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Erika M. Gardner

Rancho Santa Ana Botanic Garden, Claremont, California

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A VASCULAR FLORA OF THE KIAVAH WILDERNESS, SCODIE MOUNTAINS, KERN COUNTY, CALIFORNIA

ERIKA M. GARDNER

Rancho Santa Ana Botanic Garden and Claremont Graduate University, 1500 North College Avenue, Claremont, California 91711

ABSTRACT

Congress designated the Kiavah Wilderness in 1994 under the California Desert Protection Act. It is located in the Scodie Mountains in Kern County, ca. 24 km (15 mi) east of Lake Isabella and 24 km (15 mi) west of Ridgecrest, and encompasses a total of 137 mi² (354 km²) with elevations ranging from 1000 to 2200 m (3500–7294 ft). The Wilderness is ecologically important because it occurs in a transition zone between two floristic provinces, the Sierra Nevada of the California Floristic Province and the Mojave Desert of the Desert Province. It is of cultural significance because it has a rich history of Native Americans harvesting pinyon pine nuts and inhabiting the land. Prior to the study ca. 290 vascular plant taxa had been documented, primarily along roads and the Pacific Crest Trail. Jim Shevock and Barbara Erter made significant contributions to the floristic inventory during the 1980s and early 1990s, and LeRoy Gross added valuable collections in 2005 and 2006. The purpose of the project was to inventory the vascular plant taxa throughout the Kiavah Wilderness, document special status plants, and assess invasive non-native plants. The project took place in 2013–2015, and 68 days were spent in the field. It coincided with three severe to exceptional drought years, the driest span for the site in recorded history. During the study large stands of Pinus monophylla, found in the Wilderness and much of the Southwest, experienced large die-offs. About 1300 plant specimens were collected for the study, which are deposited at RSA, CAS, and CCR. In total, 70 families, 240 genera, 457 species, and 477 minimum-rank taxa were documented, including those collected previously. A total of 28 non-native taxa (5.9% of the flora) and 26 special status plants (5.4%) were documented. Three special status taxa previously documented in the Wilderness were not relocated: Lewisia disepala (Montiaceae), Cordylanthus rigidus subsp. brevibracteatus (Orobanchaceae), and Delphinium purpusii (Ranunculaceae). A range extension for Eriophyllum mohavense (Asteraceae) was documented.

Key words: California, drought, flora, Kiavah Wilderness, Mojave Desert, Pacific Crest Trail, Scodie Mountains, southern Sierra Nevada, vascular plants.

INTRODUCTION

Herbarium collections provide invaluable data for researchers studying ecology, biogeography, evolution, systematics and climate change to better understand the patterns of biodiversity and the processes that shape these patterns (Prather et al. 2004). Locating, identifying and mapping plant populations are essential first steps towards understanding the flora of a particular area. After a site is thoroughly explored and documented, newly gathered information can be added to preexisting knowledge to gain a greater understanding of plant diversity at different scales, including regional and continental. Floristic studies are particularly important for understanding the relationship between plants and climate, especially in context of climate change. This report is the result of a floristic study conducted over three years that coincided with a severe drought. It is projected that California will continue to experience periods of extended drought throughout the rest of the century (Williams et al. 2015). Knowing this, continued study and monitoring of the California flora are vital to predict where native and invasive plant species will persist, increase or decline, and how these plants may be managed.

The Kiavah Wilderness is located ca. 24 km (15 mi) east of Lake Isabella and 24 km (15 mi) west of Ridgecrest in Kern County, California (Fig. 1). Its ecological importance derives from its occurrence in a transition zone between two floristic provinces, the Sierra Nevada of the California Floristic Province (higher elevations) and the Mojave Desert of the Desert Province (lower elevations) (Baldwin et al. 2002). The Wilderness covers most of the Scodie Mountains, which is a component range of the southern Sierra Nevada. A small portion of the northern end of the Scodie Mountains lies outside the Wilderness boundary. The Kiavah Wilderness encompasses a total of 354 km² (137 mi²), of which 160 km² (62 mi²) are managed by the U.S. Department of the Interior, Bureau of Land Management (BLM) and 194 km² (75 mi²) are managed by the U.S. Department of Agriculture (USDA), Sequoia National Forest (SNF), and Kern River Ranger District (BLM 2017).

Southwest of the Scodie Mountains, separated by Kelso Valley, are the Pute Mountains, another range of the Sierra Nevada (Fig. 1). The South Fork of the Kern River, Chimney Creek and Canebrake Creek border the Scodie on the north. To the northeast is the Owens Peak Wilderness, separated from the Scodie Mountains by Walker Pass and Highway 178. A popular off-highway vehicle (OHV) recreational area located on the Jawbone-Butterbredt Area of Critical Environmental Concern flanks the southern and southeastern boundary of the
Kiavah Wilderness in the Indian Wells-Searles Valley of the Mojave Desert. Private property parcels abut sections along the north, east and west borders of the Wilderness. The Canebrake Ecological Reserve, managed by the California Department of Fish and Wildlife, is located in Scodie and Cap canyons (CDFW 2016). The Canebrake Ecological Reserve is closed to the public and a permit must be obtained to enter the reserve.
Access into the Kiavah Wilderness is via two main routes, Horse Canyon Road/McIver’s 4 × 4 road (36E52) and the Pacific Crest Trail (PCT) (Adkinson 2001; PCTA 2014; Fig. 1, 2). Horse Canyon Road is a rugged and difficult 4 × 4 road that winds its way into the Wilderness and terminates at McIver’s Cabin at 2040 m elevation (6696 ft). A large section of this road (ca. 13 km, 8 mi) is part of the PCT that was constructed during the 1980s and transects the Wilderness for 16 mi (25.7 km), from Bird Spring Pass (1637 m, 5371 ft elevation) to Walker Pass Campground (1542 m, 5060 ft). There is an unmaintained trail on the southwest side of the Wilderness from Cane Canyon (1220 m, 4000 ft elevation) to Yellow Jacket Spring (1790 m, 5873 ft). Maintained dirt roads terminate in Sage Canyon and Cow Haven Canyon; from these, one can hike into the Wilderness. Beyond the PCT, no maintained trails exist but cattle and deer trails are abundant.

PHYSICAL SETTING

Topography

The Kiavah Wilderness encompasses portions of six USGS 7.5’ topographic quadrangle maps: Cane Canyon, Freeman Junction, Horse Canyon, Onyx, Owens Peak, and Walker Pass. Three valleys and two passes (Fig. 2) surround the Scodie Mountains. Scodie Mountain is the highest point at 2223 m (7294 ft). The next highest peaks in the Wilderness are Skinner Peak at 2170 m (7120 ft), followed by Pinyon and Onyx peaks at 2074 m (6805 ft) and 1598 m (5244 ft), respectively. The higher elevations are part of the crest of the Sierra Nevada and are steep-sided, rugged ridges that trend in an east-west direction. Located in the southeastern section of the Wilderness is a large unnamed plateau that has gentle rolling topography. Baker (1912) described the plateau as “broad-topped summit mountains.” Lower elevations (900–1300 m, 3000–4500 ft) are characterized by gentler slopes that extend into valleys as long narrow shoulders that gradually decrease in elevation (Baker 1912).

Major canyons include Bird Spring, Horse, Sage, Boulder and Cow Haven canyons, all of which drain into Indian Wells-Searles Valley (Fig. 2). This watershed provides drinking water to residents of Inyokern and Ridgecrest (EPA 2016). Major canyons draining into the South Fork Kern River are Short, Cane, Cholla, Scodie, Smith, Cap and Spring canyons.

Geology

The history of the Sierra Nevada can be traced back to ca. 542 million years ago (mya) during the Cambrian Period of the Paleozoic Era. At that time, what is now the Sierra Nevada was the floor of an ancient sea where sediments from exposed mountains to the east settled (Hill 2006). At the time of the Triassic Period of the Mesozoic Era, ca. 250–210 mya, magma rose to
the surface and cooled to form the Sierran granite core (Hill 2006). Around the Cretaceous Period, 144–66 mya, the Sierra Nevada began to lift and tilt westward and most of the Sierran plutons were formed to create the foundation of the Sierra Nevada batholith (Hill 2006; Hall 2007). Near the beginning of the Cenozoic Era, 65 mya, the Sierra Nevada began to take shape owing to plate tectonics (Hall 2007). During the Pliocene Epoch, 6–8 mya, the Garlock fault along the southern Sierra Nevada continued to move westward, thus allowing for crestal uplift of the southern Sierra Nevada (Hall 2007). By ca. 2 mya, during the Pleistocene Epoch, the Sierra Nevada reached its present height and extent.

Geologic surveys and maps identify the main rock type of the Scodie Mountains as plutonic, Mesozoic in age and characterized by granite, quartz monzonite, granodiorite and quartz diorite (Fig. 3; CDC 2010). Alluvial deposits are described as light brown in color from the feldspar of the Sierra granite (Baker 1912). Alluvial deposits can be found in the older alluvial, lake, playa and terrace deposits on the lower desert floor in Horse, Sage, and Cow Haven canyons; these are generalized as non-marine (continental) sediments, and Pleistocene in age (CDC 2010).

Climate

The southern Sierra Nevada experiences a wide range of temperatures, minimal precipitation, and strong winds. Temperature and precipitation are strongly influenced by elevation. According to the Köppen climate classification system, the Kiavah Wilderness experiences a Mediterranean and arid mid-latitude desert climate (Kauffman 2013). Summers are hot and dry, winters are brief and relatively warm, and precipitation is in the form of rain and snow (Twisselmann 1967). In the southern Sierra Nevada, snow typically falls from November through March. At elevations above 2000 m (6561 ft), snow can persist on the ground for several months. The average annual precipitation in the Kiavah Wilderness is about 35 cm (14 in.), although drought conditions have been known to last up to six years in this area (BLM 2017). During the study, from 2013 to 2015, there was no substantial snowfall nor snowpack in the Wilderness.

