Arundo donax* and *Tamarix chinensis*.

WHY ARE SOME SONORAN DESERT PLANTS NOT FOUND WEST OF THE COLORADO RIVER?

Shreve (1964: 50) observed that “there are also some notable floristic differences between the eastern and western edges of the area [the Sonoran Desert].”

According to Van Devender (1977), factors that have historically affected plant distribution in the southwestern United States are temperature regimes (winter lows and summer highs) and rainfall patterns (winter vs. summer precipitation). Both temperature and precipitation are influenced by topography and elevation (Beatley 1975), with moisture probably more influential in determining the distributions of plants (Beatley 1974, 1975; Van Devender and Spaulding 1979).

Summer rainfall, which occurs between June and October, may have a great influence on biotic distributions. Some annuals germinate only in response to summer rainfall. Summer annuals were not found in packrat middens in the Whipple Mountains until summer precipitation began to occur (Van Devender and Spaulding 1979). Summer moisture or orographic effects may influence the lower elevational limit of woodland in the Mojave Desert (Wells and Berger 1967). A factor influencing the establishment of saguaro seedlings is July–August precipitation (Brum 1973). Summer rainfall may be a limiting factor for the western limits of some Sonoran Desert plants (Van Devender and Spaulding 1979).

Today in the Sonoran Desert, summer rainfall increases toward the southeast and winter rainfall increases toward the northwest (Fig. 13; Shreve 1964; Van Devender and Spaulding 1979). During the summer monsoon season (Jun–Oct) in the southwestern United States, a distinct anticyclone of high pressure is present over northwestern Mexico, along with a trough that allows tropical moisture to move up the Gulf of California and into Arizona and New Mexico (Higgins et al. 2002). The clockwise direction of the anticyclonic flow may induce summer storms to move up the Colorado Valley or curve eastward after reaching the head of the Gulf of California rather than turning westward. This reduces the chances of the California Sonoran Desert receiving as much rainfall as the Arizona portion of the Sonoran Desert. The intensity of the monsoon rains varies annually, even within a single summer, and is influenced by factors such as winter moisture in the southwest and northwest states, the El Niño/Southern Oscillation, and snow pack in the western United States (Higgins et al. 2002).

The Whipple Mountains today receive about 36% (43.0 mm; 1.69 in) of their annual rainfall of 119.5 mm (4.70 in) in summer monsoons from June through October (Fig. 14; see also Van Devender 1990; Van Devender et al. 1990; Rowlands 1995a). To the east, more precipitation falls in the summer than in the winter (Fig. 14; Seligman, Tucson). In Buckeye, near Phoenix, about 44% of total annual precipitation falls in the summer. Along the Colorado Valley, summer rainfall accounts for 36 to 48% of the annual total

Fig. 13–15. Precipitation in the southwestern USA.—13. Map showing the rainfall trend in the southwest, with weather stations and four major cities for reference.—14. Amounts of winter (Nov–May) and summer (Jun–Oct) precipitation.—15. Average annual precipitation for eleven cities in the southwest deserts. Sources: Fig. 13: USGS; Figs. 14, 15: US Historical Climatology Network, NOAA.

(Boulder City, Needles, Parker, Blythe, Yuma). To the north and west, less than one third of the total annual precipitation falls in the summer (Death Valley, Brawley, Indio; Fig. 14).

Total annual rainfall increases toward the east (Fig. 15; Seligman, Buckeye, Tucson), while to the west in

the Lower Colorado Valley and southeast California annual precipitation decreases. Total precipitation appears to increase slightly from south to north along the Colorado Valley, however, this may also be due to elevation or latitude.

Summer rainfall, however, is extremely variable, even in areas that receive a substantial portion of their annual precipitation from summer monsoons (see Fig. 8 in De Groot 2004). Since the amount of summer rainfall in all areas of the Sonoran Desert varies widely between years, the quantity is probably less important than the fact that precipitation occurs during the summer months (see also Beatley 1975, 1976).

Since Parker generally receives some summer moisture, less than areas farther east (e.g., Buckeye), but more than areas farther west (e.g., Indio), plants that depend on summer moisture (e.g., *Carnegiea gigantea*) may be able to survive. In most cases, the western margins of their ranges fall in the Whipple Mountains (e.g., List 2 taxa in Table 6). To the east, greater summer rainfall allows these plants to flourish, while to the west lack of summer rainfall prohibits establishment. The occurrences of California Sonoran, Mojave, and also these Arizona Sonoran desert plants within the mountains create a unique flora, as the area is more or less the only place where these elements have the potential to co-occur.

SURVEY METHODS

Collecting permits were obtained from all four land management agencies [BLM 6850(P) CA-930; Chemehuevi Indian Tribe 21 Jul 2003; MWD 28 Aug 2003; CRIT 2004002; Appendix 3 in De Groot 2004]. An additional permit was obtained from the San Bernardino County office of the US Department of Agriculture (USDA) to cover rare desert plants described in Section 80072 of the California Food and Agricultural Code, not covered under the BLM permit (permit 36-153003-1; John Willoughby pers. comm.; De Groot 2004).

Twenty-seven trips were made to the study area, resulting in 69 days of field-collecting at 425 localities (Fig. 16). In all, 3564 specimens were collected and identified, 163 (4.57%) of which were cacti, a traditionally under-collected group. A field press was used in making most collections (Herbarium Supply Company, Item 180). Each trip attempted to cover different regions of the Whipple Mountains, in order to sample as many locations and habitat types as possible. Several all-day hikes and two backpack trips were made into the Wilderness area. At many localities, samples of all plants present were collected.

Five regional herbaria were searched for specimens from the Whipple Mountains. These were the California Academy of Sciences/Dudley Herbarium (CAS/

Fig. 16. Localities of all plant collections used in this study (white Xs: previous collections; white circles: De Groot). The study area boundary is marked with a solid white line. Reproduced with permission (©2004 DeLorme [www.delorme.com] TopoUSA®, vers. 5.0).

DS; 121 specimens found), University of California and Jepson Herbaria (UC/JEPS; 185), University of California at Riverside (UCR; 222), University of Arizona at Tucson (ARIZ; 68), and Rancho Santa Ana Botanic Garden/Pomona College (RSA-POM; 271). Early collections, such as those made on army expeditions, were not searched due to time and funding constraints, and since cursory glances at the vague locality information given in the reports did not yield any specimens that may have come from the area. All specimens (867) were received on loan for verification of determinations. Of these, 124 were duplicates, leaving 743 unique specimens. J. Mark Porter contributed 213 collections from 2001. In total, 4525 specimens were examined.

FLORA

Numerical Summary

Sixty-eight families of vascular plants, as recognized by Thorne with Reveal (2005) and Hoogland and Reveal (2005; see also Baldwin et al. 2002) were represented. There were 376 species and 9 infraspecific taxa, for a total of 385.

Five hybrids were discovered. *Opuntia wigginsii* is placed on CNPS List 3 (Tibor 2001), but this may be either a hybrid of *Cylindropuntia ramosissima* × *C. echinocarpa*, or merely a dwarf form of *C. echinocarpa* (Tibor 2001; Baldwin et al. 2002; Pinkava 2004). It is occasionally encountered in the bajadas around the mountains. *Parkinsonia microphylla* × *P. florida*

had been found along Parker Dam Road on the south-east side of the mountains (Jones et al. 1998). In the present study it was collected primarily throughout the eastern side of the range. One collection was made of peppermint (*Mentha × piperita*) in a disturbed area along the Colorado River. This plant almost certainly escaped from cultivation. *Camissonia brevipes* × *C. claviformis* was collected from roadsides and washes in both the eastern and western portions of the range. *Lycium andersonii* × *L. fremontii* was collected once in a wash with more typical forms of both *L. andersonii* and *L. fremontii* also present.

Of 188 annuals, 162 (86.2%) germinate in the winter, generally flowering in the spring or early summer. Fourteen (7.4%) germinate in response to summer precipitation. An additional twelve (6.4%) germinate in response to any rainfall, and have been collected both in the spring and fall. Many perennials also flower following plentiful rainfall, either in the winter or summer, frequently twice in the same year.

Non-Native Taxa

The Whipple Mountains contain 44 non-native plants (11.4% of the total), many of which occur in disturbed areas along the Colorado River (Table 3). Fifteen of these (34.1%) are grasses (Poaceae). Poaceae contain 28 native and 15 non-native (34.9%) grasses. In contrast, four of 66 plants (6.1%) in Asteraceae are non-native. Several introduced species are found throughout the mountains, namely, *Brassica tournefortii*, *Schismus barbatus*, *Tamarix chinensis*, and *Vulpia bromoides*.

The percentage of non-natives appears high compared to other floras. Glass Mountain, in Mono County, California, has only 14 non-native taxa (2.9%, Honer 2001). McLaughlin and Bowers (1990) recorded 34 introductions (5.1%) in the Santa Rita Mountains of southern Arizona. The East Mojave ranges have 66 or 8.1% non-native plants (Thorne et al. 1981), and Clark Mountain is home to just 29 (7.0%; Prigge 1975). Most of these sites, however, are relatively remote with little human activity. In contrast, the Whipple Mountains Study Site includes the housing tract of Big River, the towns of Earp, Vidal, and Parker Dam, and numerous mobile home parks and recreational developments along the Colorado River. The cultivated plants in these communities were not sampled, but a number of plants naturalized into nearby areas and were collected there. Some examples are *Cyperus involucratus*, *Mentha × piperita*, *Nerium oleander*, and *Schinus terebinthifolius*.

Diversity

Measured the traditional way, 385 different kinds of plants found on about 129,500 hectares (500 square

Table 3. Non-native taxa naturally occurring in the Whipple Mountains area.

Family	Taxon
Anacardiaceae	<i>Rhus lancea</i> <i>Schinus terebinthifolius</i>
Apocynaceae	<i>Nerium oleander</i>
Arecaceae	<i>Phoenix dactylifera</i>
Asteraceae	<i>Pseudognaphalium luteo-album</i> <i>Pulicaria paludosa</i> <i>Senecio vulgaris</i> <i>Sonchus oleraceus</i>
Brassicaceae	<i>Brassica tournefortii</i> <i>Capsella bursa-pastoris</i> <i>Sisymbrium altissimum</i> <i>S. irio</i>
Chenopodiaceae	<i>Chenopodium murale</i> <i>Salsola tragus</i>
Cyperaceae	<i>Cyperus involucratus</i>
Fabaceae	<i>Leucaena leucocephala</i> <i>Melilotus alba</i>
Geraniaceae	<i>Erodium cicutarium</i>
Lamiaceae	<i>Mentha × piperita</i>
Malvaceae	<i>Malva parviflora</i>
Molluginaceae	<i>Mollugo cerviana</i>
Myrtaceae	<i>Eucalyptus</i> sp.
Oleaceae	<i>Fraxinus uhdei</i>
Onagraceae	<i>Gaura parviflora</i>
Poaceae	<i>Agrostis semiverticillata</i> <i>Arundo donax</i> <i>Avena sativa</i> <i>Bromus arenarius</i> <i>B. rubens</i> <i>Cynodon dactylon</i> <i>Hordeum murinum</i> subsp. <i>leporinum</i> <i>Paspalum dilatatum</i> <i>Pennisetum setaceum</i> <i>Phalaris minor</i> <i>Polypogon monspeliensis</i> <i>Schismus barbatus</i> <i>Sorghum halepense</i> <i>Triticum aestivum</i> <i>Vulpia bromoides</i>
Potamogetonaceae	<i>Potamogeton crispus</i>
Scrophulariaceae	<i>Bacopa monnieri</i>
Tamaricaceae	<i>Tamarix aphylla</i> <i>T. chinensis</i>
Zygophyllaceae	<i>Tribulus terrestris</i>

miles) equals a diversity of 0.00297 species, subspecies, or varieties per hectare (0.770 species, subspecies, or varieties per square mile). This is comparable to the diversity documented at the Nevada Test Site and in the eastern Mojave ranges (Table 4; Fig. 17; Beatley 1976; Thorne et al. 1981). Clark Mountain was more diverse (Prigge 1975), as was Glass Mountain of the Great Basin desert (Honer 2001) and the Tucson Mountains of the Arizona Upland division of the Sonoran Desert (Rondeau et al. 1996). The Santa Rita Mountains, primarily in the Chihuahuan floristic element, have even higher diversity (McLaughlin and Bowers 1990).

Table 4. Floristic diversity in the southwestern deserts.

Flora	Area: hectares (square miles)	Taxa	Diversity: taxa/hectare (taxa/square mile)	Reference
Nevada Test Site	349,648 (1350)	729	0.0021 (0.540)	Beatley 1976
East Mojave Ranges	329,000 (1270)	819	0.0025 (0.645)	Thorne et al. 1981
Whipple Mountains	129,500 (500)	385	0.0030 (0.770)	This study
Glass Mountain	72,520 (280)	489	0.0067 (1.746)	Honer 2001
Tucson Mountains	40,000 (154)	633	0.0158 (4.110)	Roundeau et al. 1996
Clark Mountain	36,260 (140)	407	0.0112 (2.907)	Prigge 1975
Santa Rita Mountains	26,000 (100)	662	0.0255 (6.620)	McLaughlin and Bowers 1990

However, this raw measure of lower taxa per unit of area can be deceiving. Larger areas, like the East Mojave ranges or the Nevada Test Site, may have lower diversities simply because they cover larger areas. The addition of 2,071,991 hectares around the Nevada Test Site added only 364 plants, decreasing the diversity from 0.0021 species, subspecies, or varieties per hectare (0.540 species, subspecies, or varieties per square mile) to 0.0005 (0.117; Beatley 1976). Also,

taxonomists will note that these ranks themselves are not equivalent and therefore not appropriate to compare as if they were.

The Whipple Mountains flora shares more species with Joshua Tree National Park than with any other flora used in comparison (Fig. 17; Table 5; Steve McLaughlin pers. comm.). As expected, its affinities appear to be primarily to the Californian portion of the Sonoran Desert, but compares fairly well with a number of Mojave and Arizona Sonoran floras. It shares fewer species with floras in the Colorado Plateau, Chihuahuan, and Great Basin deserts. Arizona Upland floras have fewer Whipple Mountains species than floras from the Sonoran Desert in Arizona. Roughly, based on ranges given in Baldwin et al. (2002) and Hickman (1993), the Whipple Mountains flora has 64.1% widespread taxa, 10.4% Sonoran (common in California), 10.4% Mojave, 2.9% mostly found east of the Colorado River, 11.4% introduced, and 0.8% with no range given (unlisted hybrids).

Sensitive Taxa and Interesting Finds

The Whipple Mountains contain 17 plants listed by the California Native Plant Society (Table 6; Tibor 2001). These plants are from thirteen different families, with more than one plant in Cactaceae, Euphorbiaceae, and Fabaceae. Most are more common in Ar-

Fig. 17. Map of all floras used in comparison, with floristic regions in the southwest deserts of the United States. Sources: USGS and Steve McLaughlin pers. comm. Regions drawn from Shreve 1964; McLaughlin 1989, 1995; Baldwin et al. 2002.

Table 5. Number and percentage of Whipple Mountains taxa occurring in other floras in the southwestern United States.

Floristic region	Flora	Number of taxa	Percent
Mojave/California Sonoran	Joshua Tree National Park (Riverside Co., California)	248	75.6
California Sonoran	SE San Diego Co. (San Diego Co., California)	217	66.2
Arizona Sonoran	Castle Dome Mountains (Yuma Co., Arizona)	191	58.2
Mojave	Granite Mountains (San Bernardino Co., California)	176	53.7
Arizona Sonoran	White Tank Mountains RP (Maricopa Co., Arizona)	162	49.4
Mojave	Nevada Test Site (S Nevada)	161	49.1
Arizona Upland	Tucson Mountains (Pima Co., Arizona)	161	49.1
E Mojave	Beaver Dam Mountains (SW Utah)	149	45.4
Arizona Upland	Greater Sedona Area (Yavapai Co., Arizona)	105	32.0
Arizona Upland	Hualapai Mountain Park (Mohave Co., Arizona)	52	15.9
Chihuahuan	Huachuca Mountains (Cochise Co., Arizona)	51	15.5
Colorado Plateau	Canyon de Chelly (Apache Co., Arizona)	38	11.6
Great Basin	Wheeler Peak (E Central Nevada)	15	4.6

Source: Steve McLaughlin pers. comm.

izona, and the Whipple Mountains lie on the western edges of their ranges. Several plants are known only from a single occurrence (e.g., *Androstaphyllum breviflorum*, *Matelea parviflora*, *Castela emoryi*). Some occur primarily in the eastern portion of the mountains (*Carnegiea gigantea*, *Parkinsonia microphyllum*, *Ditaxis clariana*, *Teucrium glandulosum*). Others are restricted to higher elevations (*Aloysia wrightii*, *Quercus turbinella*, *Senna covesii*). A few are scattered throughout the mountains (*Pholistoma auritum* var. *arizonicum*, *Psoralea fremontii* var. *attenuatus*).

Three species previously unrecorded in California also occur in the mountains. *Berberis harrisoniana* Kearney and Peebles was collected from one locality in the northeast part of the range, in a north-facing rocky chute. This plant was known from only five extant populations in Arizona and was thought to be endemic there. It was discovered in the Whipple Mountains by the BLM in 2001 (Anderson and De Groot 2004). It is listed as a Sensitive Species by the BLM and was considered for federal listing, but rejected because it did not appear threatened (Malusa 1995).

Delphinium scaposum Greene had not been reported from California, although it is widespread in Arizona, Colorado, Nevada, New Mexico, Utah, and occasional in Sonora, Mexico. It had been collected along the Bill Williams River and in the Mojave Mountains just a few miles to the east in Arizona. It is sparsely distrib-

Table 6. Taxa occurring in the Whipple Mountains area that are either rare and listed by the California Native Plant Society (CNPS), or previously unreported in California's flora (*).

Taxon	Family	CNPS List ^a
<i>Aloysia wrightii</i>	Verbenaceae	4
<i>Androstaphyllum breviflorum</i>	Alliaceae	2
<i>Berberis harrisoniana</i>	Berberidaceae	*
<i>Bouteloua trifida</i>	Poaceae	2
<i>Carnegiea gigantea</i>	Cactaceae	2
<i>Castela emoryi</i>	Simaroubaceae	2
<i>Cercidium [Parkinsonia] microphyllum</i>	Fabaceae	4
<i>Cryptantha holoptera</i>	Boraginaceae	4
<i>Delphinium scaposum</i>	Ranunculaceae	*
<i>Ditaxis clariana</i>	Euphorbiaceae	2
<i>Erigeron oxyphyllus</i>	Asteraceae	*
<i>Matelea parviflora</i>	Apocynaceae	2
<i>Opuntia [Cylindropuntia] wigginsii</i> ^b	Cactaceae	3
<i>Pholistoma auritum</i> var. <i>arizonicum</i>	Hydrophyllaceae	2
<i>Proboscidea althaeifolia</i>	Martyniaceae	4
<i>Psoralea fremontii</i> var. <i>attenuatus</i>	Fabaceae	2
<i>Quercus turbinella</i>	Fagaceae	4
<i>Senna covesii</i>	Fabaceae	2
<i>Tetracoccus hallii</i>	Euphorbiaceae	4
<i>Teucrium glandulosum</i>	Lamiaceae	2

^a CNPS Listings from CNPS Inventory, ed. 6. (Tibor 2001). List 2: rare, threatened, or endangered in California, but more common elsewhere. List 3: more information needed. List 4: limited distribution, a watch list.