Weather data were taken from private weather stations located at Bird Spring Pass (MBJ1C1, 1500 m [5000 ft]; RAWS 2013) and Walker Pass (MONYC1, 1600 m [5200 ft]; NOAA 2014). Table 1 shows that average annual temperatures and precipitation in the Kiavah Wilderness for years 2013–2015 (duration
Table 1. Weather data for stations proximate to the Kiavah Wilderness, 2013–2015 (RAWS 2013; NOAA 2014).

| Station                        | Average Temperature °C (°F) | Maximum Temp °C (°F) | Minimum Temp °C (°F) | Total Precipitation cm (in.) |
|--------------------------------|-----------------------------|----------------------|----------------------|-------------------------------|
| Walker Pass (MONYC1)           | 14 (57)                     | 40 (104)             | −10 (14)             | 12.9 (5.11)                   |
| Bird Spring Pass (MBJIC1)      | 11 (53)                     | 35 (96)              | −11 (11)             | 6.78 (2.67)                   |
| Weather stations combined      | 13 (55)                     | 36 (98)              | 7 (16)               | 11.0 (4.33)                   |

of the study) was a scant 11.0 cm (4.33 in.), although higher and lower elevations likely received greater and lesser amounts, respectively. Long-term precipitation data, taken from the Inyokern weather station for 1940–2012, indicate that average annual rainfall was 10.59 cm (4.17 in.) (Fig. 4). However, this station is at only 760 m (2500 ft) elevation and lies deeper in the rain shadow of the Sierra Nevada.

From 2012 to 2015, California experienced severe to exceptional drought conditions (USDM 2016). Although periodic droughts are not uncommon in California, the 2012–2014 drought is considered a 10,000-year event in the state and the 2012–2015 drought has an incalculable return period (Roberson 2015).

HUMAN HISTORY AND IMPACTS

The native people of the Kiavah Wilderness were the Tubatulabal and Kawaiisu tribes (Kroeber 1925). Others believed to have visited the Scodie Mountain region include tribes from the east (e.g., the Owens Valley Paiute, Panamint Shoshone, ...
Table 2. Collectors of plants from the Kiavah Wilderness prior to the present study. Collector, number of specimens, year(s) active, and location are presented in chronological order.

| Year(s)          | Collector                      | Number of collections | Location(s)                                                                 |
|------------------|--------------------------------|-----------------------|----------------------------------------------------------------------------|
| 1911             | Museum of Vertebrate Zoology    | 1                     | Scodie Canyon                                                              |
| 1911             | Unknown                        | 1                     | Scodie Canyon                                                              |
| 1927             | C. S. Robinson                 | 3                     | Sage Canyon, plateau                                                       |
| 1930             | J. Farley                      | 2                     | Scodie Mt                                                                  |
| 1941             | Bell                           | 1                     | Scodie Canyon                                                              |
| 1963, 1966–1968  | E. C. Twisselmann              | 61                    | Horse Canyon, Scodie Canyon, summit of Scodie Peak, Cholla Canyon          |
| 1964             | J. Gillett                     | 1                     | West of Walker Pass                                                        |
| 1978             | B. Orr                         | 1                     | West of Walker Pass                                                        |
| 1979–1982, 1984, | J. R. Shevock                  | 142                   | Pacific Crest Trail, Melver’s Spring, Horse Canyon, Sage Canyon, Horse Canyon, Sage Canyon, Sage Canyon, Scodie Peak |
| 1980             | S. Lawson                      | 14                    | Pacific Crest Trail, Horse Canyon, Sage Canyon, Bird Spring Pass, Sage Canyon |
| 1980             | L. Nagata                      | 9                     | Pacific Crest Trail, Horse Canyon Road, Bird Spring Pass, Sage Canyon       |
| 1980             | B. Schwartzman                 | 7                     | NW of Pinyon Peak, Caney Canyon, Sage Canyon, Scodie Peak                  |
| 1980             | J. Hiebert                     | 6                     | NW of Pinyon Peak, Caney Canyon, Sage Canyon, Scodie Peak                  |
| 1980             | C. Franz                       | 4                     | Caney Canyon                                                               |
| 1980             | J. Janzen                      | 3                     | Horse Canyon, Sage Canyon                                                  |
| 1980             | C. Bauernfeind                 | 2                     | Pacific Crest Trail, Short Canyon                                         |
| 1980             | Unknown                        | 2                     | Short Canyon                                                              |
| 1980             | Anonymous                      | 1                     | Bird Spring Pass on Pacific Crest Trail                                   |
| 1980             | USDA                           | 1                     | Pacific Crest Trail                                                       |
| 1986–1988        | B. Ertter                      | 54                    | Canyon on the N side of Pinyon Peak, Pacific Crest Trail                   |
| 1986             | M. A. Henry                    | 1                     | Sage Canyon                                                               |
| 1989             | J. Emmel                       | 1                     | N end Scodie Mts                                                          |
| 1995, 1996       | M. Geber                       | 2                     | N-facing slopes of Scodie Mountains                                        |
| 1996, 1999       | D. York                        | 24                    | Pacific Crest Trail, slopes of Pinyon Peak                                |
| 2002             | E. Laeger                      | 1                     | N ridge of Pinyon Peak                                                    |
| 2004             | L. P. Janeway                  | 11                    | Pinyon Creek                                                              |
| 2005, 2006       | L. Gross                       | 88                    | Head of Horse Canyon, Yellow Jacket Spring, N of Skinner Peak, near radio tower, Pacific Crest Trail |
| 2010             | A. Howald                      | 3                     | N end of Scodie Mts, Hwy 178                                               |
| 2011             | N. Fraga                       | 19                    | Base of Pinyon Peak                                                       |

Chemehuevi; BLM 2017). However, human history in the southern Sierra Nevada can be traced back to ca. 4000 BCE [Before Common Era] during the Lamont Phase (Moratto et al. 1984). Around this time, pinyon-juniper woodlands expanded downslope in response to changing climatic conditions towards a Mediterranean climate, making the area attractive owing to the potential for increased harvesting of pinyon pine nuts (Moratto et al. 1984). From 1200 BCE to 600 CE, during the Canebrake Phase, Native Americans began to settle in pinyon-juniper woodland base camps (Moratto et al. 1984). The Sawtooth Phase (600–1300 CE) is characterized by the presence of obsidian, ‘manos’ and milling stones, bedrock mortars and many other artifacts. The final recorded phase for the history of Native Americans in the Sierra Nevada, the Chimney Phase from 1300 to 1875 CE, saw unchanged settlement patterns and increases in artifact accumulation (Moratto et al. 1984). The Kiavah Wilderness was named after a Paiute chief from Panamint Canyon who took up residence in Sage Canyon (Guilde 1969).

During the late 1700s, Spanish explorers were sent to North America on religious expeditions. In 1776, Father Francisco Garces was the first European to encounter Native Americans of the lower Kern River Valley (Heard 1987). After this encounter, for the next 50 years, trade between the Native Americans of the southern Sierra Nevada and Europeans ensued (Kern River Valley Specific Plan 2011). In 1834, Tibatulabal Indians led Joseph Walker and his trappers, the first white men to traverse the southern Sierra Nevada, through what is known today as...
Walker Pass (Gilbert 1985). In 1844, John C. Fremont proposed that the pass be named after Walker (Gudde 1969).

During the mid-1800s, after the discovery of gold and other natural resources, Europeans and Americans from the east made their way to California. Early settlers of the South Fork Kern River Valley, near Canebrake Creek and Kelso Valley, irrigated the land to farm alfalfa (Morgan 1914). Around the early 1860s, William Scodie, a Prussian immigrant, founded a general store at the mouth of Scodie Canyon (Geographic Names Information System [GNIS] 2016; Beman 2001). Today the store is known as the Onyx Store. Scodie sold goods to the U.S. Calvary stationed in California during the Civil War (Beman 2001). During this time, conflict between Natives and settlers began to escalate. Settlers in search of gold were taking over land that the Tuhulabal and Kawaiisu tribes inhabited. In 1863, American soldiers attacked the Tuhulabal and Paiute tribes on settlers in the Owens Valley the previous year (Heard 1987). Upon their defeat, the survivors of the Tuhulabal tribe relocated to the Tule River Indian Reservation (Tulare County) during the early 1900s.

On 1 July 1908, Sequoia National Forest was established and large areas of the southern Sierra Nevada, including the Scodie Mountains, went under SNF management (Davis 1983). In 1910, the SNF was transferred to the Kern National Forest, from which it returned to SNF in 1915 (Davis 1983). The Forest Service portion of the Wilderness has been managed by SNF since that time. As for the BLM portion, the eastern sections are managed by the Bakersfield Field Office and the southern sections are managed by the Ridgecrest Resource Area (California Desert District) (BLM 2017).

During the 1900s mining operations and cattle grazing continued in the southern Sierra Nevada, including the Scodie Mountains. In the late 1930s, upon completion of the Los Angeles Aqueduct across the Mojave Desert, Murdo George McIver moved a small cabin that had been used as a guard shack during the construction of the Los Angeles Aqueduct from the desert floor to the plateau in the Scodie Mountains (Gear-grinders 2014). McIver and his wife had a small mining operation and strategically placed the cabin next to a spring, now called McIver’s Spring. This is the only historical structure in the Wilderness and is a popular destination for OHV activity and PCT hikers. Descendants of the McIver’s, their grandchildren and great-grandchildren, visit annually and maintain the cabin.

In the early 1940s, miners prospected for tungsten near Pinyon Peak (Valentine claims), but there is no record of production (Peterson and Capstick 1984). In the late 1950s miners prospected for quartz near Skinner Peak (Great White Way Prospect), but likewise there is no record of production (Peterson and Capstick 1984). In the BLM portion of the Wilderness, many old mine tailings are visible on the slopes of the desert bajadas (Gardner, pers. obs.). Prospectors from the 1940s to 1960s carved their names and dates on boulders near old mining claims. In 1983, the USGS surveyed the Scodie Mountains and determined that mineral deposits within the area are small and lack resource potential (Harmer et al. 1983). Under the California Desert Protection Act of 1994 all designated Wilderness areas were withdrawn from further mining operations, with existing claims active until the leasing agreements expire (BLM 2017).

In 1994, Congress designated a large portion of the Scodie Mountains as the Kiavah Wilderness under the California Desert Protection Act. There is only one modern structure in the Wilderness, a microwave tower along Horse Canyon Road, that is owned and operated by the Naval Air Weapons Station, China Lake. The PCT, well-traveled by hikers in the springtime, is the only maintained trail in the Wilderness. Horse Canyon Road and the PCT merge near the Microwave tower in the southwest section of the plateau and the road terminates at McIver’s Spring/Cabin (USDA 2014; Fig. 2). Several other dirt roads provide minimal access to the Wilderness but are popular weekend destinations for OHV users and campers. Off-highway vehicle use is one of the greatest threats to the Wilderness. BLM and SNF signs are posted along the Wilderness boundaries to deter OHV users, but OHV trespassing was observed on many occasions during this study. In 2012, to further deter illegal OHV use, the Student Conservation Association began constructing barriers (fences and posts) along the southern BLM boundary. Cattle grazing continues on both BLM and SNF land, even after its designation as a Wilderness. Grazing allotments are located throughout the Wilderness (BLM 2017).

The Kiavah Wilderness is also a destination for target shooting and hunting. According to the Forest Service, visitors do not heavily impact the Wilderness because it does not have any outstanding features to draw many visitors or large crowds. The most harmful human activity, besides OHV use and human-mediated climate change, may be illegal marijuana farming. A remote marijuana farm was discovered by federal authorities in 2014 within the Wilderness. Damage done by these farmers included removal of the native understory vegetation, diversion of water from a nearby unmarked spring, and use of rodenticides. On 11 July 2014, the illegal farmers started a forest fire to destroy evidence of the farming operation, the Nicoll’s Fire, which burned ca. 1600 acres over 11 days (Incident Information System 2016). The fire cost the state of California an estimated $5.6 million to extinguish (Associated Press 2015).

**BOTANICAL HISTORY**

There has been no previous focused effort to inventory the plants of the Kiavah Wilderness and Scodie Mountains. Inventories of nearby areas include that of Owens Peak eastern watershed (Fraga 2008) and Red Rock Canyon and the El Paso Range (Twisselmann 1970). The earliest known plant specimens from the Wilderness were collected in 1911 by members of the Museum of Vertebrate Zoology club at the University of California, Berkeley. Fewer than 10 specimens had been collected from the Scodie Mountains before the 1960s when Ernest Twisselmann made 61 collections. Upon completion of the PCT, Jim Shevock collected 142 specimens between 1979 and 1992. Others with significant numbers of collections are from LeRoy Gross (88) and Barbara Ertter (54). Table 2 is a list of all individuals and groups who made collections prior to my study.

According to records in the Consortium of California Herbaria (CCH) database (2013), ca. 630 specimens were collected from 1911 to 2011 (Fig. 5–6) documenting ca. 290 native and non-native vascular taxa in the Kiavah Wilderness prior to the study. Most of these specimens were collected in easily accessed areas, along roads and trails such as Horse Canyon Road, Highway 178, Kelso Valley Road, and the PCT.
STUDY GOALS AND METHODS

The primary goal of the study was to document the vascular flora of the Kiavah Wilderness by surveying as much territory and as many habitats throughout the growing season as possible. This increases our botanical knowledge of the southern Sierra Nevada, adding to Fraga’s (2008) study of the Owens Peak eastern watershed. Field surveys took place between March 2013 and May 2015, for a total of 68 days. All plant species that were encountered and identifiable (i.e., with reproductive parts) were documented via collection of ca. 1300 specimens. Special status taxa (endangered, threatened, sensitive, or watch-list; Table 5) were collected conservatively, taking into account population size and any previous documentation. Standard collection data were recorded, including GPS coordinates and descriptive habitat information. All recorded information was included on the herbarium specimen label. The first set of specimens was deposited at Rancho Santa Ana Botanic Garden (RSA) and duplicate sets were sent to the California Academy of Sciences (CAS) and the University of California, Riverside (UCR). All specimen information is accessible via the CCH database.

The ca. 630 specimens previously collected from the study area were located using the CCH database. These specimens, housed at CAS, UCJEPS, RSA-POM and UCR, were examined to verify the determinations and update the nomenclature as needed; all were annotated. Specimens were identified using The Jepson Manual, Vascular Plants of California, second edition (Baldwin et al. 2012); A Flora of Kern County, California (Twisselmann 1967) and Cryptantha of Southern California (Simpson and Hasenstab 2009). The taxonomy of Eriastrum (Polemoniaceae) is based on De Groot’s treatment (2016). Erythranthe (Phrymaceae) is based on Naomi Fraga’s revision (Fraga 2012). All specimens of Gilia (Polemoniaceae) were determined by Mark Porter. Identifications were verified through comparison with annotated specimens at RSA.

VEGETATION

Environmental variables such as climate, elevation, slope, and aspect all affect the distributions of plants and plant associations. The vegetation classification in this study is mainly based on A Manual of California Vegetation, second edition (Sawyer et al. 2009), and A California Flora (Munz 1959). Vegetation associations found in the Kiavah Wilderness are singleleaf pinyon woodland, Jeffrey pine forest, cup leaf ceanothus chaparral, ghost pine woodland, sagebrush scrub (Munz 1959), desert needlegrass grassland, Joshua tree woodland, and creosote bush scrub. The elevation range of each vegetation type is shown in Fig. 7. For the purpose of this study the vegetation associations are split into two sections, Sierra Nevada and Mojave.
Desert, although the associations are not confined to one or the other (see overlap in Fig. 7).

Sierra Nevada Section

Single-Leaf Pinyon Woodland (Fig. 8).—The most common vegetation type in the Kiavah Wilderness is singleleaf pinyon woodland. It ranges in elevation from 1300 to 2200 m (4300–7200 ft) and occupies ridges, drainages, alluvial fans, level ground to steep slopes, and all aspects. It usually occurs on soils that are well drained. *Pinus monophylla* (singleleaf pinyon pine) is the dominant or co-dominant tree and the most common tree in the study area overall. The canopy is open or intermittent. Other trees that occur in this woodland include scattered *P. jeffreyi* (Jeffrey pine) and *Quercus chrysolepis* (canyon live-oak). Shrub species include *Artemisia tridentata* (bigsagebrush) and *Ephedra viridis* (Mormon tea). The herbaceous layer consists of *Claytonia* spp. (miner’s lettuce), *Microsteris gracilis* (slender phlox), *Phacelia humilis* var. *dudleyi* (Dudley’s phacelia) and *Stipa* spp. (needlegrass), among others.

The four consecutive years of exceptional drought led to widespread pine mortality, especially of *P. monophylla*, which was most severe from Mt. Pinos in the Emigdio Mountains through the Tehachapi Range into the southern Sierra Nevada (USDA 2015). I observed *P. monophylla* die-off in the Scodie Mountains over the course of the study. Figures 12–13 show two images of a slope in Horse Canyon taken exactly one year apart. Some individuals of *P. monophylla* appear brown and dead or dying in 2014, whereas their number had increased substantially one year later. This locality lies at the transition zone between the Desert Province and the Sierra Nevada of the California Floristic Province. At higher elevations, mortality appeared to be lower.

Cup leaf ceanothus chaparral (Fig. 9).—*Ceanothus vestitus* (cup leaf ceanothus) is dominant to co-dominant with *Fremontodendron californicum* (flannel bush). This is the second most extensive vegetation type at higher elevations (1800–2000 m, 6000–6700 ft). Cup leaf ceanothus chaparral carpets the plateau atop the Kiavah Wilderness. *Ceanothus vestitus* produces seedlings in abundance following fire (Sawyer et al. 2009). As discussed below, the plateau is undergoing post-fire succession following a fire in 1997. Understory vegetation is sparse.

Jeffrey pine forest (Fig. 10).—Dense pockets of *Pinus jeffreyi* are found in the Kiavah Wilderness at the highest elevations (1889–2000 m, 6200–6600 ft) on the plateau, ridges, along dry stream benches, and slopes of all aspects. Trees are relatively large, many over 40 ft tall, and the canopy is often continuous. These trees have withstood the assault of wildfires. Scorched trunks of some dead individuals remain upright (Fig. 10), but many more lie scattered on the plateau. Additional evidence that the plateau was once a woodland or forest is the presence of *P. jeffreyi* seedlings and re-sprouting *Quercus chrysolepis*.

The understory of Jeffrey pine forest is sparse; however, grasses can be prominent, including *Bromus* spp. (brome grass), *Poa secunda* (pine bluegrass) and *Stipa* spp. (needle grass), among others.

Ghost pine woodland.—*Pinus sabiniana* (ghost pine, gray pine) stands occur on xeric sites at lower elevations (900–1500 m, 3000–5000 ft) in the Sierra Nevada (Sawyer et al. 2009). In the Kiavah Wilderness, prominent stands occur at the upper end of Sage Canyon and along the northwestern and northern boundaries of the Wilderness, but the vegetation type is less widespread than Jeffrey pine forest and single-leaf pinyon woodland. Associated trees include the desert species *P. monophylla* and *Yucca brevifolia* (Joshua tree). Understory vegetation is sparse and includes *Ephedra viridis*, *Eriogonum nudum* var. *westonii* (Weston’s buckwheat) and *Opuntia basilaris* (bearavertail cactus).

Sagebrush scrub.—This vegetation type is generally found in flatter, sandy areas at higher elevations atop the plateau (1900 m, 6300 ft) and at lower elevations in flat drainages such as Jack’s Creek (1400 m, 4800 ft) near Walker Pass. *Artemisia tridentata* (big sagebrush) is often co-dominant with *Ephedra*
Fig. 8–11. Vegetation types in the Kiavah Wilderness.—8. Singleleaf pinyon pine woodland is the most common vegetation type.—9. Dense cup leaf ceanothus chaparral dominates the post-burn vegetation on the plateau. A fire-killed *Pinus jeffreyi* stand at left.—10. Jeffrey pine forest: A small stand of unburned *Pinus jeffreyi* on the plateau.—11. Joshua tree woodland forms dense stands at the lower desert elevations.
Vascular Flora of the Kiavah Wilderness

**Fig. 12–13.** Drought-stressed pinyon pine (*Pinus monophylla*): slope in Horse Canyon facing west (35.577000°, −118.114992°; 1600 m [5300 ft]).—12. Photo taken 16 Apr 2014: note the browning (dead or dying) trees.—13. Photo taken exactly one year later, 16 Apr 2015: most of the trees in the stand are dead or dying. These trees experienced extreme drought during 2012–2015. Pinyon pines throughout the Kiavah Wilderness showed signs of drought stress.

viridis and *Eriogonum fasciculatum* var. *polifolium* (California buckwheat). Herbaceous vegetation is sparse to lacking.