^b Listed as *O. wigginsii*, which may be a hybrid between *Cylindropuntia ramosissima* and *C. echinocarpa*, or a dwarf form of *C. echinocarpa* (Baldwin et al. 2002; Pinkava 2004).

uted throughout the mountains, and found in rocky washes or on rock outcrops (De Groot 2005).

Scattered on rocky hillsides and in washes generally above 915 m (3000 ft), *Erigeron oxyphyllus* Greene was also a new state record. It had been collected in Maricopa, Mohave, Pinal, and Yuma counties, Arizona, and in Sonora, Mexico (De Groot 2005).

These three species show that botanical exploration can still yield important discoveries. The Whipple Mountains have a unique flora, with plants from the Mojave and both sides of the Sonoran Desert. The 385 different taxa documented in this study show that A.W. Whipple's "pile of black mountains" (Whipple 1856: 109) is not just a bare pile of rock.

ACKNOWLEDGMENTS

Many thanks to J. Mark Porter, my primary advisor, mentor, and source of inspiration on many occasions. Thanks also to Clement W. Hamilton, J. Travis Columbus, Steve Boyd, Gary Wallace, James Reveal and Thomas Van Devender for helpful advice and discussion. Permission to collect plants in the area was granted by the Bureau of Land Management (John Willoughby, Needles Field Office), San Bernardino County USDA (George Dearmin), Metropolitan Water

District (Terry Raymond, Robert Readhimer), Chemehuevi Indian Tribe (David Todd), and Colorado River Indian Tribes (Charles Land). I am grateful for the field assistance of J. Mark Porter, Lauren Machen, Michael Denslow, Lee De Groot, Janelle De Groot, Krina De Groot, Angela Gatto, Christopher Stevenson, Constance Baldwin, Tasha LaDoux, Naomi Fraga, Firoozeh Navidara, Harvey and Cathy De Groot, Leland Lubinsky, Linda Lee Worlow, Roy Snelling, Charles Land, and Aydee Virgen. Special thanks also to the One who was there for me the whole time. Herbarium curators Barbara Ertter (UC/JEPS), Bruce Bartholomew (CAS/DS), Andrew Sanders (UCR), Philip Jenkins (ARIZ), and Steve Boyd (RSA/POM) allowed me to search their collections and sent specimens on loan. Thanks also to the Parker Area Historical Society. Funding was provided by Rancho Santa Ana Botanic Garden (Andrew W. Mellon Research and Travel Funds and the Hardman Native Plant Research Endowment), the Southern California Botanists, and the California Native Plant Society.

LITERATURE CITED

- ALEXANDER, A. M. 1939. Field notes. UC/Jepson Herbaria, Berkeley, California, USA. <http://ucjeps.berkeley.edu/Alexander/1939fnM5.html> (Nov 2001).
- AL-SHEHBAZ, I. A. AND S. L. O'KANE, JR. 2002. *Lesquerella* is united with *Physaria* (Brassicaceae). *Novon* **12**: 319–329.
- ANDERBERG, A. A. 1991. Taxonomy and phylogeny of the tribe Gnaphalieae (Asteraceae). *Opera Botanica* **104**: 1–195.
- ANDERSON, J. AND S. J. DE GROOT. 2004. Noteworthy Collection—California. *Madroño* **51**: 395.
- ANDERSON, R. S. AND T. R. VAN DEVENDER. 1991. Comparison of pollen and macrofossils in packrat (*Neotoma*) middens: a chronological sequence from the Waterman Mountains of southern Arizona, U.S.A. *Rev. Palaeobot. Palynol.* **68**: 1–28.
- ARMSTRONG, W. P. 1997. Desert varnish and lichen crust: microscopic organisms color desert rocks. *Desert USA* December. <http://www.desertusa.com/magdec97/varnish/dec-varnish.html> (Nov 2004).
- ATWOOD, N. D. 1975. A revision of the *Phacelia* Crenulatae group (Hydrophyllaceae) for North America. *Great Basin Naturalist* **35**: 127–190.
- AXELROD, D. I. 1995. Paleobotanical history of the western deserts, pp. 3–13. In J. Latting and P. G. Rowlands [eds.], *The California desert: an introduction to natural resources and man's impact*. June Latting Books, Riverside, California, USA.
- BACKEBERG, C. AND F. M. KNUTH. 1935. *Kaktus-ABC: en haandbog for fagfolk og amatører*. Gyldendals Forlagstrykkeri, København, Denmark. 432 p.
- BALDWIN, B. G., S. BOYD, B. J. ERTTER, R. W. PATTERSON, T. J. ROSATI, D. H. WILKEN, AND M. WETHERWAX (editors). 2002. *The Jepson desert manual*. University of California Press, Berkeley, USA. 624 p.
- BEARDSLEY, P. M. AND R. G. OLMSTEAD. 2002. Redefining Phrymaceae: the placement of *Mimulus*, tribe Mimuleae, and *Phryma*. *Amer. J. Bot.* **89**: 1093–1102.
- BEATLEY, J. C. 1974. Effects of rainfall and temperature on the distribution and behavior of *Larrea tridentata* (creosote bush) in the Mojave desert of Nevada. *Ecology* **55**: 245–261.
- . 1975. Climates and vegetation patterns across the Mojave/Great Basin transition in southern Nevada. *Amer. Midl. Naturalist* **93**: 53–70.
- . 1976. Vascular plants of the Nevada Test Site and central-southern Nevada: ecologic and geographic distributions. National Technical Information Service, US Department of Commerce, Springfield, Virginia, USA. 308 p.
- BECK, W. A. AND Y. D. HASSE. 1974. *Historical atlas of California*. University of Oklahoma Press, Norman, USA. 101 p.
- BIGELOW, J. M. 1856. Part 5, Report of the botany of the expedition, no. 1, General description of the botanical character of the country. Route near the thirty-fifth parallel of north latitude, from the Mississippi River to the Pacific Ocean, pp. 1–16. In *Reports of explorations and surveys, to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean* [Pacific Railroad Reports], vol. 4. A. O. P. Nicholson, Printer, Washington, D.C., USA.
- BISHOP, C. C. 1964. Needles sheet [map]. In O. P. Jenkins [ed.], *Geologic atlas of California*. California Division of Mines and Geology, San Francisco, California, USA.
- BLAKE, W. P. 1856. Part 4, Report of the geology of the route, no. 1, General report upon the geological collections. Route near the thirty-fifth parallel of north latitude, from the Mississippi River to the Pacific Ocean, pp. 1–119. In *Reports of explorations and surveys to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean* [Pacific Railroad Reports], vol. 3. A. O. P. Nicholson, Printer, Washington, D.C., USA.
- BOWERS, J. E. 1986. *Seasons of the wind: a naturalist's look at the plant life of southwestern sand dunes*. Northland Press, Flagstaff, Arizona, USA. 156 p.
- BOYER, G. C. 1976. *I married Wyatt Earp: recollections of Josephine Sarah Marcus Earp*. University of Arizona Press, Tucson, USA. 277 p.
- BRUM, G. D. 1973. Ecology of the saguaro (*Carnegiea gigantea*): phenology and establishment in marginal populations. *Madroño* **22**: 195–204.
- CLARKE, M. L. AND H. M. RENDELL. 1998. Climate change impacts on sand supply and the formation of desert sand dunes in the southwest USA. *J. Arid Environm.* **39**: 517–531.
- COLE, K. L. 1986. The lower Colorado River valley: a Pleistocene desert. *Quatern. Res.* **25**: 392–400.
- COOKE, R. U. 1970. Stone pavements in deserts. *Ann. Assoc. Amer. Geogr.* **60**: 560–577.
- CRONQUIST, A. 1982. Map of the floristic provinces of North America. *Brittonia* **34**: 144–145.
- DE GROOT, S. J. 2004. *Vascular plants of the Whipple Mountains*. M.S. thesis, Claremont Graduate University, California, USA. 169 p.
- . 2005. Noteworthy Collection—California. *Madroño* **52**: 125–126.
- DURHAM, D. L. 1998. *California's geographic names: a gazetteer of historic and modern names of the state*. Word Dancer Press, Clovis, California, USA. 1676 p.
- GANDHI, K. N. 1990. Combinations made in the checklist of the vascular plants of Texas. *Phytologia* **69**: 276–277.
- GUDDÉ, E. G. 1998. *California place names*, 4th ed. University of California Press, Berkeley, USA. 467 p.
- HASTON, E. M., G. P. LEWIS, AND J. A. HAWKINS. 2005. A phylogenetic reappraisal of the *Peltophorum* group (Caesalpinieae: Leguminosae) based on the chloroplast *trnL-F*, *rbcL* and *rps16* sequence data. *Amer. J. Bot.* **92**: 1359–1371.
- HENDRICKSON, J. 1985. A taxonomic revision of *Chilopsis* (Bignoniaceae). *Aliso* **11**: 179–197.
- HICKMAN, J. C. 1993. *The Jepson manual: higher plants of California*. University of California Press, Berkeley, USA. 1400 p.
- HIGGINS, W., J. AMADOR, H. BERBERY, R. CARBONE, M. CORTEZ, A. DOUGLAS, M. DOUGLAS, D. GUTZLER, R. LOBATO, J. MEITAN, C.

- ROPELEWSKI, J. SCHEMM, S. SCHUBERT, J. SHUTTLEWORTH, D. STENSRUD, AND C. ZHANG. 2002. North American Monsoon Experiment (NAME): science and implementation plan. <http://www.cpc.ncep.noaa.gov/products/precip/monsoon/> (May 2004).
- HILLIARD, O. M. AND B. L. BURTT. 1981. Some generic concepts in Compositae—Gnaphaliinae. *Bot. J. Linn. Soc.* **82**: 181–232.
- HITCHCOCK, C. L. 1932. A monographic study of the genus *Lycium* of the Western Hemisphere. *Ann. Missouri Bot. Gard.* **19**: 179–374.
- HOLLAND, V. L. AND D. J. KEIL. 1995. California vegetation. Kendall Hunt Publishing Company, Dubuque, Iowa, USA. 516 p.
- HONER, M. A. 2001. Vascular flora of the Glass Mountain region, Mono County, California. *Aliso* **20**: 75–105.
- HOOGLAND, R. D. AND J. L. REVEAL. 2005. Index nominum familiarum plantarum vascularum. *Bot. Rev.* **71**: 1–291.
- HUACHUCA HISTORY PROGRAM. The Spanish Frontier, 1580–1701 [map]. <https://icon.army.mil/anon/content/history/html/maps.html> (Feb 2006).
- HUANG, J., D. E. GIANNASI, AND R. A. PRICE. 2005. Phylogenetic relationships in *Ephedra* (Ephedraceae) inferred from chloroplast and nuclear DNA sequences. *Molec. Phylogen. Evol.* **35**: 48–59.
- HUNTER, K. L., J. L. BETANCOURT, B. R. RIDDLE, T. R. VAN DEVENDER, K. L. COLE, AND W. G. SPAULDING. 2001. Ploidy race distributions since the last glacial maximum in the North American desert shrub, *Larrea tridentata*. *Global Ecol. Biogeogr.* **10**: 521–533.
- IVES, J. C. 1861. Report upon the Colorado River of the West. Government Printing Office, Washington, D.C., USA. 380 p.
- JONES, C. E., L. J. COLIN, T. R. ERICSON, AND D. K. DORSETT. 1998. Hybridization between *Cercidium floridum* and *C. microphyllum* (Fabaceae) in California. *Madroño* **45**: 110–118.
- KERN, E. H. 1852. Reconnaissance of the Zuñi, Little Colorado, and Colorado Rivers. Made in 1851 under the direction of Col. J. J. Abert, Chief of Corps of Topographical Engineers, by Bvt. Capt. L. Sitgreaves, T. E. <https://icon.army.mil/anon/content/history/html/maps.html> (Feb 2006).
- KRINGS, A. 2000. A new combination for *Sarcostemma cynanchoides* var. *hartwegii* (Asclepiadaceae). *Sida* **19**: 137–138.
- LANNER, R. M. AND T. R. VAN DEVENDER. 1998. The recent history of pinyon pines in the American southwest, pp. 171–182. In D. M. Richardson [ed.], *Ecology and biogeography of Pinus*. Cambridge University Press, Cambridge, UK.
- LIEDE, S. 1996. *Sarcostemma* (Asclepiadaceae)—a controversial generic circumscription reconsidered: morphological evidence. *Syst. Bot.* **21**: 31–44.
- AND A. TAUBER. 2000. *Sarcostemma* (Apocynaceae: Asclepiadoideae)—a controversial generic circumscription reconsidered: evidence from *trnL*–F spacers. *Pl. Syst. Evol.* **225**: 133–140.
- MALUSA, J. 1995. Noteworthy collection—Arizona. *Madroño* **42**: 408–409.
- MARCOU, J. 1856. Part 4, Report of the geology of the route, no. 2. Résumé and field notes. Route near the thirty-fifth parallel of north latitude, from the Mississippi River to the Pacific Ocean, pp. 121–164. In Reports of explorations and surveys to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean [Pacific Railroad Reports], vol. 3. A. O. P. Nicholson, Printer, Washington, D.C., USA.
- MCAULIFFE, J. R. 2000. Desert soils, pp. 87–104. In S. J. Phillips and P. W. Comus [eds.], *A natural history of the Sonoran Desert*. Arizona-Sonora Desert Museum Press, Tucson, Arizona, USA.
- AND T. R. VAN DEVENDER. 1998. A 22,000-year record of vegetation change in the north-central Sonoran Desert. *Palaeogeogr. Palaeoclimatol. Palaeoecol.* **141**: 253–275.
- MCLAUGHLIN, S. P. 1989. Natural floristic areas of the western United States. *J. Biogeogr.* **16**: 239–248.
- . 1995. Floristic relationships of the eastern Mojave Desert: a quantitative analysis of local floras. *Crossosoma* **21**: 57–74.
- AND J. E. BOWERS. 1990. A floristic analysis and checklist for the northern Santa Rita Mountains, Pima Co., Arizona. *S. W. Naturalist* **35**: 61–75.
- MILLER, A. J., D. A. YOUNG, AND J. WEN. 2001. Phylogeny and biogeography of *Rhus* (Anacardiaceae) based on ITS sequence data. *Int. J. Plant Sci.* **162**: 1401–1407.
- MOUNT, J. F. 1995. California rivers and streams: the conflict between fluvial process and land use. University of California Press, Berkeley, USA. 359 p.
- MUNZ, P. A. AND D. D. KECK. 1959. A California flora. University of California Press, Berkeley, USA. 1681 p.
- MUSICK, H. B. 1975. Barrenness of desert pavement in Yuma County, Arizona. *J. Arizona-Nevada Acad. Sci.* **10**: 24–28.
- NORRIS, R. M. 1995. Geology of the California deserts: a summary, pp. 27–58. In J. Latting and P. G. Rowlands [eds.], *The California desert: an introduction to natural resources and man's impact*. June Latting Books, Riverside, California, USA.
- OKIMOTO, R. Y. 2001. Sharing a desert home: life on the Colorado River Indian Reservation. *News from Native California*, Special Report. 31 p.
- OLMSTEAD, R. G., C. W. DEPAMPHILIS, A. D. WOLFE, N. D. YOUNG, W. J. ELISENS, AND P. A. REEVES. 2001. Disintegration of the Scrophulariaceae. *Amer. J. Bot.* **88**: 348–361.
- PETERSON, P. M., R. J. SORENG, G. DAVIDSE, T. S. FILGUEIRAS, F. O. ZULOAGA, AND E. J. JUDZIEWICZ. 2001. Catalogue of New World grasses (Poaceae): II. Subfamily Chloridoideae. National Museum of Natural History, Washington, D.C., USA.
- PINKAVA, D. J. 1999. Cactaceae, part three, *Cylindropuntia* (Engelm.) Knuth. Chollas. *J. Arizona-Nevada Acad. Sci.* **32**: 32–47.
- . 2004. *Cylindropuntia*. *Fl. N. Amer. Newslett.* **4**: 103–118.
- PORTER, J. M. 1998. *Aliciella*, a recircumscribed genus of Polemoniaceae. *Aliso* **17**: 23–46.
- PRESTON, R. N. 1974. Early California: southern edition. Western Guide Publishers, Corvallis, Oregon, USA. 76 p.
- PRICE, P. W. 1982. Wild buckwheat, *Eriogonum inflatum* (Polygonaceae): an enigmatic plant. *S. W. Naturalist* **27**: 247–253.
- PRIGGE, B. A. 1975. Flora of the Clark Mountain range, San Bernardino County, California. M.S. Thesis, California State University at Los Angeles, USA.
- REIDHEAD, S. J. 2002. Wyatt Earp, senior citizen. <http://home.earthlink.net/ca.knuthco1/ItemsOfInterest3/seniorcitsource.htm> (Oct 2002).
- ROBERTS, R. P. AND L. E. URBATSCH. 2003. Molecular phylogeny of *Ericameria* (Asteraceae, Astereae) based on nuclear ribosomal 3' ETS and ITS sequence data. *Taxon* **52**: 209–228.
- RONDEAU, R. J., T. R. VAN DEVENDER, C. D. BERTELSEN, P. D. JENKINS, R. K. WILSON, AND M. A. DIMMITT. 1996. Annotated flora and vegetation of the Tucson Mountains, Pima County, Arizona. *Desert Plants* **12**: 1–48.
- ROWLANDS, P. G. 1995a. Regional bioclimatology of the California desert, pp. 95–134. In J. Latting and P. G. Rowlands [eds.], *The California desert: an introduction to natural resources and man's impact*. June Latting Books, Riverside, California, USA.
- . 1995b. Vegetational attributes of the California desert conservation area, pp. 135–183. In J. Latting and P. G. Rowlands [eds.], *The California desert: an introduction to natural resources and man's impact*. June Latting Books, Riverside, California, USA.
- SCARBOROUGH, R. 2000. The geologic origin of the Sonoran Desert, pp. 71–85. In S. J. Phillips and P. W. Comus [eds.], *A natural history of the Sonoran Desert*. Arizona-Sonora Desert Museum Press, Tucson, Arizona, USA.
- SCHWEICH, T. 2004. Parker Dam Road. <http://www.schweich.com/caparkerdamrd.html> (Sep 2004).
- SHERIDAN, T. E. 2000. Human ecology of the Sonoran Desert, pp. 105–118. In S. J. Phillips and P. W. Comus [eds.], *A natural his-*