**Mojave Desert Section**

Desert needlegrass grassland.—Generally found on steep, exposed, south-facing slopes at elevations ranging from 1400 to 1600 m (4800–5200 ft), desert needlegrass grassland occurs throughout the Kiavah Wilderness. The dominant cover is *Stipa speciosa* (desert needlegrass), with some shrubs in-torned including *Artemisia tridentata*, *Ericameria linearifolia* (narrowleaf goldenbush), *Grayia spinosa* (hop sage) and *Krascheninnikovia lanata* (winter fat). Various annual *Eriogonum* (buckwheat) species can form dense patches within the grassland.

Joshua tree woodland (Fig. 11).—At lower elevations (1100–1600 m, 3700–5200 ft) on slopes and the desert floor, dense stands of *Yucca brevifolia* dominate. Species that often co-occur and can co-dominate are *Artemisia tridentata*, *Ephedra viridis* and *Eriogonum fasciculatum* var. *polifolium*. The herbaceous understory includes grasses such as *Bromus tectorum* (cheat grass), an invasive non-native, and a native, *Poa secunda*. Annual herbs include *Camissonia kernensis* subsp. *kernensis* (Kern County evening primrose) and *Phacelia fremontii* (Fremont’s phacelia). Despite the drought, spring 2013 was a record bloom year for *Y. brevifolia* (James 2013) and almost all mature individuals were in full bloom (Fig. 11).

Cresote bush scrub.—In the Mojave Desert-influenced areas at lower elevations (1000–1300 m, 3500–4500 ft), *Larrea tridentata* (creosote bush) is the dominant to co-dominant shrub. The soil is typical of a desert bajada, sandy and loose. Co-dominant shrubs include *Ambrosia dumosa* (burro weed), *A. salaea* (burrobush), *Encelia actoni* (Acton encelia) and *Lycium andersonii* (Anderson thornbush). The many desert annuals include *Camissonia campestris* subsp. *campestris* (Mojave suncup), *Festuca octoflora* (sixweeks grass), *Lasthenia gracilis* (needle gold-fields), *Linanthus dichotomus* (evening snow), *Linanthus parryae* (sand blossoms) and *Phacelia distans* (common phacelia).

**HABITAT TYPES**

**Intermittent Streams (Fig. 14)**

Most of the watercourses in the study area are seasonally wet, usually in the winter months. Small stands of *Quercus chrysolepis*, *Salix lasiolepis* (arroyo willow), *Populus fremontii* (Fremont’s cottonwood) and *Pinus sabiniana* (gray pine) are infrequent along these seasonally wet streams. Diversity here is much greater than on adjacent exposed arid slopes.

**Springs (Fig. 15)**

Usually occurring in depressions on the plateau, springs are formed where water from below ground rises to the surface. Springs marked on topographic maps include Boulder Spring, McIver’s Spring, Scodie Spring and Yellow Jacket Spring (Fig. 2). During the study, many of the springs were completely dry due to drought conditions. The graminoids *Carex* spp. (sedges), *Juncus* spp. (rushes), and grasses dominate these habitats. Non-native taxa are abundant at all these sites, especially invasive grasses such as *Festuca arundinacea* (tall fescue) and *Poa pratensis* subsp. *pratensis* (Kentucky bluegrass). Wildlife as well as cattle and PCT hikers frequently visit these springs; the latter especially heavily impact McIver’s and Yellow Jacket springs.

**Granite Rock Outcrops (Fig. 16)**

Eroding granitic outcrops often harbor unique plant diversity compared to surrounding habitats. Shrubs common on granite outcrops include *Ericameria cuneata* (desert rock golden-bush), *Ivesia* spp. (mousetail), *Penstemon newberryi* (mountain pride), *Holodiscus microphyllus* (oceanspray), and *Eriogonum* spp. These plants grow in rock cracks and at the base of large boulders. Very large outcrops are often devoid of canopy cover and have little vegetation. Annuals can be found in abundance
Fig. 14–17. Habitat types in the Kiavah Wilderness.—14. Intermittent stream in upper, narrow Sage Canyon.—15. Spring with dense cover of graminoids.—16. Rock outcrops provide habitat for a number of species including annuals.—17. Site of the 1997 burn on the plateau.
around the base of outcrops in sandy decomposed granite. High rock walls provide protection, shade, and moisture for annuals.

POST-FIRE SUCCESSION

The earliest recorded fire in the Wilderness occurred in August 1997. Started by lightning, it burned ca. 5700 acres mostly on the plateau (Schifrin et al. 2003). It consumed Jeffrey pine forest and single-leaf pinyon woodland. The only published observations of post-fire succession are in Southern California, Pacific Crest Trail, a hiking guide by Schifrin et al. (2003) that mentions that hikers should watch out for dermatitis-causing Eriodictyon parryi (poodle-dog bush) in the burn area. I encountered only two old plants of Eriodictyon parryi. Since the fire, Ceanothus vestitus and Fremontodendron californicum have grown into dense stands that are almost impassable except via deer trails that weave among the shrubs (Fig. 9). Understory plants are sparse except for Bromus tectorum, which invaded the post-burn site successfully. Around an unnamed spring at the headwaters of Scodie Canyon, hundreds if not thousands of Pinus jeffreyi saplings were observed in June 2014 (Fig. 17), indicating that the site has the seed bank and potential for Jeffrey pine forest to regrow. It has taken up to 17 years for these P. jeffreyi plants to reach the sapling stage. Pinus monophylla recruitment was not observed in the post-burn site; however, Quercus chrysolepis was observed re-sprouting from trunk bases.

A more recent fire occurred during the study on 11 July 2014 in the northwestern part of the Wilderness in Smith Canyon when marijuana farmers set a fire to destroy evidence of their growing operation. The Nicolls Fire burned ca. 1600 acres on slopes that were predominantly single-leaf pinyon woodland (Incident Information System 2016). In 2015, when I visited the burn site, drought conditions prevailed and plants were sparse but I documented Claytonia rubra (red stemmed spring beauty), Gaiunum aparine (common bedstraw), Microsteris gracilis (slender phlox) and Dichelostemma capitatum subsp. capitatum (blue dicks). A few individuals of Quercus chrysolepis and Fremontodendron californicum were starting to re-sprout from their bases. Future surveys to document post-fire succession, including fire followers from the seed bank, would be informative.

FLORA

A total of 477 minimum-rank vascular plant taxa (including 457 species, 73 subspecies and 84 varieties) occur in the Kiavah Wilderness based on specimens collected prior to and during the study (Appendix A). Seventy families and 240 genera are represented. The largest families are Asteraceae (73 minimum-rank taxa), Poaceae (36), Polemoniaceae (35), Polygonaceae (25) and Fabaceae (24). Family rankings are comparable to those of the Kern County floristic surveys (Twisselmann 1967; Moe 2016), with Asteraceae and Poaceae also having the greatest number of minimum-rank taxa, but in the county floras Fabaceae, Polygonaceae and Polemoniaceae ranked fourth, fifth and sixth, respectively. The largest genera in the Kaivah Wilderness are Gilia (18), Erigonaum (17), Phacelia (13), Cryptantha (12) and Lupinus (8), whereas in the Kern County flora by Twisselmann (1967) the top five genera were, in descending order, Erigonaum, Gilia, Carex, Mimulus, and Lupinus. Annual plants account for 45.6% of the total flora, followed by perennial herbs (28.1%) and large shrubs (12.3%). Life forms are based on species descriptions in Baldwin et al. (2012). Table 3 provides a summary of the flora.

Non-Native Taxa

A total of 28 non-native minimum-rank taxa were documented from 20 genera (Table 4), representing 5.9% of the total flora. Most non-native taxa are in Poaceae (13), Asteraceae (4) and Brassicaceae (3). Introduced grasses were observed in every vegetation type in the Kiavah Wilderness. These grasses can be ecological generalists and can outcompete native species (Brooks 2000). Moreover, dense stands of dead Bromus tectorum and B. madritensis subsp. rubens can carry wildfires that negatively impact native species (Brooks and Pyke 2000). Both grass species occur in abundance in the Kiavah Wilderness and, according to the California Invasive Plant Council (Cal-IPC

| Native/Non-Native | Taxa | Genera |
|------------------|------|-------|
| Native           | 429  | 220   |
| Non-native       | 28   | 20    |
| Largest Families |      |       |
| Asteraceae       | 73   | 44    |
| Poaceae          | 36   | 13    |
| Polemoniaceae    | 35   | 8     |
| Polygonaceae     | 25   | 6     |
| Fabaceae         | 24   | 6     |
| Boraginaceae     | 22   | 6     |
| Hydrophyllaceae  | 21   | 7     |
| Brassicaceae     | 21   | 13    |

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Table 4. Non-native taxa documented in the Kiavah Wilderness. California Invasive Plant Council (2016) impact rank is given for those taxa that are ranked.

| Family               | Taxon                        | Cal-IPC |
|----------------------|------------------------------|---------|
| Amaranthaceae        | Amaranthus albus             | Moderate|
| Asteraceae           | Cirsium vulgare              | Moderate|
| Asteraceae           | Lactuca serriola             | Limited |
| Asteraceae           | Sonchus asper subsp. asper   | Limited |
| Asteraceae           | Taraxacum officinale         | Limited |
| Brassicaceae         | Hornungia procumbens         | Limited |
| Brassicaceae         | Saxymbrium altissimum        | Limited |
| Brassicaceae         | Saxymbrium orientale         | Limited |
| Chenopodiaceae       | Salsola tragus               | Limited |
| Euphorbiaceae        | Euphorbia peplus             | Limited |
| Fabaceae             | Lotus corniculatus           | Limited |
| Geraniaceae          | Erodium cicutarium           | Limited |
| Iridaceae            | Iris pseudacorus             | Limited |
| Lamiaiceae           | Marrubium vulgare            | Limited |
| Poaceae              | Avena fatua                 | Moderate|
| Poaceae              | Bromus madritensis subsp. rubens | High    |
| Poaceae              | Bromus tectorum              | High    |
| Poaceae              | Festuca arundinacea          | Moderate|
| Poaceae              | Festuca myuros               | Moderate|
| Poaceae              | Hordeum murinum subsp. glaucum | Limited |
| Poaceae              | Hordeum murinum subsp. marvinum | Limited |
| Poaceae              | Poa annua                   | Limited |
| Poaceae              | Polygomon interruptus        | Limited |
| Poaceae              | Polygomon monspelizensis     | Limited |
| Poaceae              | Polygomon viridis            | Limited |
| Poaceae              | Schismus arabicus           | Limited |
| Poaceae              | Schismus barbatus            | Limited |
| Polygonaceae         | Polygonum aviculare subsp. aviculare | Limited |

2016), each is ranked as high impact, which means a species has “severe ecological impacts on physical processes, plant and animal communities and vegetation structure.” Another generalist species that was found in almost every habitat is *Erodium cicutarium*, which is ranked by Cal-IPC (2016) as having limited impact. Most of the non-native taxa were found around water sources, such as springs and cattle troughs, especially *Cirsium vulgare*, *Festuca arundinacea* and *Taraxacum officinale*. Riparian areas are frequented by wildlife, cattle and hikers and are thus dispersal sources and sinks for non-native plants that are adapted to these disturbed habitats.

**Special Status Taxa**

Collections made prior to the study documented 19 minimum-rank taxa in the Kiavah Wilderness that are listed in the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (CNPS 2013) as rare, threatened or endangered in California by the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (CNPS 2013). My study added seven taxa for a total of 26 (5.4% of the total flora) (Table 5). Of the seven additions, *Camissonia integrifolia* (Onagraceae) was last documented in 1964 just west of the Wilderness in Kelso Valley. Three occurrences of *Eriophyllum mohavense* (Asteraceae) discovered near the southern boundary of the Wilderness are disjunct by ca. 90 km (55 mi) northwest of the closest known populations near Pilot Knob (24 Apr 1988, Henry s.n., CAS). Three of the 26 special status taxa were not relocated during the study. Numerous attempts were made to find *Lewisia disepala* (Montiaceae), which was documented in 1984 (Shevock 9488, CAS). Shevock (1988) noted that *L. disepala* can be found in wet years and tends to flower soon after the snowpack melts. A late-flowering taxon (Sep 1979, Shevock 6550, CAS), *Cordylanthus rigidus* subsp. *brevibracteatus* (Orobanchaceae) was not re-

Table 5. Taxa documented in the Kiavah Wilderness that are listed in the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (CNPS 2013) or as rare, threatened or endangered in California by the CNDDDB (2013).

| Taxon                          | CNPS Rare Plant Rank1 | California State Rank 2 |
|-------------------------------|-----------------------|-------------------------|
| Androace elongata subsp. acuta | 4.2                   | S3S4                    |
| Astragalus eritterae          | 1B.3                  | S2                      |
| Camissonia integrifolia       | 1B.3                  | S2                      |
| Camissonia kernensis subsp. karnesii | 4.3               | S3                      |
| Canbya candida                | 4.2                   | S3S4                    |
| Chamaesyce vallis-mortae      | 4.2                   | S3                      |
| Clarkia xantiana subsp.       | 4.2                   | S3S4                    |
| parviflora                    | 4.3                   | S4                      |
| Cordylanthus rigidus subsp. brevibracteatus | 4.3 | S4 |
| Delphinium purpurei           | 1B.3                  | S3                      |
| Dudleya abramsii subsp. calcicola | 4.3               | S4                      |
| Eriogonum breedevei var. shevockii | 4.3             | S3                      |
| Eriophyllum mohavense         | 1B.2                  | S2                      |
| Fritillaria pinetorum         | 4.3                   | S4                      |
| Galium aquatissimum subsp. onycense | 1B.3               | S3                      |
| Gilia interior                | 4.3                   | S4                      |
| Gilia latiflora subsp.        | 4.3                   | S4                      |
| Gilia cuyamensis              | 4.3                   | S4                      |
| Gilia leptanha subsp. pinetorum | 4.3             | S4                      |
| Lewisia disepala              | 1B.2                  | S2                      |
| Monardella lindae subsp.      | 1B.3                  | S2                      |
| oblonga                       | 4.2                   | S3                      |
| Nemacladus calcarius         | 1B.2                  | S1                      |
| Oreonana vestita              | 1B.3                  | S3                      |
| Perideridia pringlei          | 4.3                   | S4                      |
| Phacelia exilis               | 4.3                   | S4                      |
| Phacelia nashiana             | 1B.2                  | S3                      |
| Phacelia novemmillensis       | 1B.2                  | S2S3                    |

1 CNPS Rare Plant Rank: 1B.2: rare, threatened, or endangered in California or elsewhere; moderately threatened.—1B.3: rare, threatened, or endangered in California or elsewhere; not very threatened.—4.2: limited distribution watch list; moderately threatened.—4.3: limited distribution watch list; not very threatened.

2 California State Rank: S1: critically imperiled because of extreme rarity.—S2: imperiled due to restricted range.—S2S3: rank is between S2 and S3.—S3: vulnerable due to restricted range.—S3S4: rank is between S3 and S4.—S4: apparently secure; uncommon but not rare.
located either. Another species not encountered was *Delphinium purpureum* (Ranunculaceae), which had been collected exclusively along Highway 178 near the town of Onyx (May 2010, Howald s.n., UCR). Drought conditions concurrent with the study may explain the failure to find these species, and they should be targets of future surveys.

Another special status species, *Oreanana vestita* (Apiaceae), was first documented in 2002 (Laeger & Bogan 1403, CAS). This species is only known from two small occurrences in the Kiawah Wilderness that are disjoint from the only other known populations in the San Gabriel and San Bernardino mountains. Plants from the Wilderness differ from those in San Gabriel Mountains populations and may be described as a new sub-species (Jane Tirrell, pers. comm. 2015).

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LYCOPHYTES

SELAGINELLACEAE

SELAGINELLA WATSONIIL. Underw. Perennial. Occasional on boulders in pinyon woodlands, 1500 m (4900 ft). Shevock 10797 (CAS).

FERNS

EQUISETACEAE

EQUISETUM LAEVIGATUM A. Braun. Perennial herb. Uncommon in wet seeps. Occasional in dry pine duff, 2000 m (6600 ft). Gardner & Nazaire 1005.

PTERIDACEAE

CHEILANTHES COVILLEI Maxim. Perennial herb. Common on rock outcrops on desert slopes, 1200–2000 m (4000–6600 ft). Gardner & Columbus 273.

PENTAGRAMMA PALLIDA (Weath.) Yatsk., Windham, & Wollenw. Perennial herb. Uncommon on rock outcrops on exposed desert slopes, 900 m (3000 ft). Gardner & De Groot 671.

PENTAGRAMMA TRIANGULARIS (Kauf.) Yatsk., Windham, & E. Wollenw. subsp. TRIANGULARIS. Perennial herb. Common on rock outcrops on desert slopes and in pinyon woodlands, 900–1600 m (3000–5300 ft). Gardner & Stoughton 543.

GYMNOSPERMS

CUPRESSACEAE

JUNIPERUS CALIFORNICA Carrière. Shrub. Common on desert slopes and in canyons, 1500–1600 m (4900–5300 ft). Gardner & Fraja 263.

JUNIPERUS GRANDIS R.P. Adams. Tree. Rare on top of mountain plateau. Only one tree found, 2000 m (6600 ft). Gardner & Fraja 247.

EPHEDRACEAE

EPHEDRA NEVADENSIS S. Watson. Shrub. Common on desert bajadas and drainages, 1100–1700 m (3600–5600 ft). Gardner & Gardner 137b.

EPHEDRA VIRIDIS Coville. Shrub. Common on rocky slopes and pinyon woodlands, 1100–2100 m (3600–6900 ft). Gross 2530.

PINACEAE

ARCTOSTAPHYLOS ARCTICUM Pursh. Shrub. Common on exposed desert slopes, 900–1600 m (3000–5300 ft). Shevock 10797 (CAS).

ANGIOSPERMAE—MAGNOLIIDS

SABINACEAE

ANGIOSPERMAE—EUDICOTS

ADOXACEAE

ANGIOSPERMAE—EUDICOTS

SAURURACEAE

XEROSPERMAE—MAGNOLIIDS

ANOONMEA—EUDICOTS

SAURURACEAE

ANKERMIA CALIFORNICA (Nutt.) Hook. & Arn. Perennial herb. Common in wet seeps and springs, 1400–1500 m (4600–4900 ft). Gardner & Forgrave 422.

ANKERMIAE—EUDICOTS

ADOXACEAE

ANKERMIAE—EUDICOTS

ANGIOSPERMAE—MAGNOLIIDS

SAURURACEAE

ANKERMIA CALIFORNICA (Nutt.) Hook. & Arn. Perennial herb. Common in wet seeps and springs, 1400–1500 m (4600–4900 ft). Gardner & Forgrave 422.

ANKERMIAE—EUDICOTS

ADOXACEAE

ANKERMIAE—EUDICOTS

ANGIOSPERMAE—MAGNOLIIDS

SAURURACEAE

ANKERMIA CALIFORNICA (Nutt.) Hook. & Arn. Perennial herb. Common in wet seeps and springs, 1400–1500 m (4600–4900 ft). Gardner & Forgrave 422.

ANKERMIAE—EUDICOTS

ADOXACEAE

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AMARANTHACEAE

* AMARANTHUS ALBUS L. Annual. Disturbed areas, roadside in mud-flat, 1500 m (4900 ft). Gardner & Pilapil 469.

APIACEAE

LOMATIUM DISSECTUM var. MULTIFIDUM (Nutt.) Mathias & Constance. Geophyte. Common in pinyon pine woodland on rocky soils, 1800–2000 m (5900–6600 ft). Gardner & Foggia 231.

LOMATIUM MOHAVENSE (J.M. Coul. & Rose) J.M. Coul. & Rose. Geophyte. Common on alluvial soils and eroding slopes, 1100–1800 m (3700–5900 ft). Gross 2485.