- tory of the Sonoran Desert. Arizona-Sonora Desert Museum Press, Tucson, Arizona, USA.
- SHREVE, F. 1964. Vegetation of the Sonoran Desert, pp. 1–186. In F. Shreve and I. L. Wiggins, Vegetation and flora of the Sonoran Desert, vol. 1. Stanford University Press, Stanford, California, USA. 1740 p.
- SITGREAVES, L. 1854. Report of an expedition down the Zuñi and Colorado rivers. Beverley Tucker, Senate Printer, Washington, D.C., USA. 198 p.
- SMITH, S. G. 2002. *Schoenoplectus*, pp. 44–60. In Flora of North America North of Mexico, vol. 23. Oxford University Press, New York, USA.
- AND G. YATSKIEVYCH. 1996. Notes on the genus *Scirpus* sensu lato in Missouri. *Rhodo* **98**: 168–179.
- SNOW, N. 1998. Nomenclatural changes in *Leptochloa* P. Beauvois sensu lato (Poaceae, Chloridoideae). *Novon* **8**: 77–80.
- SORENG, R. J., P. M. PETERSON, G. DAVIDSE, E. J. JUDZIEWICZ, F. O. ZULOAGA, T. S. FILGUEIRAS, AND O. MORRONE. 2003. Catalogue of New World grasses (Poaceae): IV. Subfamily Pooideae. National Museum of Natural History, Washington, D.C., USA.
- SPELLENBERG, R. AND S. R. R. TIJERINA. 2001. Geographic variation and taxonomy of North American species of *Mirabilis*, section *Oxybaphoides* (Nyctaginaceae). *Sida* **19**: 539–570.
- STEINMANN, V. W. AND J. M. PORTER. 2002. Phylogenetic relationships in Euphorbieae (Euphorbiaceae) based on ITS and *ndhF* sequence data. *Ann. Missouri Bot. Gard.* **89**: 453–490.
- STROTHER, J. L. AND B. G. BALDWIN. 2002. Hymenocleas are ambrosias (Compositae). *Madroño* **49**: 143–144.
- THORNE, R. F., B. A. PRIGGE AND J. HENDRICKSON. 1981. A flora of the higher ranges and the Kelso Dunes of the eastern Mojave Desert in California. *Aliso* **10**: 71–186.
- WITH J. L. REVEAL. 2005. An updated classification of the Class Magnoliophyta (“Angiospermae”). <http://www.rsabg.org/research/Angiosperms.htm> (April 2006).
- TIBOR, D. P. (editor). 2001. The California Native Plant Society’s inventory of rare and endangered plants of California, ed. 6. California Native Plant Society, Sacramento, USA. 386 p.
- TORREY, J. 1856. Part 5, Report of the botany of the expedition, no. 4, Descriptions of the general botanical collections. Route near the thirty-fifth parallel of north latitude, from the Mississippi River to the Pacific Ocean, pp. 61–182, t. 1–25. In Reports of explorations and surveys, to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean [Pacific Railroad Reports], vol. 4. A. O. P. Nicholson, Printer, Washington, D.C., USA.
- USDA (UNITED STATES DEPARTMENT OF AGRICULTURE) AND NRCS (NATURAL RESOURCES CONSERVATION SERVICE). 2004. Plants National Database. <http://plants.usda.gov/> (Nov 2004).
- VAN DEVENDER, T. R. 1977. Holocene woodlands in the southwestern deserts. *Science* **198**: 189–192.
- . 1990. Late Quaternary vegetation and climate of the Sonoran Desert, United States and Mexico, pp. 134–163. In J. L. Betancourt, T. R. Van Devender, and P. S. Martin [eds.], Packrat middens: The last 40,000 years of biotic change. University of Arizona Press, Tucson, USA.
- . 2000. The deep history of the Sonoran Desert, pp. 61–69. In S. J. Phillips and P. W. Comus [eds.], A natural history of the Sonoran Desert. Arizona-Sonora Desert Museum Press, Tucson, Arizona, USA.
- . 2001. Deep history and biogeography of *La Frontera*, pp. 56–66. In G. L. Webster and C. J. Bahre [eds.], Changing plant life of *La Frontera*: observations on vegetation in the United States/Mexico borderlands. University of New Mexico Press, Albuquerque, USA.
- . 2002a. Environmental history of the Sonoran Desert, pp. 3–24. In T. H. Fleming and A. Valiente-Banuet [eds.], Columnar cacti and their mutualists: evolution, ecology, and conservation. University of Arizona Press, Tucson, USA.
- . 2002b. Deep history of immigration in the Sonoran Desert region, pp. 5–24. In B. Tellman [ed.], Invasive exotic species in the Sonoran region. University of Arizona Press, Tucson, USA.
- AND W. G. SPAULDING. 1979. Development of vegetation and climate in the southwestern United States. *Science* **204**: 701–710.
- , L. J. TOOLIN, AND T. L. BURGESS. 1990. The ecology and paleoecology of grasses in selected Sonoran Desert plant communities, pp. 326–349. In J. L. Betancourt, T. R. Van Devender, and P. S. Martin [eds.], Packrat middens: the last 40,000 years of biotic change. University of Arizona Press, Tucson, USA.
- VREDENBURGH, L. M., G. L. SHUMWAY, AND R. D. HARTILL. 1981. Desert fever: an overview of mining in the California desert. Living West Press, Canoga Park, California, USA. 324 p.
- WELLS, P. V. AND R. BERGER. 1967. Late Pleistocene history of coniferous woodland in the Mohave Desert. *Science* **155**: 1640–1647.
- AND J. H. HUNZIKER. 1976. Origin of the creosote bush (*Larrea*) deserts of southwestern North America. *Ann. Missouri Bot. Gard.* **63**: 843–861.
- WHALEN, M. 1977. Taxonomy of *Bebbia* (Compositae: Heliantheae). *Madroño* **24**: 112–123.
- WHIPPLE, A. W. 1856. Part 1, Itinerary. Route near the thirty-fifth parallel of north latitude, from the Mississippi River to the Pacific Ocean, pp. 1–136. In Report of explorations for a railway route, near the thirty-fifth parallel of north latitude, from the Mississippi River to the Pacific Ocean [Pacific Railroad Reports], vol. 3. A. O. P. Nicholson, Printer, Washington, D.C., USA.
- , T. EW BANK, AND W. W. TURNER. 1856. Part 3, Report upon the Indian Tribes. Route near the thirty-fifth parallel of north latitude, from the Mississippi River to the Pacific Ocean, pp. 7–127. In Report of explorations for a railway route, near the thirty-fifth parallel of north latitude, from the Mississippi River to the Pacific Ocean [Pacific Railroad Reports], vol. 3. A. O. P. Nicholson, Printer, Washington, D.C., USA.
- WHITFORD, W. G. 2002. Ecology of desert systems. Academic Press, London, UK. 343 p.
- YI, T., A. J. MILLER, AND J. WEN. 2004. Phylogenetic and biogeographic diversification of *Rhus* (Anacardiaceae) in the Northern Hemisphere. *Molec. Phylogen. Evol.* **33**: 861–879.

Appendix 1. Cross-reference for names that differ from those found in the Jepson Manual (Hickman 1993; Baldwin et al. 2002).

Hickman (1993)	Current treatment	Reference
Asclepiadaceae	Apocynaceae	Thorne with Reveal 2005
<i>Bromus madritensis</i> subsp. <i>rubens</i>	<i>Bromus rubens</i>	Soreng et al. 2003
<i>Cercidium</i>	<i>Parkinsonia</i>	Haston et al. 2005
<i>Chamaesyce</i>	<i>Euphorbia</i>	Steinmann and Porter 2002
<i>Chrysothamnus paniculatus</i>	<i>Ericameria paniculata</i>	Roberts and Urbatsch 2003
<i>Eriogonum inflatum</i> var. <i>deflatum</i>	<i>Eriogonum inflatum</i>	Price 1982
<i>Eriogonum inflatum</i> var. <i>inflatum</i>	<i>Eriogonum inflatum</i>	Price 1982
<i>Erioneuron pulchellum</i>	<i>Dasyochloa pulchella</i>	Peterson et al. 2001
<i>Gilia latifolia</i>	<i>Aliciella latifolia</i>	Porter 1998
<i>Gnaphalium luteo-album</i>	<i>Pseudognaphalium luteo-album</i>	Hilliard and Burtt 1981; Anderberg 1991
<i>Heterotheca psammophila</i>	<i>Heterotheca subaxillaris</i> var. <i>psammophila</i>	Gandhi 1990
<i>Hymenoclea salsola</i>	<i>Ambrosia salsola</i>	Strother and Baldwin 2002
<i>Leptochloa mucronata</i>	<i>Leptochloa panicea</i> subsp. <i>brachiata</i>	Snow 1998
<i>Lesquerella tenella</i>	<i>Physaria tenella</i>	Al-Shehbaz and O’Kane 2002
Liliaceae	Agavaceae	Thorne with Reveal 2005
Liliaceae	Alliaceae	Thorne with Reveal 2005
Liliaceae	Nolinaceae	Thorne with Reveal 2005
<i>Mirabilis bigelovii</i> var. <i>bigelovii</i>	<i>Mirabilis laevis</i> var. <i>villosa</i>	Spellenberg and Tijerina 2001
<i>Mirabilis bigelovii</i> var. <i>retrorsa</i>	<i>Mirabilis laevis</i> var. <i>retrorsa</i>	Spellenberg and Tijerina 2001
<i>Opuntia</i>	<i>Cylindropuntia</i>	Pinkava 1999, 2004
<i>Phacelia crenulata</i> var. <i>ambigua</i>	<i>Phacelia ambigua</i>	Atwood 1975
<i>Sarcostemma cynanchoides</i> subsp. <i>hartwegii</i>	<i>Funastrum cynanchoides</i> var. <i>hartwegii</i>	Krings 2000
<i>Sarcostemma hirtellum</i>	<i>Funastrum hirtellum</i>	Liede 1996; Liede and Tauber 2000
Scrophulariaceae, in part	Phrymaceae	Beardsley and Olmstead 2002; Thorne with Reveal 2005
Not treated	<i>Erigeron oxyphyllus</i>	De Groot 2005
Not treated	<i>Berberis harrisoniana</i>	Anderson and De Groot 2004
Not treated	<i>Delphinium scaposum</i>	De Groot 2005
Not treated	<i>Leucaena leucocephala</i>	A. C. Sanders pers. comm.
Not treated	<i>Lycium andersonii</i> × <i>L. fremontii</i>	Hitchcock 1932
Not treated	<i>Triticum aestivum</i>	Munz and Keck 1959

APPENDIX 2.

ANNOTATED CATALOG OF THE FLORA

The following is a list of the plants documented in the Whipple Mountains study area, from fieldwork and herbarium searches, and is current as of April 2006. The angiosperm families are based on Thorne with Reveal (2005), and Hoogland and Reveal (2005). Monocotyledons and dicotyledons have not been separated. The order of taxa and names follow Munz and Keck (1959), Hickman (1993), or Baldwin et al. (2002) unless otherwise noted (Appendix 1). Autonyms are not listed, except for species where additional intraspecific taxa were also present. Voucher specimens obtained during this study are at Rancho Santa Ana Botanic Garden (RSA) unless denoted otherwise (ARIZ, University of Arizona at Tucson; CAS, California Academy of Sciences; DS, Dudley Herbarium; JEPS, Jepson Herbarium; POM, Pomona College; UC, University of California at Berkeley; UCR, University of California at Riverside). Non-native taxa are indicated with an asterisk (*). Frequency of taxa is indicated by “common,” “frequent,” “occasional,” “infrequent,” or “rare,” and those that are restricted to specific habitats or have patchy distributions within the site may be designated “locally common” or “locally frequent.” Collections are from BLM land unless noted MWD (Metropolitan Water District), CRIR (Colorado River Indian Reservation), or CIR (Chemehuevi Indian Reservation). While many specimens were examined for this study, only one representative voucher specimen is cited [see De Groot (2004) for a complete listing of specimens].

PTERIDOPHYTA

PTERIDACEAE E.D.M.Kirchn.

ADIANTUM CAPILLUS-VENERIS L. Rare, found only in canyons near flowing water; riparian communities. Canyon along MWD road, upstream from road, narrow grotto of rock, MWD. 24 Apr 2004 *S.J. De Groot 4164*.

CHEILANTHES PARRYI (D.C.Eaton) Domin. Frequent, under rocks or in rock crevices in shaded locations; in washes and canyons. Chute and saddle at base of Cupcake Butte, N of Whipple Wash. 10 Oct 2003 *S.J. De Groot & J.M. Porter 3322*.

ANTHOPHYTA: PINOPSIDA Burnett

EPHEDRACEAE Dumort

EPHEDRA ASPERA S.Watson (see Huang et al. 2005). Shrub, frequent on rocky slopes and among boulders in mountain washes. NW edge of Whipple Mts., 17 mi from Vidal on old road to Needles. 30 Apr 1932 *C.B. Wolf 3191*; DS 282825, CAS 972365, UC 729588.

EPHEDRA FASCICULATA A.Nelson (see Huang et al. 2005). Shrub, frequent on rocky slopes and in mountain washes. Saddle at N end of Savahia Peak. 4 May 2003 *S.J. De Groot 2823*.

EPHEDRA NEVADENSIS S.Watson (see Huang et al. 2005). Glaucous shrub, among rocks at edge of wash. Rare and found only above 610 m (2000 ft). Pebbly wash with boulders and occasional exposed bedrock. Upper N fork of Whipple Wash. 17 Oct 2004 *S.J. De Groot & L. Lubinsky 4554*.

EPHEDRA TRIFURCA Torr. (see Huang et al. 2005). Shrub, locally com-

mon in sandy soil near the river. Just W of Colorado River, Copper Basin Dunes OHV area. 20 Apr 2001 *J.M. Porter 12500*.

ANTHOPHYTA: MAGNOLIOPSIDA Brongn.

AGAVACEAE Dumort

AGAVE DESERTI Engelm. Succulent perennial, frequent on open slopes generally above 305 m (1000 ft). Between War Eagle Mine and summit ridge, hills just N of summit. 18 May 2004 *S.J. De Groot & L. Lubinsky 4359*.

HESPEROCALLIS UNDULATA A.Gray. Perennial from bulb, frequent on sand dunes. Copper Basin Dunes OHV area near Echo Lodge, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter 1164*.

AIZOACEAE Martynov

SESUVIUM VERRUCOSUM Raf. Succulent, locally common, often in semi-alkaline soil near open water in riparian areas. Copper Basin Reservoir, N side of lake. MWD. 29 Mar 2004 *S.J. De Groot 3915*.

ALLIACEAE Batsch ex Borkh.

ANDROSTEPHIUM BREVIFLORUM S.Watson. Rare annual, growing on sand dunes. CNPS List 2. Dune OHV area near Echo Lodge, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter 1165*.

AMARANTHACEAE Juss.

AMARANTHUS FIMBRIATUS (Torr.) Benth. ex S.Watson. Summer annual, occasional in washes and on open slopes. Upper N fork of Whipple Wash. 17 Oct 2004 *S.J. De Groot & L. Lubinsky 4566*.

TIDESTROMIA OBLONGIFOLIA (S.Watson) Standl. Shrubby perennial, frequent on mud or gravel flats near water and in sandy or rocky washes. Gene Wash, upstream from swimming hole. MWD. 25 Oct 2003 *S.J. De Groot & N. Fraga 3363*.

ANACARDIACEAE R.Br.

**RHUS LANCEA* L.f. Large solitary shrub, in brush thickets back from the river near the side of the highway. Along the Colorado River at Earp, N side of highway to Parker. CRIR. 21 Nov 2001 *C. McCaugh s.n.*; UCR 118742.

RHUS TRILOBATA Nutt. ex Torr. & A.Gray (Miller et al. 2001; Yi et al. 2004). Shrub. Locally frequent in steep rocky chutes above 610 m (2000 ft). W slope just below saddle at N end of Savahia Peak. 4 May 2003 *S.J. De Groot, J.M. Porter & N. Fraga 2840*. Recognized as distinct in Yi et al. (2004), although those authors mention the occurrence of hybrids between *R. trilobata* and *R. aromatica*.

**SCHINUS TEREBINTHIFOLIUS* Raddi. Large solitary shrub ca. 2 m high, among *Arundo donax* and *Pluchea sericea*, on river bank, in silty alkaline soil. Rock House boat ramp, along Parker Dam Road. 27 Sep 2003 *S.J. De Groot & J.M. Porter 3144*.

APIACEAE Lindl.

BOWLESIA INCANA Ruiz & Pav. Annual, locally frequent near seeps and moist areas in mountain washes. Whipple Wash, SW of powerline road. 2 Mar 2003 *S.J. De Groot & J.M. Porter 1321*.

CYOPTERUS PANAMINTENSIS J.M.Coult. & Rose var. *ACUTIFOLIUS* (J.Coulter & Rose) Munz. Perennial, rare in steep rocky chutes above 610 m (2000 ft). Trail to Cupcake Butte, NW of Whipple Wash, steep rocky chute on the side of the butte. 18 Mar 2004 *S.J. De Groot & K. De Groot 3796*.

HYDROCOTYLE VERTICILLATA Thunb. Perennial, locally common but restricted to a few shallow inlets and backwaters along the river.

Bass Point, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter 1047*.

APOCYNACEAE Juss.

APOCYNUM CANNABINUM L. Shrub, infrequent, just above boggy area near backwater of the river. Along levee road, S-SW of Big River. CRIR. 26 Jun 2004 *S.J. De Groot, A. Virgen & C. Land 4373*.

ASCLEPIAS ALBICANS S.Watson. Perennial 1–2 m tall, branching from base, generally leafless. Frequent on hillsides, in washes and in canyons. Near W end of Copper Basin, upper Bowman's Wash, along old road. 28 Sep 2003 *S.J. De Groot & J.M. Porter 3217*.

ASCLEPIAS EROSA Torr. Occasional in sandy washes and on road shoulders, generally below 305 m (1000 ft). Chemehuevi Wash at junction with Highway 95 (Hwy 95), N of Vidal Junction. 5 Apr 2003 *S.J. De Groot & L. De Groot 2254*.

ASCLEPIAS SUBULATA Decne. Perennial, branched from base, generally leafless. Frequent in washes and on roadsides. Cascade Mine Road, ENE of Savahia Peak. 5 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow 4440*.

FUNASTRUM CYNANCHOIDES (Decne.) Schltr. var. *HARTWEGII* (Vail) Krings (Krings 2000) = *Sarcostemma cynanchoides* Decne. subsp. *hartwegii* (Vail) R.W.Holm. Twining perennial, frequent in washes, canyons, or on roadsides. Along Colorado River Aqueduct, near Hwy 95, twining on chain-link fence. 5 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow 4446*.

FUNASTRUM HIRTELLUM (A.Gray) Schltr. (Liede 1996; Liede and Tauber 2000) = *Sarcostemma hirtellum* (A.Gray) R.W.Holm. Twining perennial, frequent on rocky slopes, canyons, and washes. W side of range, wide wash along Needles-Parker road S of D & W mine. 20 Mar 2003 *S.J. De Groot & M. Denslow 2004*.

MATELEA PARVIFLORA (Torr.) Woodson. Rare perennial, twining in *Ephedra*. CNPS List 2. Steep rocky chute below summit of Cupcake Butte, N of Whipple Wash. 10 Oct 2003 *S.J. De Groot & J.M. Porter 3319b*.

**NERIUM OLEANDER* L. Shrub, locally common in canyons with flowing water and in disturbed areas along the Colorado River, generally below 305 m (1000 ft). Gene Wash, upstream from swimming hole. MWD. 25 Oct 2003 *S.J. De Groot & N. Fraga 3373*.

ARECACEAE Schultz Sch.

**PHOENIX DACTYLIFERA* L. Naturalized into riparian areas where it is fairly common; native to northern Africa. Along Parker Dam Road, several miles S of Parker Dam. 17 Mar 2003 *S.J. De Groot & J.M. Porter 1475*.

WASHINGTONIA FILIFERA (L.Linden) H.Wendl. Fairly common near open or running water. Single tree ca. 5 m tall on bank of wash at seep, Whipple Wash. 15 Apr 1975 *R.M. Turner & D.E. Brown 75–24*. ARIZ 194064. Gene Wash, up canyon past swimming hole. MWD. RSA Living Collection #21254. 25 Oct 2003 *S.J. De Groot & N. Fraga 3376*.

ASTERACEAE Martynov

ADENOPHYLLUM POROPHYLLOIDES (A.Gray) Strother. Subshrub, occasional on rocky slopes and in small washes. W side of range, along East Mojave Heritage Trail, E of Pyramid Butte. 19 Mar 2003 *S.J. De Groot & M. Denslow 1884*.

AMBROSIA DUMOSA (A.Gray) Payne. A dominant shrub on hillsides, sand dunes, and in washes. Whipple Wash where it joins the road to Havasu Landing, about 0.5 mi below Willow Spring and 1.25 mi above Lake Havasu. 23 Apr 1983 *A.C. Sanders 3781*; UCR 31227.

AMBROSIA SALSOLA (Torr. & A.Gray ex A.Gray) Strother & B.G.Baldwin (Strother and Baldwin 2002) = *Hymenoclea salsola* Torr. & A.Gray ex A.Gray. Shrub, common in sandy washes. Chemehuevi Wash, near Colorado River. 7 Sep 2003 *S.J. De Groot & A. Gatto 3120*.

- ARTEMISIA LUDOVICIANA Nutt. subsp. ALBULA (Wooton) Keck. Suffrutescent perennial, rare among rocks on banks of washes, above 610 m (2000 ft). Upper N fork of Whipple Wash, a few miles E of summit. 16 Oct 2004 *S.J. De Groot & L. Lubinsky* 4500.
- ATRICHOSERIS PLATYPHYLLA (A.Gray) A.Gray. Annual, common on open hillsides and in sandy washes. Havasu Palms Road just S of Chemehuevi Indian Reservation Boundary. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1632.
- BACCHARIS BRACHYPHYLLA A.Gray. Shrub, occasional on slopes or in rocky washes. In drainage between N fork of Whipple Wash and top of ridge just S of wash. 16 Oct 2004 *S.J. De Groot & L. Lubinsky* 4494.
- BACCHARIS EMORYI A.Gray Shrub, ca. 2 m high, single collection. Edge of Colorado River just S of Headgate Rock Dam, N of Parker and Earp. CRIR. 10 Apr 2004 *S.J. De Groot* 4063. This specimen could possibly be *B. sergiloides*, but with very toothed leaves.
- BACCHARIS SERGILOIDES A.Gray. A fairly common shrub, along the Colorado River and in large washes. Copper Basin, mud flat on W-SW side of reservoir. MWD. 12 Dec 2003 *S.J. De Groot & F. Navidara* 3487.
- BEBBIA JUNCSEA (Benth.) Greene var. ASPERA Greene. Shrub, common in washes. Stem pubescence varying from bristly to glabrous (see also Whalen 1977). 6.5 mi N of Crossroads, Colorado River. 3 May 1939 *A.M. Alexander* 374; DS 269434.
- BRICKELLIA ATRACTYLOIDES A.Gray. Shrub, infrequent in rocky chutes and washes above 610 m (2000 ft). Upper N fork of Whipple Wash. 17 Oct 2004 *S.J. De Groot & L. Lubinsky* 4562.
- CALYCOSERIS WRIGHTII A.Gray. Annual, frequent in washes and on slopes. On the Vidal-Needles road, Hank's Well [West Well]. 1000–1200 ft. 1 May 1932 *C.B. Wolf* 3212; RSA 4013.
- CHAENACTIS CARPHOCLINIA A.Gray. Annual, fairly common in washes, generally below 610 m (2000 ft). Across Parker Dam Road from Bass Point. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1100.
- CHAENACTIS FREMONTII A.Gray. Annual, outer corollas enlarged. Occasional on rocky slopes and washes above 610 m (2000 ft). S of highest peak, along wash N of aqueduct, SW side of range. 15 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3594.
- CHAENACTIS STEVIOIDES Hook. & Arn. Annual, cobwebby. Frequent in washes, generally below 610 m (2000 ft). Wash and desert pavement along Hwy 95 between Vidal and Vidal Junction. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1377.
- CHLORACANTHA SPINOSA (Benth.) G.Nesom. Suffrutescent perennial, infrequent among rocks at edges of lakes or rivers. Copper Basin, NW side of lake. MWD. 12 Apr 2004 *S.J. De Groot* 4134.
- CIRSIIUM NEOMEXICANUM A.Gray. Biennial or short-lived perennial, rare on rock outcrops and in rocky washes. Whipple Wash, ca. 2.5-hour walk upstream from powerline road. 17 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3785.
- CONYZA COULTERI A.Gray. Rare, mostly in alkaline disturbed sites, alluvial soil. From Parker Bridge N along Colorado River. CRIR. 2 May 1978 *Faulkner* 569; UCR 33555.
- DICORIA CANESCENS A.Gray. Annual, restricted to sand dunes, but fairly frequent there. Copper Basin dunes OHV area near Echo Lodge, along Parker Dam Road; in flower. 12 Dec 2003 *S.J. De Groot & F. Navidara* 3466.
- ENCELIA FARINOSA A.Gray ex Torr. Common shrub throughout the area, on open slopes and in washes. Canyon of light colored granite just N of Gene Pumping Station along Black Meadow Landing Road. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1421.
- ENCELIA FRUTESCENS A.Gray. Shrub, frequent in sandy areas and on roadsides, generally below 305 m (1000 ft). Small wash along road between Vidal and Big River, just E of the Travel at Your Own Risk sign. 9 Oct 2003 *S.J. De Groot, J.M. Porter & L. Machen* 3269.
- ENCELIA VIRGINENSIS A.Nelson. Rare shrub, next to rock in pebbly wash with boulders and occasional exposed bedrock. Upper N fork of Whipple Wash. 17 Oct 2004 *S.J. De Groot & L. Lubinsky* 4559.
- ERICAMERIA PANICULATA (A.Gray) Rydb. (Roberts and Urbatsch 2003) = *Chrysothamnus paniculatus* (A.Gray) H.M.Hall. Shrub, mostly restricted to Chemehuevi Wash, but locally common there. Chemehuevi Wash between powerline road and Lake Havasu. 8 May 2004 *S.J. De Groot* 4280.
- ERIGERON DIVERGENS Torr. & A.Gray. Annual, locally frequent in moist areas and seeps. Whipple Wash, ca. 1.5-hour walk upstream from powerline road, moist clay low area, with toads. 17 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3755.
- ERIGERON OXYPHYLLUS Greene. Suffrutescent perennial, branching from base. Occasional in rocky chutes, canyons, and washes above 610 m (2000 ft). New California record (De Groot 2005). Middle fork of Whipple Wash, ca. WNW of large dark bluff. 16 Oct 2004 *S.J. De Groot & L. Lubinsky* 4482.
- ERIOPHYLLUM LANOSUM (A.Gray) A.Gray. Annual, frequent in washes, generally below 610 m (2000 ft). Wash near intersection of Hwy 95 and East Mojave Heritage Trail, W of Pyramid Butte. 19 Mar 2003 *S.J. De Groot & M. Denslow* 1820.
- EUTHAMIA OCCIDENTALIS Nutt. Infrequent perennial in bog areas near open water. Bass Point, along Parker Dam Road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3185.
- FILAGO CALIFORNICA Nutt. Annual, occasional in washes, generally below 610 m (2000 ft). Canyon heading W off Parker Dam Road about 3 mi S of Parker Dam. 6 Apr 2003 *S.J. De Groot & L. De Groot* 2309.
- FILAGO DEPRESSA A.Gray. Annual, occasional in washes, generally below 610 m (2000 ft). Hills N of highest peak, S of War Eagle Mine. 9 May 2004 *S.J. De Groot* 4286b.
- GERAEA CANESCENS Torr. & A.Gray. Common annual of washes, roadsides, and gravelly slopes, generally below 610 m (2000 ft). Along MWD road between Gene Wash and Parker Dam Road. MWD. 11 Apr 2004 *S.J. De Groot* 4129.
- GNAPHALIUM PALUSTRE Nutt. (Anderberg 1991). Locally frequent, but otherwise rare, annual. In moist clay low area, with toads; Whipple Wash, ca. 1.5-hour walk upstream from powerline road. 17 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3756.
- GUTIERREZIA MICROCEPHALA (DC.) A.Gray. Shrub, scattered in rocky or sandy washes above 610 m (2000 ft). Upper N fork of Whipple Wash. 17 Oct 2004 *S.J. De Groot & L. Lubinsky* 4542.
- HELIANTHUS ANNUUS L. Annual, locally common in moist ditches and disturbed areas along the Colorado River. Ditch at intersection of Parker Dam Road and MWD road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3158.
- HETEROTHECA SUBAXILLARIS (Lam.) Britt. & Rusby var. PSAMMOPHILA (B.Wagenkn.) Gandhi (Gandhi 1990) = *Heterotheca psammophila* B.Wagenkn. Mouth of a large wash, in sandy soil near the river. Collected along Colorado River at Big River, SW of Earp. CRIR. 15 Nov 1980 *A.C. Sanders* 2043; UCR 23019, UC 1494253.
- HYMENOXYIS ODORATA DC. Annual, on flats near the river, not collected here since 1949. 5.7 mi N of Crossroads, Colorado River. 22 Apr 1940 *A.M. Alexander & L. Kellogg* 1203; UC 667438, DS 309797.
- MACHAERANTHERA ASTEROIDES (Torr.) Greene. Suffrutescent perennial, infrequent on road shoulders and in silty soil near the river. 5.7 mi N of Crossroads, Colorado River. 22 Apr 1940 *A.M. Alexander & L. Kellogg* 1202; UC 667460, ARIZ 88075.
- MACHAERANTHERA PINNATIFIDA (Hook.) Shinnars subsp. GOODINGII (A.Nelson) B.L.Turner & R.L.Hartm. Frequent subshrub, often growing in rock cracks, in washes and on rocky slopes. American Eagle Prospect, 14 mi from Vidal on old road to Needles. 30 Apr

- 1932 *C.B. Wolf* 3185; RSA 4022. American Eagle Mine. 19 Mar 2003 *S.J. De Groot & M. Denslow* 1943.
- MALACOTHRIX COULTERI* A.Gray. Rare annual, on gentle slope scattered with volcanic rock. N slope of Pyramid Butte. 19 Mar 2003 *S.J. De Groot & M. Denslow* 1834.
- MALACOTHRIX GLABRATA* A.Gray. Annual, locally common in sandy washes, and in scattered localities on the bajadas. Along Hwy 95 between East Mojave Heritage Trail and Chemehuevi Wash. 25 Apr 2004 *S.J. De Groot* 4182.
- MALACOTHRIX STEBBINSII* W.S.Davis & Raven. Annual, infrequent among rocks on slopes and in washes, generally above 610 m (2000 ft). S side of range, small seep S of highest peak along wash N of aqueduct. 16 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3745.
- MONOPTILON BELLIOIDES* (A.Gray) H.M.Hall. Annual, occasional in washes and on open slopes, generally below 610 m (2000 ft). Bowman's Wash near Parker Dam Road and Crossroads. 20 Apr 2003 *S.J. De Groot & A. Gatto* 2424a.
- PALAFOXIA ARIDA* B.Turner & M.Morris. Annual or short-lived perennial, occasional in sandy soil and washes generally below 305 m (1000 ft). Just W of Colorado River, near Echo Point, Copper Basin Dunes OHV area. 20 Apr 2001 *J.M. Porter* 12482.
- PECTIS PAPPOSA* Harvey & A.Gray. Summer annual, occasional or locally abundant on clay flat areas in or near washes, also infrequent on ridges around 915 m (3000 ft). Wash beside Atchison, Topeka, and Santa Fe Railroad tracks, just E of Vidal and Hwy 95. 9 Oct 2003 *S.J. De Groot, J.M. Porter & L. Machen* 3251.
- PERITYLE EMORYI* Torr. Common annual in washes and on slopes among rocks. Whipple Wash, upstream from powerline road. 2 Mar 2003 *S.J. De Groot & J.M. Porter* 1252.
- PEUCEPHYLLUM SCHOTTII* A.Gray. Shrub, common on rocky slopes and bluffs. Copper Basin Reservoir, ca. N-NE side of lake. MWD. 29 Mar 2004 *S.J. De Groot* 3942.
- PLEUROCORNIS PLURISETA* (A.Gray) R.M.King & H.Rob. Shrub, frequent among rocks in washes or on slopes. Whipple Wash at intersection with Havasu Palms Road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1683.
- PLUCHEA ODORATA* (L.) Cass. Small $\pm$ herbaceous perennial, infrequent in wet soil near open water. Gene Reservoir. MWD. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3347.
- PLUCHEA SERICEA* (Nutt.) Coville. Common perennial forming thickets at the edges of open water. Bank of Colorado River, about 3 mi S of Parker Dam. 6 Apr 2003 *S.J. De Groot & L. De Groot* 2327.
- POROPHYLLUM GRACILE* Benth. Low shrub with a pungent odor, frequent among rocks in washes. Just SW of Copper Basin, along old road into BLM Wilderness area, slope S of road. 28 Sep 2003 *S.J. De Groot & J.M. Porter* 3203.
- PRENANTHELLA EXIGUA* (A.Gray) Rydb. Annual, occasional among rocks on slopes. Baily Mine, NW slope of Savahia Peak. 4 May 2003 *S.J. De Groot, J.M. Porter & N. Fraga* 2812.
- PSATHYROTES RAMOSISSIMA* (Torr.) A.Gray. Annual or short-lived perennial, uncommon among rocks on open slopes. W of Copper Basin, just W of divide between Copper Basin and Whipple Wash drainages. 11 Apr 2004 *S.J. De Groot* 4123.
- **PSEUDOGNAPHALIUM LUTEO-ALBUM* (L.) Hilliard & Burt (Hilliard and Burt 1981; Anderberg 1991) = *Gnaphalium luteo-album* L. Annual, found on rocks or in mud near open water; native to Eurasia. Bass Point, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1049.
- **PULICARIA PALUDOSA* Link. Herbaceous perennial, locally frequent in moist disturbed sites near open water. Gene Reservoir. MWD. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3348.
- RAFINESQUIA CALIFORNICA* Nutt. Uncommon annual, in dense growth of forbs. Chute on N side of Cupcake Butte. 19 Mar 2005 *S.J. De Groot & K. De Groot* 4777.
- RAFINESQUIA NEOMEXICANA* A.Gray. Annual, occasional in sandy washes and open slopes. Side wash heading NW from Whipple Wash, upstream from powerline road. 2 Mar 2003 *S.J. De Groot & J.M. Porter* 1280.
- SENECIO MOHAVENSIS* A.Gray. Annual, frequent in washes and on open rocky slopes. Copper Basin, just outside gate to reservoir. MWD. 29 Mar 2004 *S.J. De Groot* 3950.
- **SENECIO VULGARIS* L. Rare annual in disturbed sites and along roads; native to Eurasia. Wash and desert pavement along Hwy 95 between Vidal and Vidal Junction. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1375.
- **SONCHUS OLERACEUS* L. Infrequent annual in moist disturbed areas in washes or near open water; native to Europe. Tamarisk grove along Havasu Palms Road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1688.
- STEPHANOMERIA EXIGUA* Nutt. Annual, infrequent in sandy washes, generally below 610 m (2000 ft). Wash along Colorado River Aqueduct W of Chamber's Well Road. 4 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen* 2799.
- STEPHANOMERIA PAUCIFLORA* (Torr.) A.Nelson. Glaucous shrub, scattered on rocky slopes and in rocky washes. On crumbly conglomerate cliff, lower end of Bowman's Wash. 21 Apr 2003 *S.J. De Groot & A. Gatto* 2603.
- STYLOCLINE INTERTEXTA* Morefield. Annual, occasional in sandy washes and on open slopes. Alkaline flat along Parker Dam Road, ca. 1 mi S of Parker Dam. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1725.
- STYLOCLINE MICROPOIDES* A.Gray. Annual, infrequent on rocky slopes. Canyon on NE side of mountains, intersecting powerline road. 19 Apr 2003 *S.J. De Groot, A. Gatto, C. Stevenson & C. Baldwin* 2390b.
- TRICHOPTILUM INCISUM* (A.Gray) A.Gray. Annual, occasional on open gravelly slopes. Dirt road heading N from Hwy 62 about 9 mi E of Vidal Junction and W of Earp, vicinity of Vista Peak. 5 Apr 2003 *S.J. De Groot & L. De Groot* 2275.
- TRIXIS CALIFORNICA* Kellogg. Shrub, frequent on rocky slopes and among rocks in washes, generally above 305 m (1000 ft). Old road heading W from Copper Basin, upper Bowman's wash. 20 Apr 2003 *S.J. De Groot & A. Gatto* 2455.
- UROPAPPUS LINDLEYI* (DC.) Nutt. Annual, rare on open rocky slopes or in washes. W slope just below saddle at N end of Savahia Peak. 4 May 2003 *S.J. De Groot, J.M. Porter & N. Fraga* 2846.
- VIGUIERA PARISHII* Greene. Shrub, common in washes. Toward S end of basin on NW side of range. 4 Oct 2004 *S.J. De Groot & L.L. Worlow* 4420.
- XANTHIUM STRUMARIUM* L. Annual, locally common in moist sandy disturbed areas near river. Along levee road S-SW of Big River. CRIR. 26 Jun 2004 *S.J. De Groot, A. Virgen & C. Land* 4384.
- XYLORHIZA TORTIFOLIA* (Torr. & A.Gray) Greene. Glandular suffrutescent perennial, on rocky slopes generally above 610 m (2000 ft). Trail to Cupcake Butte, NW of Whipple Wash, rocky chute at base of butte. 18 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3813.

BERBERIDACEAE Juss.

- BERBERIS HARRISONIANA* Kearney & Peebles. Sprawling shrubs; nearly 300 plants were counted in March 2005 in three parallel chutes on Cupcake Butte, on the NE side of the range. New California record (Anderson and De Groot 2004). Steep rocky chute on north side of Cupcake Butte, N of Whipple Wash. 18 Mar 2004 *S.J. De Groot & K. De Groot* 3798, RSA Living Collection accession #21338.

BIGNONIACEAE Juss.

- CHILOPSIS LINEARIS* (Cav.) Sweet subsp. *ARCUATA* (Fosberg) Hendrickson (Hendrickson 1985). Small tree, small patches scattered in sandy soil of Chemehuevi Wash. Chemehuevi Wash between

mouth and powerline road. 7 Sep 2003 *S.J. De Groot & A. Gatto* 3128.

BORAGINACEAE Juss.