LOMATIUM NEVADENSE var. PARISHII (J.M. Coul. & Rose) Jeps. Geophyte. Common on alluvial slopes and in washes in pinyon pine woodlands, 1600–2100 m (5300–6900 ft). Gross 2324.

LOMATIUM NEVADENSE (S. Watson) J.M. Coul. & Rose var. NEVADENSE. Geophyte. Occasional on alluvial soils and mountain slopes, 1600–2100 m (5300–6900 ft). Gardner & Fraga 250.

ASCLEPIAS FASCICULARIS Decne. Perennial herb

ASCLEPIAS CALIFORNICA Greene. Perennial herb

ASCLEPIAS DOUGLASIANA Besser. Perennial herb. Uncommon along banks of washes, 1200 m (4000 ft). Gardner & Paik 115.

ASCLEPIAS DRACUNCULUS L. Perennial herb. Occasional along banks of washes and in rocky washes, 1300 m (4300 ft). Gardner & Nixiaire 1044.

ASCLEPIAS LUDOVICIANA Nutt. subsp. LUDOVICIANA. Perennial herb. Common in canyons and along banks of washes, 1500 m (4900 ft). Gardner & Forgrave 418.

ARTEMESIA TRIDENTATA Nutt. Small shrub. Common in open exposed sites on level ground and on mountain slopes, 2000 m (6600 ft). Gardner & Pilapil 458.

BACCHARIS SALICIFOLIA (Ruiz & Pav.) Pers. subsp. SALICIFOLIA. Shrub. Occasional around springs and cattle troughs, 1400–1500 m (4600–4900 ft). Gardner & Paik 96.

BACCHARIS SERGILDIFLOIDES A. Gray. Shrub. Occasional around springs and cattle troughs, 1200 m (4000 ft). Gardner & Paik 100.

BALSAMORHIZA DELTOIDEA Nutt. Perennial herb. Common in pinyon woodland on northern exposures, 1500–1900 m (4900–6300 ft). Gardner & Fraga 245.

CHAEACHTIS FREMONTI A. Gray. Annual. Common on desert floor and bajadas, 1100–1700 m (3600–5600 ft). Gardner & De Groot 695.

CHAEACHTIS SANTOLINOIDES Greene. Perennial herb. Uncommon in pinyon woodlands on N slopes and shade of mountain, 1500–2100 m (4900–6900 ft). Gardner & Fraga 229.

CHAEACHTIS STEVIVOIDES Hook. & Arn. Annual. Common on steep exposed sandy slopes in the desert, 1200–1600 m (4000–5300 ft). Gardner, Poutasse, & Maldonado 562.

DIETEREA CANESCENS (Pursh) Nutt. Perennial herb

DIETEREA XANTIANA A.Gray. Annual

ERIOPHYLLUM CONFERTIFLORUM (DC.) A.Gray var. CONFERTIFLORUM

ERICA CUNEATA (A. Gray) McClatchie. Shrub

ERICA NAOSEOSA var. SPECSOSA (Nutt.) G.L. Nesom & G.I. Baird. Shrub. Common on plateau in post-fire site and around Jeffrey pine grove, 2000 m (6600 ft). Gardner & Gardner 435.

ERIOPHYLLUM AMBIGUUM (A. Gray) A. Gray var. PALEACEUM (Brandegee) Ferris. Annual. Common on desert floor and slopes and among washes, 1200–2100 m (4000–6900 ft). Gardner & Fraga 256.

ERIOPHYLLUM CONFERTIFLORUM (DC.) A Gray var. CONFERTIFLORUM. Small shrub. Common on ridges and mountain slopes in rocky soil, 2000–2100 m (6600–6900 ft). Gardner & Fraga 248.

* A MARANTHUS ALBUS L. Annual. Distributed areas, roadside in mud-flat, 1500 m (4900 ft). Gardner & Pilapil 469.
MADIA GLOMERATA Hook.
RAFINESQUIA NEOMEXICANA A. Gray. Annual. Common on sandy soils and slopes, 1100–2000 m (3600–6600 ft). *Gardner & Gardner 143.*
ERIOPHYLLUM PRINGLEI A. Gray. Annual. Common on sandy washes and desert floor, 1100–2100 m (3600–6900 ft). *Gardner & De Groot 656.*
HELENIUM PUBERULUM DC. Perennial herb. Uncommon in desert riparian area of Sage Canyon, 1200 m (4000 ft). *Gardner & Niziolek 1055.*
HEMIZONELLA MINIMA (A. Gray) A. Gray. Annual. Common in disturbed areas in exposed sandy washes, 1900–2100 m (6300–6900 ft). *Gardner & Fraga 167.*
HULSEA HETEROCRHOME A. Gray. Perennial herb. Uncommon in Jeffrey pine forest in shade, growing from around downed logs, 2000 m (6600 ft). *Gardner & Paik 1455.*
LEPTOSYNE BIGELOVII (A. Gray) A. Gray. Annual. Occasional along high altitude 178 in shade of mountain slopes, wet site, 900 m (3000 ft). *Hovak 24598; Shevock 3723 (CAS).*
LAVIA GLANDULOSA (Hook.) Hook. & Arn. Annual. Common on desert slopes and in pinyon woodlands, 1200–2000 m (4000–6600 ft). *Gardner, Alba, Alba, & Alba 130.*
PSEUDOGNAPHALIUM STRAMINEUM (Kunth) Anderb. Annual. Common on sandy banks in drainage and rocky soil, 1200–1800 m (4000–5900 ft). *Twisselmann 13729 (CAS).*
STEPHANOMERIA PASCIFLORA (Torr.) A. Nelson. Perennial herb. Occasional in drainages and sandy disturbed soils, 1300–1800 m (4300–5900 ft). *Twisselmann 13729 (CAS).*
SYZYGIUM A. gray. Annual. Common on sandy and rocky soil and rock outcrops, 1200 m (4000 ft). *Gardner & De Groot 692.*
SOLIDAGO ELONGATA DC. Annual. Common along sandy banks in drainages and rocky soils, 1200–1800 m (4000–5900 ft). *Gardner, Palu, & Nico 404.*
S. VELUTINA DC. Annual. Common in moist soil, in springs and sites disturbed by cattle, 1900–2000 m (6300–6600 ft). *Gardner & Fraga 244.*
TETRADYMYA AXILLARIS A. Nelson var. LONGISPINA (M.E. Jones) Strother. Shrub. Occasional in drainages, desert bajadas and compact exposed soil, 1000–1300 m (3500–4300 ft). *Abrams 11539.*
TETRADYMYA CANESCENS DC. Shrub. Occasional in rock outcrops and drainages, 2000 m (6600 ft). *Gardner, Elam, & Nico 404.*
ALSO

**BORAGINACEAE**

AMINCIA TESSELLATA A. Gray var. TESSELLATA. Annual. Common on sandy soils and desert slopes, 1100–1900 m (3600–6200 ft). *Gardner, Palu, & Lee 72.*
CRYPTANTHA ANGUSTIFOLIA (Torr.) Greene. Annual. Occasional on desert bajadas and in compact exposed soil, 1200 m (4000 ft). *Gardner, Palu, & Lee 57.*
CRYPTANTHA BARBIGERA (A. Gray) Greene var. RIGIDA I.M. Johnst. Annual. Occasional on desert slopes and outcrops, 1000 m (3300 ft). *Gardner & De Groot 687.*
CRYPTANTHA CIRCUMSCISSA (Hook. & Arn.) I.M. Johnst. Annual. Occasional on desert slopes and outcrops, 1000 m (3300 ft). *Gardner & De Groot 687.*
CRYPTANTHA DUMETORUM (A. Gray) Greene. Annual. Occasional on desert slopes and outcrops, 1000 m (3300 ft). *Gardner & De Groot 687.*
CRYPTANTHA MARITIMA (Greene) Greene. Annual. Occasional on desert slopes and outcrops, 1000 m (3300 ft). *Gardner & De Groot 687.*
CRYPTANTHA MICRANTHA (Torr.) I.M. Johnst. Annual. Common in unburned sites on rocky desert slopes and pinyons and oaks, 1600–1800 m (5300–5900 ft). *Gardner & Fraga 254.*
CRYPTANTHA MYRAEAE (Greene) Greene. Annual. Common in unburned sites on rocky desert slopes and pinyons and oaks, 1600–1800 m (5300–5900 ft). *Gardner & Fraga 254.*
CRYPTANTHA NEVADENSIS A. Nelson & P.B. Kenn. var. RIGIDA I.M. Johnst. Annual. Common on bajadas, desert floor and rock outcrops, 1100–1300 m (3600–4300 ft). *Gardner & De Groot 704.*
CRYPTANTHA OXYONYXA (A. Gray) Greene. Annual. Occasional on sandy soils and slopes, 2000 m (6600 ft). *Gardner & De Groot 692.*
CRYPTANTHA PTEROCRANIA (Torr.) Greene var. CYCLOPTERA (Greene) J.F. Macbr. Annual. Common on bajadas, sandy soil and washes, 1100–1200 m (3600–4000 ft). *Gardner & De Groot 702.*
CRYPTANTHA PETROCARIA (Torr.) Greene var. PTEROCRANIA. Annual. Common on rocky steepslopes and outcrops, 2000 m (6600 ft). *Gardner & De Groot 692.*
**EUPHROSYNE HIRSCHFELDII** (Torr.) Greene. Annual. Common in pinyon woodlands, desert slopes, rock outcrops, and disturbed soils, 1200–1300 m (3900–4300 ft). Gardner & Paik 830.

**CAMPANULACEAE**

**SYMPHORICARPUS ROTUNDIFOLIUS** A. Gray var. PARISHII (Rydb.) Dempster. Shrub. Occasional in shaded canyons of pinyons and along Pacific Crest trail, 1800–2000 m (5900–6600 ft). Gardner & Poutasse 861.

**CARYOPHYLLACEAE**

**MEUM BRACHYCARPA** (Richardson) Descurainia. Annual. Common in disturbed sandy soils, 1200–1300 m (3900–4300 ft). Gardner & De Groot 659.

**BOECHERA DAVIDSONII** (Greene) N.H. Holmgren. Perennial. Common in rocky slopes, sandy soils, and on mountain slopes, 1000–2000 m (3300–6600 ft). Gardner & De Groot 611.