- AMSINCKIA MENZIESII (Lehm.) A.Nelson & J.F.Macbr. var. INTERMEDIA (Fischer & C.A.Mey.) Ganders. Annual, occasional in washes, generally below 610 m (2000 ft). Wash N of Hwy 62 and aqueduct, E of old Needles-Parker road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1539.
- AMSINCKIA TESSELLATA A.Gray. Annual, frequent in washes and on open rocky slopes. Ridge near highest peak, above wash N of aqueduct. 15 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3603.
- CRYPTANTHA ANGUSTIFOLIA (Torr.) Greene. Annual, frequent in washes and open areas. Bowman's wash near Parker Dam Road and Crossroads. 20 Apr 2003 *S.J. De Groot & A. Gatto* 2439.
- CRYPTANTHA BARBIGERA (A.Gray) Greene. Annual, frequent in washes and on open slopes. Wash along Hwy 95 about 6 mi N of Vidal Junction, W of Savahia Peak. 5 Apr 2003 *S.J. De Groot & L. De Groot* 2180.
- CRYPTANTHA DECIPIENS (M.E.Jones) Heller. Rare annual. Gravelly slopes and wash, along East Mojave Heritage Trail, NE of Pyramid Butte. 19 Mar 2003 *S.J. De Groot & M. Denslow* 1855.
- CRYPTANTHA HOLOPTERA (A.Gray) J.F.Macbr. Perennial, sometimes suffrutescent, rare in rock cracks in washes or near water. CNPS List 4. Copper Basin Reservoir, ca. N-NE side of lake. MWD. 1 Mar 2004 *S.J. De Groot* 3556.
- CRYPTANTHA MARITIMA (Greene) Greene. Annual, common in washes and on slopes. Wash as it passes through Tunnel Ridge, S side of Whipple Mountains. 17 Feb 1974 *B.G. Phillips, T.R. Van Deventer, A.M. Phillips III* 74-10; ARIZ 191153.
- CRYPTANTHA MICRANTHA (Torr.) I.M.Johnston. Annual, locally frequent in sandy soil of washes or dunes. Sand dune area just S of Echo Point, across Parker Dam Road from Copper Basin Dunes OHV area. 6 Apr 2003 *S.J. De Groot & L. De Groot* 2329.
- CRYPTANTHA PTEROCARYA (Torr.) Greene. Annual, common in washes and on open slopes. Wash along western boundary of BLM Wilderness area, S of D&W mine. 21 Apr 2001 *J.M. Porter* 12586.
- HELIOTROPIMUM CURASSAVICUM L. Perennial, locally frequent in alkaline disturbed areas near open water. Copper Basin Reservoir, ca. N side of lake. MWD. 29 Mar 2004 *S.J. De Groot* 3914.
- PECTOCARYA HETEROCARPA (I.M.Johnston) I.M.Johnston. Annual, frequent in washes and on slopes. Along powerline road, southern boundary of Chemehuevi Indian Reservation. CIR. 29 Mar 2004 *S.J. De Groot* 3977.
- PECTOCARYA LINEARIS (Ruiz & Pav.) DC. subsp. FEROCULA (I.M.Johnston) Thorne. Annual, frequent in washes and on slopes. Along summit ridge between D&W mine and highest peak. 26 Apr 2004 *S.J. De Groot* 4209.
- PECTOCARYA PENICILLATA (Hook. & Arn.) A.DC. Annual, occasional in washes. Copper Basin Dunes OHV area, near Echo Point along Parker Dam Road. 20 Mar 2003 *S.J. De Groot & M. Denslow* 2116.
- PECTOCARYA PLATYCARPA (Munz & I.M.Johnston) Munz & I.M.Johnston. Annual, frequent in washes and on slopes. Wide wash along Needles-Parker road S of D&W mine. 20 Mar 2003 *S.J. De Groot & M. Denslow* 2030.
- PLAGIOBOTHRYS JONESII A.Gray. Annual, frequent in washes. Bluff NW of Monument Peak, S side of Copper Basin, on higher slopes. 20 Apr 2003 *S.J. De Groot & A. Gatto* 2504.
- TIQUILIA PALMERI (A.Gray) A. Richardson. Suffrutescent perennial, locally frequent in sand dunes and sandy washes. Sand dunes above the Colorado River, N of Crossroads. 23 Apr 1940 *A.M. Alexander & L. Kellogg* 1212; UC 667400, ARIZ 88074, POM 299184.

TIQUILIA PPLICATA (Torr.) A. Richardson. Suffrutescent perennial, stems glandular, infrequent in sandy soil. Alkaline flat near Colorado River, N-NE of Earp and next to Bernie's Rock. CRIR. 10 Apr 2004 *S.J. De Groot* 4046.

BRASSICACEAE Burnett

- ARABIS GLAUCOVALVULA M.E.Jones. Perennial from root, known from a single collection. Highest peak and ridge running 1.2 air miles to the SW. 6 Apr 1974 *J.F. Emmel* 477; RSA 297055.
- ARABIS PERENNANS S.Watson. Rare perennial from root, on rocky slopes above 610 m (2000 ft). Highest peak of summit ridge. 20 Mar 1983 *J.F. Emmel* 842; RSA 557744.
- *BRASSICA TOURNEFORTII Gouan. Annual, common in washes; native to Mediterranean. NE side of range, wash just W of Chemehuevi Indian Reservation boundary, at intersection with the powerline road. 19 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3829.
- *CAPSELLA BURSA-PASTORIS (L.) Medik. Rare annual; native to Europe. Roadside; wash and desert pavement along Hwy 95 between Vidal and Vidal Junction. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1365.
- CAULANTHUS COOPERI (S.Watson) Payson. Annual, rare in rocky washes or among rocks, generally above 610 m (2000 ft). Along wash just S of ridge near summit, N of aqueduct. 14 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3589.
- DESCURAINIA PINNATA (Walter) Britton subsp. GLABRA (Wootton & Standl.) Detling. Annual, occasional in washes. Wash near intersection of Hwy 95 and East Mojave Heritage Trail, W of Pyramid Butte. 19 Mar 2003 *S.J. De Groot & M. Denslow* 1787.
- DITHYREA CALIFORNICA Harv. Annual, roadsides, washes, and dunes, generally in sandy soil. Dune OHV area near Echo Lodge, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1145.
- DRABA CUNEIFOLIA Nutt. ex Torr. & A.Gray. Annual, frequent in washes. Along Black Meadow Landing Road, N of Gene Pumping Station. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1208.
- GUILLENIA LASIOPHYLLA (Hook. & Arn.) Greene. Annual, frequent in washes and on slopes. Along Havasu Palms Road, between Black Meadow Landing Road and intersection with powerline road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1574.
- LEPIDIUM DENSIFLORUM Schrader var. RAMOSUM (A.Nelson) Thell. Annual, single collection. Alkaline flats between Colorado River and Parker Dam Road. Bass Point, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1039.
- LEPIDIUM LASIOCARPUM Torr. & A.Gray. Annual, common on hill-sides and in washes. Clay seep area, S of highest peak along wash N of aqueduct. 16 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3741.
- PHYSARIA TENELLA (A.Nelson) O'Kane & Al-Shehbaz (Al-Shehbaz and O'Kane 2002) = *Lesquerella tenella* A.Nelson. Annual, infrequent in washes in the bajada, below 305 m (1000 ft). Wash near intersection of Hwy 95 and East Mojave Heritage Trail, W of Pyramid Butte. 19 Mar 2003 *S.J. De Groot & M. Denslow* 1816.
- *SISYMBRIUM ALTISSIMUM L. Annual, infrequent on roadsides and disturbed areas; native to Europe. Chemehuevi Wash at junction with Hwy 95, north of Vidal Junction. 5 Apr 2003 *S.J. De Groot & L. De Groot* 2233.
- *SISYMBRIUM IRIIO L. Annual, occasional in washes and disturbed sites; native to Europe. Canyon along Parker Dam Road, several miles S of Parker Dam. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1479.
- STREPTANTHELLA LONGIROSTRIS (S.Watson) Rydb. Rare annual, in sandy soils. Dune OHV area near Echo Lodge, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1144.
- THYSANOCARPUS LACINIATUS Torr. & A.Gray. Annual, rare in rocky washes and among boulders on slopes. Cupcake Butte, NW of

Whipple Wash, just below summit. 18 Mar 2004 *S.J. De Groot, K. De Groot & L.L. Worlow 3811*.

CACTACEAE Juss.

CARNEGIEA GIGANTEA (Engelm.) Britton & Rose. Columnar cactus, to about 11 m, scattered on rocky slopes in the eastern part of the mountains. CNPS List 2. Although individuals cover a wide range of height classes, the population may be declining and about 10% of flowers set fruit in 1972 (Brum 1973). Along Black Meadow Landing Road north of Gene Pumping Station, near intersection with Havasu Palms Road. 18 Jul 2003 *S.J. De Groot 3053*. RSA Living Collection no. 21193.

CYLINDROPUNTIA ACANTHOCARPA (Engelm. & J.M.Bigelow) Knuth var. COLORADENSIS (L.Benson) Pinkava (Backeberg and Knuth 1935; Pinkava 1999, 2004) = *Opuntia acanthocarpa* Engelm. & J.M.Bigelow var. *coloradensis* L.Benson. Large spreading shrub, branching above base. Frequent on open rocky slopes and bajada. Canyon on E side of range along Black Meadow Landing Road, N of Gene Pumping Station. 1 Mar 2003 *S.J. De Groot & J.M. Porter 1217*.

CYLINDROPUNTIA BIGELOVII (Engelm.) Knuth (Backeberg and Knuth 1935; Pinkava 1999, 2004) = *Opuntia bigelovii* Engelm. Generally one main stem, upright, locally common on open gravelly hillsides of upland bajada. Whipple Wash, upstream from powerline road. 2 Mar 2003 *S.J. De Groot & J.M. Porter 1342*.

CYLINDROPUNTIA ECHINOCARPA (Engelm. & J.M.Bigelow) Knuth (Backeberg and Knuth 1935; Pinkava 1999, 2004) = *Opuntia echinocarpa* Engelm. & J.M.Bigelow. Low, branched shrub, frequent in bajadas around the mountains, mostly below 305 m (1000 ft). Chalk Hills, near Colorado River. CIR. 30 Mar 2004 *S.J. De Groot 4016*.

CYLINDROPUNTIA RAMOSISSIMA (Engelm.) Knuth (Backeberg and Knuth 1935; Pinkava 1999, 2004) = *Opuntia ramosissima* Engelm. Branched shrub, to ca. 0.5 m (20 in.) tall, occasional in bajadas around the mountains, mostly below 305 m (1000 ft). Along old Needles-Parker road S of Chemehuevi Wash. 25 Apr 2004 *S.J. De Groot 4191*.

CYLINDROPUNTIA RAMOSISSIMA (Engelm.) Knuth × C. ECHINOCARPA (Engelm. & J.M.Bigelow) Knuth = *Opuntia ramosissima* Engelm. × *O. echinocarpa* Engelm. & J.M.Bigelow. Probably = *Opuntia wigginsii* L.Benson (Baldwin et al. 2002). CNPS List 3. Pinkava (2004) lists *O. wigginsii* as a synonym of *C. echinocarpa*, apparently being only a dwarf form of the latter. The morphology of specimens collected in the Whipple Mountains is intermediate between *C. ramosissima* and *C. echinocarpa*, and warrants further study. The hybrids are rare in bajadas, and generally found with *C. ramosissima* and *C. echinocarpa*. E range of Whipple Mountains. 11 May 1939 *A.M. Alexander s.n.*; UC 625545. East Mojave Heritage Trail, E of Pyramid Butte. 22 Nov 2003 *S.J. De Groot, A. Gatto & F. Navidara 3424*.

ECHINOCEREUS ENGELMANNII (Engelm.) Lemaire. Succulent perennial, occasional to locally common on open rocky slopes above about 305 m (1000 ft). Wash near clay seep area, S of highest peak along wash N of aqueduct, S side of range. 16 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow 3747*.

FEROCACTUS CYLINDRACEUS (Engelm.) Orcutt. Frequent on rocky slopes and outcrops. NE side of range, along powerline road near Chemehuevi Indian Reservation boundary. RSA Living Collection #21539. 17 May 2004 *S.J. De Groot & L. Lubinsky 4357*.

[MAMMILLARIA DIOICA K.Brandegee. Botanical Expedition along the Colorado River, Needles to Yuma, Oct. 22 to Nov. 7. Whipple Mts, 130–450 ft. (40–137 m). Fall 1912 *W.L. Jepson 5228*; JEPS 66859. The identification of this specimen was not verified as it was not available for loan. I suspect it was either *M. tetrandicistra* or *M. grahamii*, as *M. dioica* is generally found much farther west.]

MAMMILLARIA GRAHAMII Engelm. Stems 1–many, occasional in rock cracks in canyons or on outcrops. Slot canyon through light-colored granite along Black Meadow Landing Road just NW of Gene Pumping station. 24 Apr 2004 *S.J. De Groot 4170*.

MAMMILLARIA TETRANCISTRA Engelm. Stem generally 1 (sometimes several), generally hemispheric, occasional in rock cracks or in rocky soil on slopes. Copper Canyon, NE side of range, just upstream from intersection with powerline road. 2 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow 4402*.

OPUNTIA BASILARIS Engelm. & J.M.Bigelow. Perennial < 0.5m high, frequent on gravelly or rocky slopes, sometimes at the edges of washes. S of highest peak along wash N of aqueduct, S side of range. 16 Mar 2004 *S.J. De Groot & K. De Groot 3713*.

CAMPANULACEAE Juss.

NEMAELADUS GLANDULIFERUS Jeps. Annual, occasional in sandy washes, generally below 610 m (2000 ft). SE side of range, wash intersecting road along Colorado River aqueduct. 3 May 2003 *S.J. De Groot, J.M. Porter & N. Fraga 2660*.

NEMAELADUS RUBESCENS Greene. Annual, on sand dunes. Just W of Colorado River, Copper Basin Dunes OHV area. 20 Apr 2001 *J.M. Porter 12490*.

NEMAELADUS SIGMOIDEUS G.Robbins. Annual, on sand dunes. Copper Basin Dunes OHV area near Echo Point/Echo Lodge along Parker Dam Road, near Colorado River. 3 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen 2733*.

CARYOPHYLLACEAE Juss.

ACHYRONYCHIA COOPERI Torr. & A.Gray. Prostrate annual, restricted to sandy soil. Dune OHV area near Echo Point/Echo Lodge along Parker Dam Road, near Colorado River. 3 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen 2734*.

SPERGULARIA MARINA (L.) Griseb. Annual, locally frequent in moist areas in washes or near open water. Whipple Wash, upstream from powerline road. 17 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow 3795*.

CHENOPODIACEAE Vent.

ALLENROLFEA OCCIDENTALIS (S.Watson) Kuntze. Shrub, stems jointed, locally common in alkaline flats near the river. Burro (Jackass) Flats, just N of Bass Point day use area, along Parker Dam Road. 26 Aug 2003 *S.J. De Groot 3084*.

ATRIPLEX CANESCENS (Pursh) Nutt. subsp. LINEARIS (S.Watson) H.M.Hall & Clem. Shrub, occasional in sandy alkaline soil near the river. Bass Point day use area, along Parker Dam Road. 26 Aug 2003 *S.J. De Groot 3082*.

ATRIPLEX ELEGANS (Moq.) D.Dietr. var. ELEGANS. Locally frequent annual or short-lived perennial, generally in moist disturbed areas. Bank of ditch at intersection of Parker Dam Road and MWD road. 27 Sep 2003 *S.J. De Groot & J.M. Porter 3161*.

ATRIPLEX ELEGANS (Moq.) D.Dietr. var. FASCICULATA (S.Watson) M.E.Jones. Locally frequent annual or short-lived perennial, in alkaline soils near the river. Alkaline sink along Parker Dam Road, 1–2 mi S of Parker Dam. 17 Mar 2003 *S.J. De Groot & J.M. Porter 1468*.

ATRIPLEX HYMENELYTRA (Torr.) S.Watson. Shrub, on rocky outcrops near the river. Just S of Bass Point along Parker Dam Road. 1 Mar 2004 *S.J. De Groot 3585*.

ATRIPLEX LENTIFORMIS (Torr.) S.Watson. Common shrub in alkaline flats along the river. Just SW of Bullfrog day use area, along Parker Dam Road. 19 Jul 2003 *S.J. De Groot 3068*.

ATRIPLEX POLYCARPA (Torr.) S.Watson. Shrub, frequent in sandy soils, usually near the river. Near Bass Point day use area, along Parker Dam Road (W side of road). 27 Sep 2003 *S.J. De Groot & J.M. Porter 3140*.

*CHENOPODIUM MURALE L. Annual, occasional in washes and dis-

turbed areas; native to Europe. Whipple Wash, ca. 2.5-hour walk upstream from powerline road. 17 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3789.

MONOLEPIS NUTTALLIANA (Schult.) Greene. Annual, infrequent in alkaline flats along the Colorado River. Along Parker Dam Road, 1–2 mi S of Parker Dam. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1471.

*SALSOLA TRAGUS L. Rare annual, on road shoulder, in silty alkaline soil. Along Rahun Trail off Rio Vista Drive. CRIR. 27 Apr 2004 *S.J. De Groot* 4244.

SUAEDA MOQUINII (Torr.) Greene. Shrub, dominant in sandy alkaline flats along the Colorado River. Cable Car day use area, along Parker Dam Road. 19 Jul 2003 *S.J. De Groot* 3060.

CONVOLVULACEAE Juss.

CUSCUTA CALIFORNICA Hook. & Arn. var. *APICULATA* Engelm. Rare parasite, on *Paspalum dilatatum* and *Lythrum californicum* on rocks at edge of river. Cable Car day use area, along Parker Dam Road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3179.

CUSCUTA DENTICULATA Engelm. Parasite, occasional on various shrubs, generally at lower elevations. S side of range, along Chamber's Well Road near aqueduct road. 4 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen* 2741.

CROSSOSOMATACEAE Engl.

CROSSOSOMA BIGELOVII S.Watson. Rare shrub, in rocky ravines generally above 305 m (1000 ft). NW side of Monument Peak, S side of Copper Basin. 20 Apr 2003 *S.J. De Groot & A. Gatto* 2472.

CUCURBITACEAE Juss.

BRANDEGEA BIGELOVII (S.Watson) Cogn. Perennial from root, fairly common in spring, twining over shrubs in washes. Intersection of Parker Dam Road and MWD/Black Meadow Landing Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1192.

CUCURBITA PALMATA S.Watson. Rare, in sandy soil. 20 mi NE of Vidal Junction, 8 mi W of Lake Havasu City in Chemehuevi Wash. 10 May 1978 *Faulkner* 600; UCR 33636.

CYPERACEAE Juss.

*CYPERUS INVOLUCRATUS Rottb. Locally frequent perennial, naturalized into riparian areas; native to eastern Africa. Rock House boat ramp, along Parker Dam Road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3152.

ELEOCHARIS GENICULATA (L.) Roem. & Schult. Annual, locally common in boggy areas at the edges of open water. Bass Point, along Parker Dam Road just N of Colorado River Indian Reservation. 19 May 2003 *S.J. De Groot & T. LaDoux* 2871.

ELEOCHARIS PARISHII Britton. Perennial, frequent on bank of creek in rocky canyon with flowing water. Gene Wash, up canyon past swimming hole. MWD. 25 Oct 2003 *S.J. De Groot & N. Fraga* 3359.

SCHOENOPLECTUS AMERICANUS (Pers.) Volkart ex Schinz & R.Keller (Smith and Yatskievych 1996; Smith 2002) = *Scirpus americanus* Pers. Perennial from rhizome, locally frequent at the edges of open water. Copper Basin, N side of reservoir. MWD. 17 May 2004 *S.J. De Groot & L. Lubinsky* 4351.

SCHOENOPLECTUS CALIFORNICUS (C.A.Mey.) Sojak (Smith 2002) = *Scirpus californicus* (C.Meyer) Steudel. Perennial from rhizome, locally common in shallows at the edges of open water. Shore of Lake Havasu, S of Chemehuevi Wash. CIR. 8 May 2004 *S.J. De Groot* 4276.

EUPHORBIACEAE Juss.