**ELEUSINE MACRADENIA** (S. Watson) Ikonn. var. CORDATUS (Gardner & Paik) Shevock 9820. Shrub. Occasional in shaded canyons of pinyons and along Pacific Crest trail, 1800–2000 m (5900–6600 ft). Gardner & Poutasse 861.

**CAPRIFOLIACEAE**

**CAMPIONA PUBESCENS** (Hook. & Am.) A. DC. Annual. Common on rocky slopes and drainages, 900–1000 m (2900–3280 ft). Gardner & De Groot 630.

**BOECHERA PULCHRA** (S. Watson) W.A. Weber. Shrub. Occasional in disturbed soils around water sources, 1400 m (4600 ft). Gardner & Forgrave 214.

**BOECHERA SP.** (Torr.) S. Watson. Annual. Common in disturbed sandy soils, 1200–1300 m (3900–4300 ft). Gardner & De Groot 709.

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CHENOPODIACEAE

Atriplex canescens (Pursh) Nutt. var. canescens. Shrub. Occasional in desert washes and on sandy slopes, 2000 m (6600 ft). Gross 2526.

Atriplex polyacarpa (Torr.) S. Watson. Shrub. Uncommon in bajadas, rock outcrops and rocky slopes, 1100–1200 m (3600–4000 ft). Gardner & Pilapil 472.

Chenopodium californicum (S. Watson) S. Watson. Perennial herb. Occasional in drainages and sandy disturbed soils, 1300–1900 m (4300–6200 ft). Gardner & De Groot 636.

Chenopodium fremontii S. Watson. Annual. Occasional on steep exposed rocky slopes, 1500–1800 m (4900–5900 ft). Gardner & Columbus 268.

Grayia spinosa (Hook.) Moq. Shrub. Common on bajadas, desert floor and banks of drainages, 1200–1700 m (4000–5600 ft). Gardner & Gardner 150.

Krascheninnikovia lanata (Pursh) A. Meus. & A. Smit. Shrub. Common on bajadas and desert floor, 1100–1200 m (3600–4000 ft). Hart 712.

CRASSULACEAE

Dudleya saxosa (M.E. Jones) Britton & Rose subsp. aloides (Rose) Moran. Perennial herb (Succulent). Uncommon in rock outcrops on exposed desert slopes, 1500 m (4900 ft). Gardner & Gardner 156.

Crassula connata (Ruiz & Pav.) A. Berger. Annual (Succulent). Rare on special moist shallow soil on large granite boulder near desert riparian spring, 1400 m (4600 ft). Gardner & Paik 1438.

CUCURBITACEAE

*Calystegia longipes (S. Watson) Brummitt. Perennial herb (Succulent). Occasional on exposed sandy slopes and exposed flat level ground in the desert, 1000–1600 m (3300–5300 ft). Gardner & De Groot 649.

Astragalus didymocarpus Hook. & Arn. Annual. Uncommon on exposed sandy slopes and exposed flat level ground along the Pacific Crest Trail, 1800 m (5900 ft). Gardner & Lushire 869.

Astrogalus lentiginosus Douglas var. variabilis Barneby. Perennial herb. Common on exposed sandy soils and slopes, 1300–2100 m (4300–6900 ft). Gardner & Nazaire 1036.

Lupinus purshii Douglas var. tinctus M.E. Jones. Perennial herb. Occasional on exposed slopes and eroding banks of washes, 1200–2100 m (4000–6900 ft). Gardner & Fragga 1343.

*Lotus corniculatus L. Annual. Occasional on exposed sandy slopes and exposed flat level ground in the desert, 1000–1600 m (3300–5300 ft). Casse CA 650-44.

Lupinus benthami A. Heller. Annual. Uncommon on exposed sandy slopes and rock outcrops, 1200–1300 m (4000–4300 ft). Gardner & De Groot 646.

*Lupinus bicolor Lindl. Annual. Common on bajadas, rock outcrops, steep slopes and pinyon woodlands, 1100–1900 m (3600–6200 ft). Gardner, Paik, & Lee 73.

Lupinus concinnus J. Agardh. Annual. Common on bajadas, rock outcrops and washes, 900–1700 m (3000–5600 ft). Schappe CA 650-45.

Lupinus excavatus M.E. Jones var. austromontanus (A. Heller) C.P. Sm. Shrub. Occasional in pinyon woodlands on protected slopes, 1900 m (6300 ft). Gross 2336.

Lupinus excavatus M.E. Jones var. excubitus. Shrub. Common in washes and exposed sandy and rocky slopes, 1200–1700 m (4000–5600 ft). Gardner & Paik 73.

Lupinus formosus Greene var. formosus. Perennial herb. Uncommon in pinyon woodlands and in pine duff, 2000 m (6600 ft). Gardner & Fragga 208.

Lupinus graysi S. Watson. Perennial herb. Uncommon in pinyon woodlands and exposed slopes, 1600–2000 m (5300–6600 ft). Gross 2325.

Lupinus odoratus A. Heller. Annual. Uncommon on bajadas and open exposed sandy flat level surfaces, 1300 m (4300 ft). Gardner & Fisher 1284.

Trifolium microcephalum Pursh. Annual. Common in drainages and alkaline soils, 2000 m (6600 ft). Gardner & Nazaire 1016.

Trifolium oliganthum Steud. Annual. Common in and around springs, 2000 m (6600 ft). Gardner & Columbus 349.

Trifolium variegatum Nutt. Perennial herb. Common in and around springs, 2000 m (6600 ft). Gardner & Sutton 1222.

Trifolium wormskoldii Lehm. Perennial herb. Common in and around springs, 2000 m (6600 ft). Gardner & Columbus 334.
**Vascular Flora of the Kiawah Wilderness**

**FAGACEAE**
- Quercus chrysolepis Liebm. Tree. Common with pinyon pines on mountain slopes and plateau, 1600–2100 m (5300–6900 ft). Gardner & Fraga 205.
- Quercus kelloggii Newb. Tree. Uncommon mixed with pinyons and Jeffrey pines in rocky soils, 2000–2100 m (6600–6900 ft). Gardner & Fraga 203.
- Quercus wislizeni DC. Tree. Uncommon on N rocky mountain slopes, 1700 m (5600 ft). Gardner & Terrell 1401.

**GARRYACEAE**
- Garrya flavesens S. Watson. Shrub. Occasional in pinyon woodlands and along the Pacific Crest Trail, 1100 m (3600 ft). Gardner & Fraga 218.

**GENTIANACEAE**
- Frasera tubulosa Coville. Perennial herb. Rare along the Pacific Crest Trail in shade of pinyon and oaks, 2100 m (6900 ft). Gardner & Nazzare 1041.

**GERANIACEAE**
- *Erodium cicutarium* (L.) Aiton. Annual. Common on bajadas, desert floor, drainages and rock outcrops, 1100–1700 m (3600–5600 ft). Gardner & Paik 79.

**GROSSULARIACEAE**
- Ribes lasianthum Greene. Shrub. Uncommon on rocky exposed slopes, 2100 m (6900 ft). Shevock 9518 (CAS).
- Ribes queretorum Greene. Shrub. Common on rocky exposed slopes and banks of riparian seeps, 1200–2100 m (4000–6900 ft). Gross 2530.
- Ribes boesii Regel. Shrub. Uncommon in canyons and on mountain ridges, 1700 m (5600 ft). Shevock 11418 (CAS).

**HYDROPHYLLACEAE**
- Emmenanthe penduliflora Benth. var. penduliflora. Annual. Common in rock outcrops and sites recovering from fire, 1100–1800 m (3600–5900 ft). Gardner 44.
- Erodictyon parryi (A. Gray) Greene. Perennial herb. Uncommon on plateau in rock outcrops, remnants from post-fire, 2000 m (6600 ft).
- Nama californicum (A. Gray) J.D. Bacon. Annual. Occasional along the Pacific Crest Trail and in sandy soil, 1200–1600 m (4000–5300 ft). Gardner & Paik 1428.
- Nama demissa A. Gray var. demissa. Annual. Common on desert slopes in sandy soil, 1200–1800 m (4000–5900 ft). Gardner & Gardner 144.
- Nemophila menziesii Hook. & Arn. var. menziesii. Annual. Occasional on rocky desert slopes and banks of washes, 1000–1200 m (3300–4000 ft).
- Gardner & Poutasse 853.
- Nemophila spatulata Coville. Annual. Occasional in sandy and rocky soil and drainages in mixed conifer forests, 1900–2100 m (6300–6900 ft).
- Gardner & Fraga 198.