CROTON CALIFORNICUS Müll.Arg. Locally frequent perennial, restricted to sand dunes and sandy soils near river. Copper Basin dunes

OHV area near Echo Lodge, along Parker Dam Road. 26 Aug 2003 *S.J. De Groot* 3086.

DITAXIS CLARIANA (Jepson) G.L.Webster. Rare annual or short-lived perennial, CNPS List 2. Growing on a gravel bar in a dry wash, 8 mi NE of Earp near the Empire Landing Campground. 16 Mar 1980 *A.C. Sanders* 1158; UCR 21033.

DITAXIS LANCEOLATA (Benth.) Pax & K.Hoffm. Subshrub, frequent in washes or on higher slopes, generally among rocks. Cascade Mine Road, ENE of Savahia Peak. 5 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow* 4433.

DITAXIS NEOMEXICANA (Müll.Arg.) A.A.Heller. Small annual or short-lived perennial, frequent in washes or on open gravelly slopes. Ridge near highest peak, above wash N of aqueduct. 15 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3618.

DITAXIS SERRATA (Torr.) A.A.Heller. Perennial, infrequent among rocks in washes. Just N of mouth of Gene Wash, near Whitset Intake along Lake Havasu. MWD. 25 Oct 2003 *S.J. De Groot & N. Fraga* 3384.

EUPHORBIA ERIANTHA Benth. Annual, rare in washes in the plains and bajadas, below 305 m (1000 ft). Chemehuevi Wash at intersection with Hwy 95. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3190.

EUPHORBIA MICROMERA Boiss. (Steinmann and Porter 2002) = *Chamaesyce micromera* (Boiss. ex Engelm.) Wootton & Standley. Prostrate annual, frequent in or near sandy washes. Vidal Wash at intersection with Hwy 95, S of Vidal. 28 Sep 2003 *S.J. De Groot & J.M. Porter* 3235.

EUPHORBIA PARISHII Greene (Steinmann and Porter 2002) = *Chamaesyce parishii* (Greene) Millsp. Perennial, frequent among rocks in washes or near open water. Intersection of Chamber's Well and old Needles–Parker road. 16 Jan 2004 *S.J. De Groot, H. & C. De Groot* 3526.

EUPHORBIA POLYCARPA Benth. (Steinmann and Porter 2002) = *Chamaesyce polycarpa* (Benth.) Millsp. Perennial, common among rocks or in sand, in or near washes. Wash N of Hwy 62 and aqueduct, E of old Needles–Parker road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1573.

EUPHORBIA SETILOBA Engelm. ex Torr. (Steinmann and Porter 2002) = *Chamaesyce setiloba* (Engelm. ex Torr.) Parish. Prostrate annual, frequent in sandy washes. Middle fork of Whipple Wash, ca. NW of large dark bluff. 16 Oct 2004 *S.J. De Groot & L. Lubinsky* 4473.

STILLINGIA LINEARIFOLIA S.Watson. Perennial, occasional in large sandy washes, generally below 305 m (1000 ft). Intersection of Chemehuevi Wash and powerline road. 19 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3867.

TETRACOCCUS HALLII Brandege. Dioecious shrub, occasional in rocky washes in the southern foothills. CNPS List 4. Wash N of Hwy 62 and aqueduct, E of old Needles–Parker road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1570.

FABACEAE Lindl.

ACACIA GREGGII A.Gray. Shrub or small tree, common in washes. Hills and wash between War Eagle Mine and summit ridge. 20 May 2003 *S.J. De Groot & T. LaDoux* 2932.

ASTRAGALUS ACUTIROSTRIS S.Watson. Annual, infrequent on rocky granitic slopes. Canyon of light colored granite just N of Gene Pumping Station along Black Meadow Landing Road. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1414.

ASTRAGALUS NUTTALLIANUS A.DC. var. *IMPERFECTUS* (Rydb.) Barneby. Annual, infrequent on open rocky slopes. Along Havasu Palms Road, between Black Meadow Landing Road and intersection with powerline road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1583.

DALEA MOLLIS Benth. Annual, occasional in washes or on open flats.

- Along powerline road, southern boundary of Chemehuevi Indian Reservation. CIR. 29 Mar 2004 *S.J. De Groot* 3978.
- DALEA MOLLISSIMA (Rydb.) Munz. Annual, occasional in washes or on open flats. Road along N side of range, past War Eagle Mine; between powerline and mine. 30 Mar 2004 *S.J. De Groot* 4032.
- *LEUCAENA LEUCOCEPHALA (Lam.) de Wit. Lone tree 6–8 m high, edge of river, sandy shore, inlet of wash. Along levee road S–SW of Big River. CRIR. 26 Jun 2004 *S.J. De Groot, A. Virgen & C. Land* 4385. Det. A.C. Sanders, Mar 2006.
- LOTUS SALSUGINOSUS Greene var. BREVIVEXILLUS Ottley. Annual, fairly common in gravelly or sandy washes. Road to Twin Lode Mine, off Needles–Parker road, S side of mountains. 20 Mar 2003 *S.J. De Groot & M. Denslow* 2081.
- LOTUS STRIGOSUS (Nutt.) Greene. Annual, fairly common in sandy washes. Along Havasu Palms Road, between Black Meadow Landing Road and intersection with powerline road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1594.
- LUPINUS ARIZONICUS (S.Watson) S.Watson. Annual, common in washes. Canyon of light colored granite just N of Gene Pumping Station along Black Meadow Landing Road. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1400.
- LUPINUS CONCINNUS J.Agarth. Annual, rare in washes. Whipple Wash, upstream from powerline road. 2 Mar 2003 *S.J. De Groot & J.M. Porter* 1266.
- LUPINUS SPARSIFLORUS Benth. Annual, occasional in sandy washes and canyons. Upper Whipple Wash, 4 mi above the powerline crossing. 16 Feb 1986 *D. Charlton* 15; UCR 41661.
- MARINA PARRYI (Torr. & A.Gray) Barneby. Suffrutescent perennial to subshrub, fairly common in washes and on gravelly flats near washes. Wash that is Cascade Mine Road, ENE of Savahia Peak. 5 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow* 4432.
- *MELILOTUS ALBA Medik. Annual, locally frequent in disturbed areas on the banks of the Colorado River. Along levee road S–SW of Big River. CRIR. 26 Jun 2004 *S.J. De Groot, A. Virgen & C. Land* 4378.
- OLNEYA TESOTA A.Gray. Tree, common in washes throughout the southern bajada. Copper Basin, N–NE side of reservoir. MWD. In flower. 17 May 2004 *S.J. De Groot & L. Lubinsky* 4352.
- PARKINSONIA FLORIDA (Benth. ex A.Gray) S.Watson (Haston et al. 2005) = *Cercidium floridum* A.Gray. Tree, common in washes. Bowman's Wash SE of Copper Basin, near Colorado River Indian Reservation boundary. 21 Apr 2003 *S.J. De Groot & A. Gatto* 2595.
- PARKINSONIA MICROPHYLLA Torr. (Haston et al. 2005) = *Cercidium microphyllum* (Torr.) Rose & I.M.Johnston. Tree, frequent in rocky washes and on hillsides in the eastern part of the range. CNPS List 4. Along powerline road, southern boundary of Chemehuevi Indian Reservation. CIR. 29 Mar 2004 *S.J. De Groot* 3986.
- PARKINSONIA MICROPHYLLA Torr. × P. FLORIDA (Benth. ex A.Gray) S.Watson (Jones et al. 1998; Haston et al. 2005) = *Cercidium microphyllum* (Torr.) Rose & I.M.Johnston × *C. floridum* A.Gray. Rare tree, generally in rocky washes and on hillsides in the eastern part of the range. Along Black Meadow Landing Road between Havasu Palms Road and Gene Pumping Station. 27 Aug 2003 *S.J. De Groot* 3100.
- PROSOPIS GLANDULOSA Torr. var. TORREYANA (L.Benson) M.C.Johnston. Spreading tree, along the Colorado River, often in sandy saline areas, occasionally in mountain washes. Alkaline flat along Parker Dam Road, ca. 1 mi S of Parker Dam. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1726.
- PROSOPIS PUBESCENS Benth. Small tree, frequent next to open water. Gene Reservoir. MWD. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3342.
- PSOROTHAMNUS EMORYI (A.Gray) Rydb. Rare shrub, in sandy soil. Sand dunes across Parker Dam Road from River Shore resort, N of Earp. CRIR. 12 Apr 2004 *S.J. De Groot* 4162.
- PSOROTHAMNUS FREMONTII (A.Gray) Barneby var. ATTENUATUS Barneby. Shrub, locally common on slopes below about 915 m (3000 ft). CNPS List 2. Rocky ridge above and E of Whipple Wash along the powerline road. 23 Apr 1983 A.C. Sanders 3783; UCR 31223.
- PSOROTHAMNUS SPINOSUS (A.Gray) Barneby. Small tree, frequent in larger washes, generally below 610 m (2000 ft). Along small powerline road just W of Chemehuevi Indian Reservation, S of Chemehuevi Wash. 8 May 2004 *S.J. De Groot* 4278.
- SENNA ARMATA (S.Watson) H.S.Irwin & Barneby. Shrub, occasional in washes, generally below 610 m (2000 ft). SE side along aqueduct road, SW of Bowman's wash. 3 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen* 2666.
- SENNA COVESII (A.Gray) H.S.Irwin & Barneby. Herbaceous perennial, locally common on slopes and in washes above 610 m (2000 ft). CNPS List 2. N fork of Whipple Wash, a few miles E of summit. RSA Living Collection #21537. 16 Oct 2004 *S.J. De Groot & L. Lubinsky* 4511.

FAGACEAE Dumort.

- QUERCUS TURBINELLA Greene. Small tree, infrequent on rocky north-facing slopes above about 915 m (3000 ft). CNPS List 4. Chute just below summit of Cupcake Butte, N of Whipple Wash. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3304.

FOUQUIERIACEAE DC.

- FOUQUIERIA SPLENDENS Engelm. Perennial, in scattered patches throughout the mountains. Road along N side of range, E of intersection with old Needles–Parker road. 21 May 2003 *S.J. De Groot & T. LaDoux* 2978.

GENTIANACEAE Juss.

- EUSTOMA EXALTATUM (L.) Don. Locally frequent herbaceous perennial on rocks or in bogs near open water. Colorado River, Parker Strip at Crossroads. 18 Oct 1986 *G. Helmkamp s.n.*; UCR 45127. Bass Point day use area, along Parker Dam Road. 19 Jul 2003 *S.J. De Groot* 3069.

GERANIACEAE Juss.

- *ERODIUM CICUTARIUM (L.) L'Hér. ex Aiton. Annual, occasional in washes and disturbed areas; native to Eurasia. Canyon of light colored granite just N of Gene Pumping Station along Black Meadow Landing Road. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1450.

- ERODIUM TEXANUM A.Gray. Annual, occasional in washes or on desert pavement. Along Hwy 95 just N of Vidal. 19 Mar 2003 *S.J. De Groot & J.M. Porter* 1749.

HALORAGACEAE R.Br.

- MYRIOPHYLLUM SIBIRICUM Kom. Aquatic, locally common in shallows of reservoirs, pools, and at edges of the Colorado River. Bass Point day use area, along Parker Dam Road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3181.

HYDROCHARITACEAE Juss.

- NAJAS GUADALUPENSIS (Spreng.) Magnus. Rare aquatic in shallow water along the river. Along levee road next to Colorado River, SW of Big River. CRIR. 27 Apr 2004 *S.J. De Groot* 4258. Det. R. F. Thorne.
- NAJAS MARINA L. Frequent aquatic forming patches in shallow water, in canyons and along the river. Gene Wash, up canyon past swimming hole. MWD. 25 Oct 2003 *S.J. De Groot & N. Fraga* 3366.

HYDROPHYLLACEAE R.Br.

- EUCRYPTA CHRYSANTHEMIFOLIA (Benth.) Greene var. BIPINNATIFIDA (Torr.) Constance. Annual, frequent in washes. Whipple Wash at intersection with Havasu Palms Road. 18 Mar 2003 *S.J. De Groot & J.M. Porter 1674*.
- EUCRYPTA MICRANTHA (Torr.) A.A.Heller. Annual, frequent in washes. Whipple Wash, upstream from powerline road. 2 Mar 2003 *S.J. De Groot & J.M. Porter 1240*.
- [NAMA ARIZONICUM J.D.Bacon. Two specimens (UC 667152, UC 667431) were thus annotated in 1984 by John D. Bacon. However, this name apparently has not yet been published, and accordingly these specimens are referred to *Nama demissum*.]
- NAMA DEMISSUM A.Gray. Annual, occasional in sandy washes. Wash along Havasu Palms Road. 18 Mar 2003 *S.J. De Groot & J.M. Porter 1689*.
- NAMA HISPIDUM A.Gray var. SPATHULATUM (Torr.) C.L.Hitchc. Annual, infrequent in sandy soil and washes. Hank's Well [West Well], on the Vidal-Needles road. 1 May 1932 *C.B. Wolf 3218*; RSA 3986.
- PHACELIA AMBIGUA M.E.Jones (Atwood 1975) = *Phacelia crenulata* Torr. var. *ambigua* (M.E.Jones) J.F.Macbr. Annual, common in washes and on rocky hillsides. S of highest peak, along wash near old mine at end of road into S side of range, N of aqueduct. 16 Mar 2004 *S.J. De Groot & K. De Groot 3751*.
- PHACELIA CRENULATA Torr. var. MINUTIFLORA (J.W.Voss) Jepson. Annual, occasional on steep rocky slopes and in sandy washes. Wash along Black Meadow Landing Road. 18 Mar 2003 *S.J. De Groot & J.M. Porter 1710*.
- PHACELIA CRYPTANTHA Greene. Annual, rare on steep slopes of dark volcanic boulders. Bluff northwest of Monument Peak, S side of Copper Basin, higher slopes. 20 Apr 2003 *S.J. De Groot & A. Gatto 2513*.
- PHACELIA DISTANS Benth. Annual, common in washes. W of Copper Basin, S fork of Whipple Wash, just downstream from Whipple Cave. 11 Apr 2004 *S.J. De Groot 4101*.
- PHACELIA IVESIANA Torr. Rare annual. Sandy wash, Hank's Well [West Well], on Vidal-Needles road. 1 May 1932 *C.B. Wolf 3196A*; RSA 3997.
- PHACELIA LEMMONII A.Gray. Rare annual, at base of rocky slope. Copper Basin Reservoir, just inside gate by lake. MWD. 1 Mar 2004 *S.J. De Groot 3559*.
- PHACELIA NEGLECTA M.E.Jones. Rare annual, growing on desert pavement that occurs between the washes. Four mi due S of the city of Havasu Lake, along the utility road on an alluvial fan. 7 Apr 1978 *A.C. Sanders & R. Twitchell 393*; UCR 18349.
- PHACELIA ROTUNDFOLIA Torr. Annual, infrequent in rock cracks. Canyon of Copper Basin Creek. 18 Apr 1935 *F.W. Peirson 11485*; RSA 74705.
- PHOLISTOMA AURITUM (Lindl.) Lilja var. ARIZONICUM (M.E.Jones) Constance. Annual, occasional in mountain washes. CNPS List 2. Small seep, S of highest peak along wash N of aqueduct, SW side of range. 16 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow 3744*.

JUNCACEAE Juss.

- JUNCUS TORREYI Coville. Locally frequent perennial, in boggy inlet of river. Bass Point, along Parker Dam Road just N of Colorado River Indian Reservation. 19 May 2003 *S.J. De Groot & T. LaDoux 2870*.

KRAMERIACEAE Dumort

- KRAMERIA ERECTA Schult. Shrub, frequent in washes and on open slopes. Along old Needles-Parker road, northern bajada. 30 Mar 2004 *S.J. De Groot 4045*.
- KRAMERIA GRAYI Rose & Painter. Shrub, frequent in washes and on

open slopes. Along Parker Dam Road, Just N-NE of Cable Car day use area, S of Parker Dam. 25 Apr 2004 *S.J. De Groot 4176*.

LAMIACEAE Martynov

- HYPTIS EMORYI Torr. Shrub, common in washes. Along Havasu Palms Rd. 7 Jan 2003 *S.J. De Groot & J.R. De Groot 885*. Upper N fork of Whipple Wash. 17 Oct 2004 *S.J. De Groot & L. Lubinsky 4567*.
- *MENTHA ×PIPERITA L. Peppermint. Lone small shrub, escape from cultivation; native to Europe. Sandy alkaline area next to river. Along Hanemo Drive near intersection with Koip Drive, vicinity of Big River. CRIR. 26 Jun 2004 *S.J. De Groot, A. Virgen & C. Land 4364*.
- SALAZARIA MEXICANA Torr. Shrub, patches frequent in washes. Wash through bajada, N side of range along road past War Eagle Mine. 21 May 2003 *S.J. De Groot & T. LaDoux 2977*.
- SALVIA COLUMBARIAE Benth. Annual, frequent in sandy washes. Havasu Palms Road just S of Chemehuevi Indian Reservation Boundary. 18 Mar 2003 *S.J. De Groot & J.M. Porter 1631*.
- SALVIA MOHAVENSIS Greene. Shrub, frequent in small, rocky washes generally above 305 m (1000 ft). Baily Mine, NW slope of Savahia Peak. 4 May 2003 *S.J. De Groot, J.M. Porter & N. Fraga 2818*.
- TEUCRIUM GLANDULOSUM Kellogg. Shrub, infrequent among rocks in small, steep drainages, generally above 305 m (1000 ft). CNPS List 2. Cliff ravine. W of Gene wash and Copper Basin Rd. 22 Apr 1940 *A.M. Alexander & L. Kellogg 1188*; UC 667448, POM 299186, UC667440, ARIZ 35166.

LILIACEAE Juss.

- CALOCHORTUS FLEXUOSUS S.Watson. Perennial from bulb, occasional on ridges above 610 m (2000 ft). Vidal. 812 ft. 11 Apr 1941 *R.S. Woglum & E.M. Harvey 2949*; RSA 369083, UCR 17244. Trail to Cupcake Butte, between powerline and first butte. 1400 ft. 19 Mar 2005 *S.J. De Groot & K. De Groot 4775*.

LOASACEAE Juss.

- EUCNIDE URENS (Parry ex A.Gray) Parry. Frequent shrub or suffrutescent perennial, often in rock crevices along washes. Bowman's Wash SE of Copper Basin, near Colorado River Indian Reservation boundary. 21 Apr 2003 *S.J. De Groot & A. Gatto 2572*.
- MENTZELIA AFFINIS Greene. Annual, occasional in washes and on sand dunes. Just W of Colorado River, Copper Basin Dunes OHV area. 20 Apr 2001 *J.M. Porter 12480*.
- MENTZELIA ALBICAULIS (Hook.) Torr. & A.Gray. Annual, occasional in or near washes. S side of range, along Colorado River aqueduct W of Chamber's Well Road. 4 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen 2778*.
- MENTZELIA INVOLUCRATA S.Watson. Annual, frequent in washes. Across Parker Dam Road from Bass Point. 1 Mar 2003 *S.J. De Groot & J.M. Porter 1120*.
- MENTZELIA MULTIFLORA (Nutt.) A.Gray. Perennial, but often appearing annual, occasional in sandy soil. Just W of Colorado River, Copper Basin Dunes OHV area. 27 Sep 2003 *S.J. De Groot & J.M. Porter 3180*.
- MENTZELIA OBSCURA H.J.Thomps. & J.E.Roberts. Annual, occasional in washes or on hillsides. Wide wash along Needles-Parker road S of D&W mine. 20 Mar 2003 *S.J. De Groot & M. Denslow 2049*.
- MENTZELIA OREOPHILA J.Darl. Infrequent perennial, subshrub, often growing on or next to rocks in wash areas. Copper Basin, just outside gate to reservoir. MWD. 12 Apr 2004 *S.J. De Groot & R. Snelling 4154*.
- PETALONYX THURBERI A.Gray. Shrub, occasional patches in sandy washes of the bajadas. Along Hwy 95 ca. 3 mi N of Vidal Junction. 18 Jul 2003 *S.J. De Groot & A. Gatto 3041*.

LYTHRACEAE J.St.-Hil.

LYTHRUM CALIFORNICUM Torr. & A.Gray. Locally frequent on rocks or in mud at the edges of the Colorado River. Cable Car day use area, along Parker Dam Road. 19 Jul 2003 *S.J. De Groot* 3065.

MALVACEAE Juss.

EREMALCHE EXILIS (A.Gray) Greene. Rare annual, prostrate, in sandy wash. Hank's Well [West Well], Vidal to Needles. 1 May 1932 *C.B. Wolf* 3220; DS 282803, RSA 3988.

EREMALCHE ROTUNDIFOLIA (A.Gray) Greene. Infrequent annual, often in sandy washes. Wash N of Hwy 62 and aqueduct, E of old Needles–Parker road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1561.

HIBISCUS DENUDATUS Benth. Subshrub, occasional on hillsides. Copper Basin, NW side of lake. MWD. 12 Apr 2004 *S.J. De Groot & R. Snelling* 4144.

*MALVA PARVIFLORA L. Rare annual, disturbed area. Along Parker Dam Road, 12 mi S of Parker Dam. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1461.

SPHAERALCEA AMBIGUA A.Gray. Shrub, frequent in washes. Road to unnamed mine off Needles–Parker road, southwest side of mountains. 20 Mar 2003 *S.J. De Groot & M. Denslow* 2078. One collection was toward var. *rugosa* (S. Dreher pers. comm.): S of highest peak along wash, near old mine at end of road into S side of range, N of aqueduct. 16 Mar 2004 *S.J. De Groot & K. De Groot* 3753.

SPHAERALCEA EMORYI Torr. Suffrutescent perennial or subshrub, occasional on rocks or in alkaline soil at low elevations near the Colorado River. Along Parker Dam Road, small clay basin 1–2 mi S of Parker Dam. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1472.

MARTYNIACEAE Horan.

PROBOSCIDEA ALTHAEIFOLIA (Benth.) Decne. Perennial from root, occasional in sandy washes below 305 m (1000 ft). CNPS List 4. Chemehuevi Wash at intersection with Hwy 95. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3195.

MOLLUGINACEAE Bartl.

*MOLLUGO CERVIANA (L.) Ser. Annual, silty bar above sandy wash. Two plants found. Vidal Wash at intersection with Hwy 95, S of Vidal. 28 Sep 2003 *S.J. De Groot & J.M. Porter* 3239.

MYRTACEAE Juss.

*EUCALYPTUS L'Hér. sp. Tree 10+ m high. Silty soil, in wide wash. An occasional escape, usually near habitations along the river. Near Bass Point day use area, along W side of Parker Dam Road. Not in flower. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3138.

NOLINACEAE Nakai

NOLINA BIGELOVII (Torr.) S.Watson. Perennial, frequent among rocks in washes or on slopes above 305 m (1000 ft). Just SW of Copper Basin, along old road into BLM Wilderness area, slope S of road. 28 Sep 2003 *S.J. De Groot & J.M. Porter* 3206.

NYCTAGINACEAE Juss.

ABRONIA VILLOSA S.Watson. Annual, frequent in sandy areas near the Colorado River. Just W of Colorado River, Copper Basin Dunes OHV area. 1 Mar 2004 *S.J. De Groot* 3582.

ALLIONIA INCARNATA L. Annual or short-lived perennial, locally common on gravelly slopes, often near washes. Canyon along Parker Dam Road, several miles S of Parker Dam. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1483.

BOERHAVIA COCCINEA Mill. Herbaceous perennial, occasional in

washes or on sandy road shoulders, generally below 305 m (1000 ft). Ditch at intersection of Parker Dam Road and MWD road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3156.

BOERHAVIA INTERMEDIA M.E.Jones. Summer annual, infrequent in sandy washes. Chemehuevi Wash at intersection with Hwy 95. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3194.

BOERHAVIA TRIQUETRA S.Watson. Summer annual, often sticky, occasional in washes or on higher slopes. Trail to Cupcake Butte, N of Whipple Wash, NW side of first butte along trail. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3278.

BOERHAVIA WRIGHTII A.Gray. Summer annual, occasional in washes, usually below 610 m (2000 ft). NW side of range, Copper Canyon, near first tributary upstream from powerline road. 2 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow* 4414.

MIRABILIS LAEVIS (Benth.) Curran var. RETRORSA (A.A.Heller) Jeps. (Spellenberg and Tijerina 2001) = *M. bigelovii* A.Gray var. *retrorsa* (A.A.Heller) Munz. Subshrub, frequent among rocks in mountain washes. Along summit ridge between D&W mine and highest peak. 26 Apr 2004 *S.J. De Groot* 4215.

MIRABILIS LAEVIS (Benth.) Curran var. VILLOSA (Kellogg) Spellenb. (Spellenberg and Tijerina 2001) = *M. bigelovii* A.Gray var. *bigelovii*. Subshrub, frequent among rocks in washes. Along old Needles–Parker road between Hwy 62 and Colorado River aqueduct. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1525.

MIRABILIS MULTIFLORA (Torr.) A.Gray var. PUBESCENS (Torr.) Torr. & A.Gray. Rare perennial, on clay bank in rocky wash. Not in flower. Canyon on NE side of mountains, intersecting powerline road. 19 Apr 2003 *S.J. De Groot, A. Gatto, C. Stevenson & C. Baldwin* 2392.

OLEACEAE Hoffmanns. & Link

*FRAXINUS UHDEI (Wenz.) Lingelsh. Small tree; on rock surrounded by shallow water of river. Bass Point, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1053.

MENODORA SCABRA A.Gray. Shrub, 3 plants seen, 2 in flower and fruit. Gentle slope strewn with volcanic boulders. Along wash E of S fork of Whipple Wash and Whipple Cave, toward Copper Basin and divide. 11 Apr 2004 *S.J. De Groot* 4113.

ONAGRACEAE Juss.

CAMISSONIA BOOTHII (Douglas ex Lehm.) Raven subsp. CONDENSATA (Munz) Raven. Annual, frequent in washes at lower elevations. Wide wash on S side of range, along Colorado River Aqueduct, W of Chamber's Well Road. 4 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen* 2775.

CAMISSONIA BOOTHII (Douglas ex Lehm.) Raven subsp. DESERTORUM (Munz) Raven. Annual, infrequent in sandy washes. Wash and desert pavement along Hwy 95 between Vidal and Vidal Junction. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1395.

CAMISSONIA BREVIPIES (A.Gray) Raven. Annual, common in washes. Hybridizes and introgresses with *C. claviformis*. Havasu Palms Road just S of Chemehuevi Indian Reservation Boundary. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1652.

CAMISSONIA BREVIPIES (A.Gray) Raven × *C. CLAVIFORMIS* (Torr. & Frem.) Raven. Annual, infrequent in washes at lower elevations. Along US Hwy 95, 15.7 mi N of Vidal Junction; a single individual with parents, like a back-cross to [*C.*] *brevipes*. 1 Mar 1958 *P.H. Raven* 11757A; RSA 135233.

CAMISSONIA CALIFORNICA (Torr. & A.Gray) Raven. Annual, infrequent in sandy areas in rocky washes, generally above 305 m (1000 ft). S of highest peak along wash N of aqueduct, SW side of range. 16 Mar 2004 *S.J. De Groot & K. De Groot* 3710.

CAMISSONIA CARDIOPHYLLA (Torr.) Raven. Herbaceous or suffrutescent perennial, occasional among boulders in canyons and washes, usually above 305 m (1000 ft). Whipple Wash, ca. 2.5-hour

walk upstream from powerline road. 17 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3762.

CAMISSONIA CHAMAENERIOIDES (A.Gray) Raven. Annual, fairly frequent in washes. Dirt road heading N from Hwy 62 about 9 mi E of Vidal Junction and W of Earp, vicinity of Vista Peak. 5 Apr 2003 *S.J. De Groot & L. De Groot* 2290.

CAMISSONIA CLAVIFORMIS (Torr. & Frem.) Raven subsp. *AURANTIACA* (Munz) Raven. Annual, frequent in washes in the plains and bajadas. Hybridizes and introgresses with *C. brevipes*. Across Parker Dam Road from Bass Point. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1096.

CAMISSONIA CLAVIFORMIS (Torr. & Frem.) Raven subsp. *CLAVIFORMIS*. Annual, infrequent in washes and sandy areas below 305 m (1000 ft). Dune OHV area near Echo Lodge, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1153.

CAMISSONIA REFRACTA (S.Watson) Raven. Annual, common in washes. American Eagle Mine. 19 Mar 2003 *S.J. De Groot & M. Denslow* 1973.

**GAURA PARVIFLORA* Lehm. Large bush (about 3 ft) with several long flowering spikes, on flat near the river, 5.5 (5.7) mi N of Crossroads. 23 Apr 1940 *A.M. Alexander & L. Kellogg* 1213; UC 1311821, UC 667402.

OENOTHERA DELTOIDES Torr. & Frem. Annual, frequent on dunes and in sandy areas along the river. Just W of Colorado River, Copper Basin Dunes OHV area. 20 Apr 2001 *J.M. Porter* 12481.

OENOTHERA SPECIOSA Nutt. Annual, one plant found. Probable escape from cultivation; native to central US. Edge of river, sandy shore. Along levee road S–SW of Big River. CRIR. 26 Jun 2004 *S.J. De Groot, A. Virgen & C. Land* 4377.

OROBANCHACEAE Vent.

OROBANCHE COOPERI (A.Gray) A.A.Heller. Parasite, often on the roots of *Ambrosia dumosa*; infrequent in sandy washes and on dunes. Dune OHV area near Echo Point and Echo Lodge along Parker Dam Road, near Colorado River. 3 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen* 2740.

PAPAVERACEAE Juss.

ARGEMONE MUNITA Durand & Hilg. Annual, frequent in washes, generally below 610 m (2000 ft). Copper Basin, just outside gate to reservoir. MWD. 29 Mar 2004 *S.J. De Groot* 3962.

ESCHSCHOLZIA GLYPTOSPERMA Greene. Annual, occasional or locally frequent in washes or on open slopes. Wash along western boundary of BLM Wilderness area, S of D&W mine. 21 Apr 2001 *J.M. Porter* 12611.

ESCHSCHOLZIA MINUTIFLORA S.Watson. Annual, common in washes. Havasu Palms Road just S of Chemehuevi Indian Reservation Boundary. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1638.

ESCHSCHOLZIA PARISHII Greene. Rare annual, edge of wash in southern bajada. Dirt road heading N from Hwy 62 about 9 mi E of Vidal Junction and W of Earp, vicinity of Vista Peak. 5 Apr 2003 *S.J. De Groot & L. De Groot* 2266.

PHRYMACEAE Schauer

MIMULUS BIGELOVII (A.Gray) A.Gray. (Olmstead et al. 2001; Beardsley and Olmstead 2002) Annual, occasional in sandy washes. Wash on S–SE side along aqueduct road, SW of Bowman's wash. 3 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen* 2667.

MIMULUS GUTTATUS DC. (Olmstead et al. 2001; Beardsley and Olmstead 2002) Annual, occasional in washes near surface water. Moist clay low area, with toads, Whipple Wash, ca. 1.5-hour walk upstream from powerline road. 17 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3754.

PLANTAGINACEAE Juss.

PLANTAGO OVATA Forssk. Annual, common on open hillsides. Canyon on NE side of mountains, intersecting powerline road. 19 Apr 2003 *S.J. De Groot, A. Gatto, C. Stevenson & C. Baldwin* 2346.

POACEAE (R.Br.) Barnhart

ACHNATHERUM SPECIOSUM (Trin. & Rupr.) Barkworth. Perennial, occasional among rocks in washes and on slopes. Along summit ridge between D&W mine and highest peak. 26 Apr 2004 *S.J. De Groot* 4222.

**AGROSTIS SEMIVERTICILLATA* (Forssk.) C.Ch. Perennial, in boggy inlet of Colorado River; native to Europe. Bass Point, along Parker Dam Road just N of Colorado River Indian Reservation. 19 May 2003 *S.J. De Groot & T. LaDoux* 2867.

ARISTIDA ADSCENSIONIS L. Annual, frequent among rocks on open slopes. S fork of Whipple Wash, upstream from Whipple Cave, just E–NE of large dark bluff. 15 Oct 2004 *S.J. De Groot & L. Lubinsky* 4459.

ARISTIDA CALIFORNICA Thurb. Perennial, occasional on sand dunes. Just W of Colorado River, Copper Basin Dunes OHV area. 10 Apr 2004 *S.J. De Groot* 4068.

ARISTIDA PURPUREA Nutt. var. *NEALLEYI* (Vasey) Allred. Perennial, fairly common among rocks in washes and on open slopes. Cascade Mine Road, ENE of Savahia Peak. 5 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow* 4437.

ARISTIDA PURPUREA Nutt. var. *PARISHII* (Hitchc.) Allred. Perennial, fairly common among rocks in washes and on open slopes. S of highest peak along wash N of road into S side of range, N of aqueduct. 16 Mar 2004 *S.J. De Groot & K. De Groot* 3711.

ARISTIDA PURPUREA Nutt. var. *WRIGHTII* (Nash) Allred. Perennial, occasional among rocks in washes and on open slopes. Summit of Cupcake Butte, N of Whipple Wash. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3296.

**ARUNDO DONAX* L. Perennial to 8 m tall, forming clumps along the river in disturbed sites; native to Europe. Rock House boat ramp, along Parker Dam Road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3146.

**AVENA SATIVA* L. Native to Europe. Disturbed area, rocky sand soil. 6 mi N of Vidal Junction, along Hwy 95. 25 Apr 1978 *Faulkner* 454; UCR 33688.

BOUTELOUA ARISTIDOIDES (Kunth) Griseb. Annual, common in and near washes. Ditch at intersection of Parker Dam Road and MWD road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3154.

BOUTELOUA BARBATA Lag. Summer annual, frequent in and near washes. Chemehuevi Wash at intersection with Hwy 95. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3192.

BOUTELOUA TRIFIDA S.Watson. Perennial, rare in washes. CNPS List 2. Wide wash along Needles–Parker road S of D&W mine. 20 Mar 2003 *S.J. De Groot & M. Denslow* 2064.

**BROMUS ARENARIUS* Labill. Annual, in steep rocky canyon. Canyon on NE side of mountains, intersecting powerline road. 19 Apr 2003 *S.J. De Groot, A. Gatto, C. Stevenson & C. Baldwin* 2393.

BROMUS ARIZONICUS (Shear) Stebbins. Annual, occasional in washes. Wash along Havasu Palms Road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1697.

**BROMUS RUBENS* L. (Soreng et al. 2003) = *B. madritensis* L. subsp. *rubens* (L.) Husnot. Annual, fairly frequent in moist disturbed sites. Copper Basin, just outside gate to reservoir. MWD. 12 Apr 2004 *S.J. De Groot & R. Snelling* 4156.

**CYNODON DACTYLON* (L.) Pers. Locally common, naturalized in moist areas near the river; native to Africa. Shore of Lake Havasu, S of Chemehuevi Wash. CIR. 8 May 2004 *S.J. De Groot* 4275.

DASYOCHLOA PULCHELLA (Kunth) Willd. ex Rydb. (Peterson 2001) = *Erioneuron pulchellum* (Kunth) Tateoka. Perennial, occasional among rocks on slopes. Canyon on NE side of mountains, inter-

- secting powerline road. 19 Apr 2003 *S.J. De Groot, A. Gatto, C. Stevenson & C. Baldwin* 2387.
- DISTICHLIS SPICATA* (L.) Greene. Perennial, infrequent patches in alkaline flats along the river. Rock House boat ramp, along Parker Dam Road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3141.
- **HORDEUM MURINUM* L. subsp. *LEPORINUM* (Link) Arcang. Annual, infrequent in disturbed areas near roads. Alkaline flat between Colorado River and Parker Dam Road, near intersection with MWD road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1721.
- LEPTOCHLOA PANICEA* (Retzius) Ohwi subsp. *BRACHIATA* (Steudel) N.Snow (Snow 1998) = *L. mucronata* (Michx.) Kunth. Rare annual, on bank of sandy wash. Vidal Wash at intersection with Hwy 95, S of Vidal. 28 Sep 2003 *S.J. De Groot & J.M. Porter* 3246.
- MUHLENBERGIA MICROSPERMA* (DC.) Kunth. Annual, fairly common in washes and on open slopes. Trail to Cupcake Butte, N of Whipple Wash, NW side of first butte along trail. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3289.
- MUHLENBERGIA PORTERI* Scribn. ex Beal. Perennial, among rocks in washes and on open slopes, generally above 305 m (1000 ft). N fork of Whipple Wash, a few miles E of summit. 16 Oct 2004 *S.J. De Groot & L. Lubinsky* 4501.
- MUHLENBERGIA RIGENS* (Benth.) A.Hitchc. Occasional perennial, recently reported from MWD land (M. Honer pers. comm.). About 2 mi SE of Copper Basin Reservoir, short side canyon ¼ mi N of Copper Basin Wash, near powerline running E–W from river to aqueduct tunnel. MWD. 15 Apr 2004 *M. Honer & L. Hulse* 1952.
- **PASPALUM DILATATUM* Poir. Perennial, locally frequent in disturbed sites at the edge of the Colorado River; native to South America. Cable Car day use area, along Parker Dam Road. 19 Jul 2003 *S.J. De Groot* 3064.
- **PENNISETUM SETACEUM* Forssk. Perennial, occasional along roads and at the edges of open water; native to Africa. Gene Reservoir. MWD. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3345.
- **PHALARIS MINOR* Retz. Annual, infrequent in flats and washes, usually near roads; native to the Mediterranean. Along Parker Dam Road S of Bullfrog day use area, across river from Roadrunner resort. 6 Apr 2003 *S.J. De Groot & L. De Groot* 2339.
- PHRAGMITES AUSTRALIS* (Cav.) Steudel. Locally abundant; recently reported from MWD land (M. Honer pers. comm.). Steep S-facing slopes of chocolate-brown sedimentary rock with rounded river rock inclusions, 1.5 mi SE of Copper Basin Reservoir, and ½ mi N of Copper Basin Wash. MWD. 15 Apr 2004 *M. Honer & L. Hulse* 1956.
- PLEURAPHIS RIGIDA* Thurb. Perennial, common in washes, on sand dunes, and on open slopes. SE of Savahia Peak, near Dollar Bill Mine. 5 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow* 4444.
- POA BIGELOVII* Vasey & Scribn. Annual, occasional in washes and canyons. Ridge and saddle on SE side of Whipple Wash. 2 Mar 2003 *S.J. De Groot & J.M. Porter* 1228.
- **POLYPOGON MONSPELIENSIS* (L.) Desf. Annual, locally common in moist areas near open water, occasional in washes; native to Europe. Copper Basin Reservoir, ca. N side of lake. MWD. 29 Mar 2004 *S.J. De Groot* 3913.
- **SCHISMUS BARBATUS* (L.) Thell. Annual, frequent throughout the mountains; native to southern Europe and Africa. Wash and desert pavement along Hwy 95 between Vidal and Vidal Junction. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1390.
- **SORGHUM HALEPENSE* (L.) Pers. Rare perennial ca. 2 m (6 ft) high, near flowing water; native to Mediterranean. Wash along MWD road near intersection with Parker Dam Road. MWD. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3175.
- SPOROBOLUS AIROIDES* (Torr.) Torr. Caespitose perennial, frequent in washes above 305 m (1000 ft). Middle fork of Whipple Wash, ca. N of large dark bluff. 16 Oct 2004 *S.J. De Groot & L. Lubinsky* 4471.
- TRIDENS MUTICUS* (Torr.) Nash. Perennial, occasional on open slopes above 305 m (1000 ft). W of Copper Basin, bluff at end of road from Bowman's Wash, above S fork of Whipple Wash. 26 Oct 2003 *S.J. De Groot & N. Fraga* 3419.
- **TRITICUM AESTIVUM* L. Wheat. Rare annual, roadside; native to the Old World. Chemehuevi Wash at junction with Hwy 95, N of Vidal Junction. 5 Apr 2003 *S.J. De Groot & L. De Groot* 2222.
- **VULPIA BROMOIDES* (L.) Gray. Annual, fairly frequent in washes and canyons; native to Europe. NE side of range, wash just W of Chemehuevi Indian Reservation boundary, at intersection with the powerline road. 19 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3836.
- VULPIA OCTOFLORA* (Walter) Rydb. var. *HIRTELLA* (Piper) Henrard. Annual, fairly frequent in washes and canyons. Ridge near highest peak, above wash N of aqueduct. 15 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3599.

POLEMONIACEAE Juss.

- ALICIELLA LATIFOLIA* (S.Watson) J.M.Porter. (Porter 1998) = *Gilia latifolia* S.Watson. Rare annual. NW side of Copper Basin Lake. 6 May 1939 *A.M. Alexander* 708; UC 625588.
- ERIASTRUM DIFFUSUM* (A.Gray) H.Mason. Rare annual, in shallow wash through bajada, along Hwy 95 6–7 mi N of Vidal Junction, S of Chemehuevi Valley. 5 Apr 2003 *S.J. De Groot & L. De Groot* 2255.
- ERIASTRUM EREMICUM* (Jepson) H.Mason. Annual, occasional patches on saddles above 610 m (2000 ft) and on sand dunes near the river. Between summit ridge and War Eagle Mine, top and N-facing slope of ridge near summit. 9 May 2004 *S.J. De Groot* 4291.
- GILIA ANGELENSIS* V.E.Grant. Annual, on the side of a wash. Road to Parker Dam. 17 Mar 1938 *R.M. Perkins & H. de Forest* 420; RSA 470101. Probably a waif.
- GILIA SCOPULORUM* M.E.Jones. Annual, fairly frequent in washes. Whipple Wash, upstream from powerline road. 2 Mar 2003 *S.J. De Groot & J.M. Porter* 1270.
- GILIA STELLATA* A.A.Heller. Annual, fairly frequent in washes. S side of range, along Colorado River aqueduct W of Chamber's Well Road. 4 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen* 2754.
- LANGLOISIA SETOISSIMA* (Torr. & A.Gray) Greene. Annual, scattered in washes and on gravelly open slopes. Along East Mojave Heritage Trail, NE of Pyramid Butte. 19 Mar 2003 *S.J. De Groot & M. Denslow* 1850.
- LINANTHUS BIGELOVII* (A.Gray) Greene. Rare annual, small clay seep area, S of highest peak along wash N of aqueduct. 16 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3734.
- LINANTHUS DEMISSUS* (A.Gray) Greene. Rare annual, rocky canyon 5.5 mi NW of Whipple Wash along the utility road. 7 Apr 1978 *A.C. Sanders & R. Twitchell* 527; UCR 18412. May come up only when the area receives normal or more than normal rainfall.
- LINANTHUS JONESII* (A.Gray) Greene. Annual, fairly frequent in washes. Across Parker Dam Road from Bass Point. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1080.
- LOESELIASTRUM SCHOTTII* (Torr.) Timbrook. Annual, occasional in washes and sandy areas. Along Hwy 95 just N of Vidal. 19 Mar 2003 *S.J. De Groot & J.M. Porter* 1736.

POLYGONACEAE Juss.

- CHORIZANTHE BREVICORNU* Torr. Annual, common in washes in the plains and bajadas. Wash along Hwy 95 about 6 mi N of Vidal Junction, W of Savahia Peak. 5 Apr 2003 *S.J. De Groot & L. De Groot* 2163.
- CHORIZANTHE CORRUGATA* (Torr.) Torr. & A.Gray. Annual, locally frequent in washes or on gravelly slopes. S side of range, along

- Colorado River Aqueduct W of Chamber's Well Road. 4 May 2003 *S.J. De Groot, J.M. Porter, N. Fraga & L. Machen* 2757.
- CHORIZANTHE RIGIDA (Torr.) Torr. & A.Gray. Annual, fairly frequent on desert pavement in the plains and bajadas. Desert pavement and dark volcanic rock outcrop, along road past War Eagle Mine. 21 May 2003 *S.J. De Groot & T. LaDoux* 2971.
- ERIOGONUM DEFLEXUM Torr. var. BARATUM (Elmer) Reveal. Annual, flowering either spring or fall, frequent in washes. Vidal Wash, along Hwy 95 between Vidal and San Bernardino county line. 26 Aug 2003 *S.J. De Groot* 3071.
- ERIOGONUM DEFLEXUM Torr. var. DEFLEXUM. Annual, flowering either spring or fall, frequent in washes. Wash of dark volcanic and granitic rock, SE side along Colorado River Aqueduct. 3 May 2003 *S.J. De Groot, J.M. Porter & N. Fraga* 2615.
- ERIOGONUM DEFLEXUM Torr. var. RECTUM Reveal. Annual, occasional in washes. Short steep canyon, along Parker Dam Road, several miles S of Parker Dam. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1477.
- ERIOGONUM FASCICULATUM (Benth.) Torr. & A.Gray var. POLIFOLIUM (Benth. ex DC.) Torr. & A.Gray. Shrub, frequent on slopes and banks of washes above 305 m (1000 ft). Slot canyon through light-colored granite along Black Meadow Landing Road just NW of Gene Pumping station. 24 Apr 2004 *S.J. De Groot* 4169.
- ERIOGONUM INFLATUM Torr. & Frém. (vars. *inflatum*, *deflatum* I.M.Johnston not recognized; Price 1982). Suffrutescent perennial, frequent among rocks in washes, sometimes on open slopes. Copper Basin: S/SW side of reservoir. MWD. 12 Dec 2003 *S.J. De Groot & F. Navidara* 3470.
- ERIOGONUM RENIFORME Torr. & Frém. Annual, occasional on gravelly open slopes, rocky washes, or sandy soils. Side wash heading NW off Whipple Wash, upstream from powerline road. 2 Mar 2003 *S.J. De Groot & J.M. Porter* 1286.
- ERIOGONUM THOMASII Torr. Annual, frequent in washes and on open slopes. Vidal. 1 Apr 1920 *P.A. Munz & R.D. Harwood* 3594; POM 8736.
- ERIOGONUM TRICHOPES Torr. Annual, frequent in washes and on open gravelly slopes. Bowman's wash near Parker Dam Road and Crossroads. 20 Apr 2003 *S.J. De Groot & A. Gatto* 2419.
- ERIOGONUM WRIGHTII Torr. ex Benth. var. NODOSUM (Small) Reveal. Shrub, frequent among boulders in rocky washes, generally above 305 m (1000 ft). Southern fork of Whipple Wash, upstream from Whipple Cave, just E-NE of large dark bluff. 15 Oct 2004 *S.J. De Groot & L. Lubinsky* 4461.
- POLYGONUM HYDROPIPEROIDES Michx. Infrequent perennial, in saline flats along river. Foot of mountains, along the Colorado River. CRIR. 18 Nov 2001 *J.M. Porter* 13366.
- PTEROSTEGIA DRYMARIOIDES Fisch. & C.A.Mey. Annual, occasional among rocks in washes and on slopes. Wash along Black Meadow Landing Road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1711.

POTAMOGETONACEAE Rchb.

- *POTAMOGETON CRISPUS L. An occasional submerged aquatic floating in the river. Along the Colorado River at Big River, SW of Earp. CRIR. 15 Nov 1980 *A.C. Sanders* 2041; UCR 23016.
- POTAMOGETON NODOSUS Poir. Aquatic perennial, occasional in shallows at edges of open water. Rock House boat ramp, along Parker Dam Road. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3148. An additional vegetative specimen was collected which may be *P. nodosus*, or may be a different species (R.F. Thorne pers. comm.): Gene Reservoir. MWD. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3351.
- POTAMOGETON PECTINATUS L. Frequent aquatic perennial, floating in shallows at edges of open water. Gene Wash, up canyon past swimming hole. MWD. 25 Oct 2003 *S.J. De Groot & N. Fraga* 3367.

RANUNCULACEAE Juss.

- ANEMONE TUBEROSA Rydb. Perennial from root, rare on slopes and in washes, above 305 m (1000 ft). Along Whipple Wash 0–4 mi upstream of the powerline road. 15 Mar 1980 *A.C. Sanders & J. Zabriskie* 1151; UCR 22517.
- DELPHINIUM SCAPOSUM Greene. Perennial from root, rare in rocky washes and on rock outcrops. New California record (De Groot 2005). Canyon of light colored granite just N of Gene Pumping Station along Black Meadow Landing Road. 17 Mar 2003 *S.J. De Groot & J.M. Porter* 1411.

RESEDACEAE Bercht. & J.Presl.

- OLIGOMERIS LINIFOLIA (Vahl) J.F.Macbr. Annual, frequent in alkaline flats near the river and in washes below 305 m (1000 ft). Bass Point, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1029.

RHAMNACEAE Juss.

- ZIZIPHUS OBTUSIFOLIA (Hook. ex Torr. & A.Gray) A.Gray var. CANESCENS (A.Gray) M.C.Johnston. Shrub ca. 2 m tall, patchy distribution in mountain washes and canyons, and on the northern bajada. Chemehuevi Wash between mouth and powerline road. 7 Sep 2003 *S.J. De Groot & A. Gatto* 3133. N fork of Whipple Wash, a few miles E of summit. 17 Oct 2004 *S.J. De Groot & L. Lubinsky* 4539.

ROSACEAE Juss.

- PRUNUS FASCICULATA (Torr.) A.Gray. Shrub, in washes through the bajada, NW side of the range. Along East Mojave Heritage Trail just NE of Pyramid Butte. 26 Apr 2004 *S.J. De Groot* 4236.

RUBIACEAE Juss.

- GALIUM STELLATUM Kellogg var. EREMICUM Hilend & J.T.Howell. Shrubby perennial, frequent among rocks on slopes and in washes, above 305 m (1000 ft). Wash below and S of highest peak, N of aqueduct, southwest side of range. 15 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky & L.L. Worlow* 3650.

RUTACEAE Juss.

- THAMNOSMA MONTANA Torr. & Frém. Shrub, occasional in washes and on rocky slopes. N western side of Monument Peak, S side of Copper Basin. 20 Apr 2003 *S.J. De Groot & A. Gatto* 2471.

SALICACEAE Mirb.

- POPULUS FREMONTII S.Watson. Tree, frequent near surface water, in canyons and at edges of the river and the reservoirs. Copper Basin Reservoir, near intake to aqueduct. MWD. 1 Mar 2004 *S.J. De Groot* 3542.
- SALIX EXIGUA Nutt. Small tree or shrub forming thickets ca. 2–4 m high, occasional at edges of the Colorado River. Shore of Lake Havasu, S of Chemehuevi Wash. CIR. 8 May 2004 *S.J. De Groot* 4273.
- SALIX GOODINGII C.R.Ball. Tree, frequent near surface water, at the edges of the river and reservoirs. Copper Basin Reservoir, ca. NE side of lake. MWD. 29 Mar 2004 *S.J. De Groot* 3932.

SCROPHULARIACEAE Juss.

- ANTIRRHINUM FILIPES A.Gray. Twining annual, occasional in washes and on rocky slopes. Chemehuevi Wash at junction with Hwy 95, N of Vidal Junction. 5 Apr 2003 *S.J. De Groot & L. De Groot* 2210.

- *BACOPA MONNIERI (L.) Wettst. Aquatic herb, locally common in

- mud at edges of the Colorado River. Bass Point day use area, along Parker Dam Road. 26 Aug 2003 *S.J. De Groot* 3083.
- KECKIELLA ANTIRRHINOIDES (Benth.) Straw var. MICROPHYLLA (A.Gray) N.H.Holmgren. Shrub, rare among boulders in washes above 610 m (2000 ft). Upper N fork of Whipple Wash. 17 Oct 2004 *S.J. De Groot & L. Lubinsky* 4552.
- MOHAVEA CONFERTIFLORA (Benth.) A.A.Heller. Annual, occasional in washes. Whipple Wash, upstream from powerline road. 2 Mar 2003 *S.J. De Groot & J.M. Porter* 1338.
- PENSTEMON PSEUDOSPECTABILIS M.E.Jones. Suffrutescent perennial, infrequent among rocks in washes or on slopes, generally above 305 m (1000 ft). Copper Basin, just outside gate to reservoir. MWD. 29 Mar 2004 *S.J. De Groot* 3961.

SIMAROUBACEAE DC.

- CASTELA EMORYI (A.Gray) Moran & Felger. Large shrub, clump of ca. 11 plants, some 2–3 m high, in gravelly and sandy alluvial soil. CNPS List 2. Chemehuevi Wash, just N of wash, a few miles E of Hwy 95. 25 Apr 2004 *S.J. De Groot* 4185. Technically out of the study site, but so close to the line that I included it. Potentially it could occur S of the wash as well.

SOLANACEAE Juss.

- DATURA DISCOLOR Bernh. Summer annual. Occasional in small wash along road between Vidal and Big River (roughly following the Atchison, Topeka, and Santa Fe Railroad tracks), just E of Travel at Your Own Risk sign. 9 Oct 2003 *S.J. De Groot, J.M. Porter & L. Machen* 3266.
- DATURA WRIGHTII Regel. Three ft. high & spread, stem 1.5 in. Sun, sandy wash of open valley. Hank's Well [West Well], on Vidal–Needles road. 1 May 1932 *C.B. Wolf* 3216; RSA 4017.
- LYCIUM ANDERSONII A.Gray. Shrub, common in washes. Appears to introgress and form occasional hybrids with *L. fremontii* (see Hitchcock 1932: 196). Intersection of Chemehuevi Wash and powerline road. 19 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky, & L.L. Worlow* 3872.
- LYCIUM ANDERSONII A.Gray × *L. FREMONTII* A.Gray (see Hitchcock 1932: 196). Shrub, in shallow wash, with *Lycium andersonii* and *L. fremontii*. Gene Wash just N of Gene Reservoir. MWD. 27 Sep 2003 *S.J. De Groot & J.M. Porter* 3164.
- LYCIUM FREMONTII A.Gray. Shrub, frequent in mountain washes and on rocky slopes. S of highest peak along wash N of aqueduct. 16 Mar 2004 *S.J. De Groot & K. De Groot* 3694.
- LYCIUM TORREYI A.Gray. Shrub, frequent in washes or on slopes. Trail to Cupcake Butte, N of Whipple Wash, NW side of first butte along trail. 10 Oct 2003 *S.J. De Groot & J.M. Porter* 3287.
- NICOTIANA ATTENUATA Torr. Annual, infrequent, in sandy soils at lower elevations. Bass Point, along Parker Dam Road. 1 Mar 2003 *S.J. De Groot & J.M. Porter* 1031.
- NICOTIANA OBTUSIFOLIA M.Martens & Galeotti. Perennial, frequent in washes and canyons. S side of basin in NW part of range. 4 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow* 4427.
- PHYSALIS CRASSIFOLIA Benth. Subshrub or suffrutescent perennial, frequent in sandy or rocky washes. Gold Standard Mine. 9 Jan 2003 *S.J. De Groot & J.R. De Groot* 939.

TAMARICACEAE Bercht & J.Presl.

- *TAMARIX APHYLLA (L.) H.Karst. Tree ca. 8–9 m, in washes and sandy areas near the river. Tamarisk grove along Havasu Palms Road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1685.
- *TAMARIX CHINENSIS Laureio. Shrub or small tree, forming clumps and dense thickets; locally common in washes and moist areas near the river, occasionally colonizing mountain washes. May be the same as *T. ramosissima* (Baldwin et al. 2002). Whipple Wash at intersection with Havasu Palms Road. 18 Mar 2003 *S.J. De Groot & J.M. Porter* 1684.

TYPHACEAE Juss.

- TYPHA DOMINGENSIS Pers. Perennial, locally common in shallows at edges of open water. Copper Basin: ca. W–SW side of reservoir. MWD. 12 Dec 2003 *S.J. De Groot & F. Navidara* 3490. Shore of Lake Havasu, S of Chemehuevi Wash. CIR. 8 May 2004 *S.J. De Groot* 4277.

URTICACEAE Juss.

- PARIETARIA HESPERA B.D.Hinton. Annual, frequent in washes. W slope just below saddle at N end of Savahia Peak. 4 May 2003 *S.J. De Groot, J.M. Porter & N. Fraga* 2835.

VERBENACEAE J.St.-Hil.

- ALOYSIA WRIGHTII A. Heller ex Abrams. Shrub, occasional among rocks in outcrops or steep drainages above 915 m (3000 ft). CNPS List 4. Ridge between middle and N forks of Whipple Wash, saddle just S of N fork. 16 Oct 2004 *S.J. De Groot & L. Lubinsky* 4487.

VISCACEAE Batsch.

- PHORADENDRON CALIFORNICUM Nutt. Parasite, on trees and shrubs in the Fabaceae, frequent in washes. Intersection of Chemehuevi Wash and powerline road. 19 Mar 2004 *S.J. De Groot, K. De Groot, L. Lubinsky, & L.L. Worlow* 3873.

ZYGOPHYLLACEAE R.Br.

- FAGONIA LAEVIS Standl. Subshrub, frequent among rocks in washes. Plains at southern base of mountains. 19 Apr 2001 *J.M. Porter* 12463.
- KALLSTROEMIA CALIFORNICA (S.Watson) Vail. Summer annual, infrequent in washes through the southern bajada. Vidal Wash at intersection with Hwy 95, S of Vidal. 28 Sep 2003 *S.J. De Groot & J.M. Porter* 3240.
- LARREA TRIDENTATA (Sessé & Moq. ex DC.) Coville. Shrub, dominant in bajadas and on open slopes. Just SE of Savahia Peak, road between Cascade and Dollar Bill mines. 5 Oct 2004 *S.J. De Groot, L. Lubinsky & L.L. Worlow* 4442.
- *TRIBULUS TERRESTRIS L. Annual, occasional in disturbed sites and near roads; native to the Mediterranean. Growing in crack between concrete curb and asphalt pavement, parking area, Parker Dam. 19 Jul 2003 *S.J. De Groot* 3059.