**LAMIACEAE**
- # Phacelia exilis (A. Gray) G.J. Lee. Annual. Occasional in exposed drainages and disturbed soils, 1900–2000 m (6300–6600 ft). Shevock 10930 (CAS).
- Phacelia fremontii Torr. Annual. Common on bajadas, desert floor and slopes. In disturbed soils, post-fire sites, 1000–2100 m (3300–6900 ft). Shevock 9224 (CAS).
- Phacelia humilis var. dedleri J.T. Howell. Annual. Common in pinyon woodlands and along the Pacific Crest Trail, 1800–2000 m (5900–6600 ft). Gross 2340.
- Phacelia imbricata Greene. Perennial herb. Occasional along the Pacific Crest Trail and in rocky soils, 2000 m (6600 ft). Gardner & Fraga 196.
- Phacelia nashiana Jeps. Annual. Uncommon on steep exposed sandy slopes, 1500–1900 m (4900–6300 ft). Gardner & England 819.
- Phacelia novemlilennis Munz. Annual. Uncommon along the Pacific Crest Trail in pinyon woodlands, 1900 m (6300 ft). Shevock 12167 (CAS).
- Phacelia ramosissima Lehm. Perennial herb. Occasional along the Pacific Crest Trail and in pinyon woodlands, 1800 m (5900 ft). Shevock 11546 (CAS).
- Phacelia tanacetifolia Benth. Annual. Common on desert bajadas, rock outcrops and bank of drainages, 1100–1300 m (3600–4300 ft). Gardner & De Groot 616.
- Pholistoma membranaceum (Benth.) Constance. Annual. Common on desert slopes and in rock outcrops, 1000–1300 m (3300–4300 ft). Gardner & Fraga 1359.
- Tricardia watsonii S. Watson. Perennial herb. Uncommon on bajadas and rocky desert slopes under downed Joshua trees, 1200–1400 m (4000–4600 ft).
- Gardner, Poutasse, & Chumchim 1167.
- Marrubium vulgare L. Perennial herb. Rare in disturbed sandy soil and on desert slopes in rock outcrops, 1000–1400 m (3300–4600 ft). Gardner & Forgrave 439.
- Monardella linoides A. Gray subsp. oblonga (Greene) Abrams. Perennial herb. Occasional on rocky slopes and along the Pacific Crest Trail near Skinner Peak, 1900–2100 m (6300–6900 ft). Gardner & Columbus 285.
- Monardella linoides A. Gray subsp. sierrae Elvin & A.C. Sanders. Perennial herb. Uncommon on steep sandy mountain ridges, 1900 m (6300 ft).
- Gardner & Fraga 232.
- Monardella odoeatisima Benth. Perennial herb. Uncommon on rocky exposed desert slopes, 1900 m (6300 ft). Gross 2535.
- Salvia carduacea Benth. Annual. Uncommon on desert slopes and bank of wash, 1300 m (4300 ft). Gardner & De Groot 654.
- Salvia columbariae Benth. Annual. Common on bajadas, desert floor, drainages and rock outcrops, 1000–2000 m (3300–6600 ft).
- Gardner & Gardner 145b.
- Salvia doriei (Kellogg) Abrams var. doriei. Shrub. Occasional in pinyon woodlands on protected slopes, 1500–1800 m (4900–5900 ft).
- Gardner & Terrell 1399.
- Salvia doriei (Kellogg) Abrams var. pilosa (A. Gray) Strachan & Reveal. Shrub. Common on banks of washes and in pinyon woodlands and along the Pacific Crest Trail, 1000–1600 m (3300–5300 ft). Gardner & Gardner 134.
- Salvia pachypylla Munz. Shrub. Occasional along the Pacific Crest Trail on steep rocky slopes, 1700–2100 m (5600–6900 ft).
- Gardner & Rolland 1062.
- Scutellaria mexicana (Torr.) A.J. Paton. Shrub. Common on bajadas, desert floor and rock outcrops, 1200–1300 m (4000–4300 ft).
- Gardner & Paik 1104.
- Scutellaria siphocampylus Vatke. Perennial herb. Occasional under Jeffrey pines in drainages, 2000 m (6600 ft).
- Gardner & Columbus 334.
- Stachys albicans A. Gray. Perennial herb. Common in wet sites around springs, 2000 m (6600 ft).
- Gardner & Columbus 288.
LENNOACEAE

PHLOELIS ARENABRUM Hook. Perennial herb. Uncommon on desert bajadas, washes and disturbed soils, 1200 m (4000 ft). Gardner 1454.

LOASACEAE

MAMMATIA ALBICAULIS (Hook.) Torr. & A. Gray. Annual. Common on exposed sandy soils and slopes, 1100–1800 m (3600–5900 ft). Gardner, Alba, Alba, & Alba 134.

MAMMATIA CONGESTA Torr. & A. Gray. Annual. Common on sandy slopes and banks of washes, 1600–1900 m (5300–6300 ft). Gardner & Fraga 210.

MAMMATIA MONTANA Davidson. Annual. Occasional on bajadas and desert slopes, 1200–2000 m (4000–6600 ft). Erter 6042 (UC).

MAMMATIA VESICIANA Kellogg. Annual. Common on bajadas, exposed slopes and washes, 1200–1700 m (4000–5600 ft). Gardner & Paik 77.

LYTHRACEAE

LYTHRUM CALIFORNICUM Torr. & A. Gray. Uncommon in rich moist soil in canyon bottom drainage, 1500 m (4900 ft). Gardner & Forgrave 423.

MALVACEAE

ERMALCHIE EXILIS (A. Gray) Greene. Annual. Common on bajadas and desert floor, 1200 m (4000 ft). Gardner & De Groot 703.

FREIMONTODENDRON CALIFORNICUM (Torr.) Coville. Shrub. Common on plateau in post-fire site and mountain slopes, 1100–1700 m (3600–5600 ft). Gardner & Fraga 259.

MALACOTHAMNUS FREMONTII (A. Gray) Kellogg. Annual. Common on exposed rocky outcrops, 1800 m (5900 ft). Gardner, Elam, & Nico 405.

Sphaeralcea AMBIGUA A. Gray var. AMBIGUA. Perennial herb. Common on bajadas, desert slopes and washes, 1100–1400 m (3600–4600 ft). Gardner & De Groot 725.

MONTIACEAE

CALANDRINIA MZENZIESI (Hook.) Torr. & A. Gray. Annual. Common on bajadas and desert slopes, 1200–1500 m (4000–4900 ft). Gardner & Paik 85.

CALYPTREUM MONANDRUM Nutt. Annual. Common on bajadas and desert slopes, 1000–1600 m (3300–5300 ft). Gardner & Paik 113.

CALYPTREUM ROSEUM S. Watson. Annual. Uncommon in sandy drainages in shade of Jeffrey pines, 2000 m (6600 ft). Gardner & Columbus 937.

CLAYTONIA EXigua Torr. & A. Gray subsp. EXigua. Annual. Common in sandy soils and drainages, 1900–2000 m (6300–6600 ft). Gardner & Columbus 329b.

CLAYTONIA PARVIFLORA Hook. subsp. PARVIFLORA. Annual. Common in sandy desert and in pinyon woodlands, 1000–1900 m (3300–6200 ft). Gardner & Paik 99.

CLAYTONIA PARVIFLORA Hook. subsp. UTAHENES (Rydby.) John M. Mill. & K.L. Chambers. Annual. Uncommon in rock outcrops on exposed desert slopes, 1200 m (4000 ft). Erter 6061 (UC).

CLAYTONIA PARVIFLORA Hook. subsp. VIRIDIS (Davidson) John M. Mill. & K.L. Chambers. Annual. Occasional in pinyon woodlands on protected slopes, 1900 m (6500 ft). Gardner, Alba, Alba, & Alba 127.

CLAYTONIA PERFACTA Willd. Annual. Occasional on sandy slopes in pinyon woodlands, 2100 m (6900 ft). Shevock 9491 (CAS).

CLAYTONIA RUSSA (Howell) Tidestr. subsp. RUSSA. Annual. Common along the Pacific Crest Trail and in post-burn site, 1700–2000 m (5600–6600 ft). Gardner & Columbus 329a.

LEWISIA DISPALEA Rydb. Geophyte. Rare in exposed rolling compacted conglomerate soil. Was not found during this study, 1900–2100 m (6300–6900 ft). Shevock 9488 (CAS).

LEWISIA REDIVIVA Pursh var. REDIVIVA. Geophyte. Common on rocky exposed soils surrounded by pinyon pines and in quartz outcrops, 1900–2100 m (6300–6900 ft). Gardner & Fraga 162.

NYCTAGINACEAE

ABRONIA POSONANTHA Heimerl. Annual. Rare on steep sandy desert slopes, 1200–1600 m (4000–5300 ft). Gardner & Engeland 735.

MIRABILIS LAVIS (Benth.) Curran var. RETHROSA (A. Hellr.) Jeps. Perennial herb. Common on bajadas, rock outcrops and washes, 1300–1500 m (4300–4900 ft). Gardner & Poutasse 834.

OLEACEAE

FORESTIERA PUBESCENS Nutt. Shrub. Uncommon in canyons near water sources, 1100–1300 m (3600–4300 ft). Gardner & Poutasse 858.

ONAGRACEAE

CAMISSONIA CAMPESTRES (Greene) P.H. Raven subsp. CAMPESTRES. Annual. Common on bajadas and desert slopes, 1100–1300 m (3600–4300 ft). Gardner & De Groot 755a.

CAMISSONIA KERNENESI (Munz) P.H. Raven subsp. KERNENESI. Annual. Common on bajadas and desert slopes, 1300–2000 m (4300–6600 ft). Gardner, Alba, Alba, & Alba 119.

CAMISSONIA PUSILLA P.H. Raven. Annual. Uncommon in wet soil in drainages, 1900 m (6300 ft). Gardner & Columbus 290.

CAMISSONIA STRIGULOSA (Fisch. & C.A. Mey.) P.H. Raven. Annual. Common in disturbed sandy soil, usually around primitive campsites and along roadcuts and trails, 1200–1600 m (4000–5300 ft). Gardner & De Groot 721.

CAMISSONIOPSIS PALLIDA (Abrams) W.L. Wagner & Hoch subsp. PALLIDA. Annual. Common in desert washes and loose sandy soil, 1200 m (4000 ft). Gardner & De Groot 685.

CHYLLIMA CLAUVIFORMIS (Torr. & Frém.) A. Heller subsp. CLAUVIFORMIS. Annual. Common on desert slopes and bajadas, 1200–1800 m (4000–5900 ft). Gardner & Columbus 277.

CLARKIA XANTIANA A. Gray subsp. PARVIFLORA (Eastw.) H. Lewis & P.H. Raven. Annual. Uncommon on bajadas and banks of washes, 1200–1300 m (4000–4300 ft). Geber 95–299 (UC).

EPILHRUM CANUM (Greene) P.H. Raven subsp. LAITIFOLIUM (Hook.) P.H. Raven. Perennial herb. Occasional in drainages surrounded by pinyon and Jeffrey pines, 1500–2000 m (4900–6600 ft). Gardner & Forgrave 424.

EPILHRUM CILIATUM Raf. subsp. CILIATUM. Perennial herb. Common in canyons and along banks of washes, 1500 m (5000 ft). Gardner & Forgrave 416.

EPILHRUM DENSIFOLIUM (Lindl.) Hoch & P.H. Raven. Annual. Occasional in springs and seasonally wet locations, 2000 m (6600 ft). Shevock 10912 (CAS).

GYOPHYTUM DIFUSUM T.H. Torr. & A. Gray subsp. PARVIFLORA H. Lewis & Szweyk. Annual. Common in shade of shrubs in recovering post-burn sites, 2000–2100 m (6600–6900 ft). Gardner & Columbus 309.

TETRAPTERON GRAECIFLORUM (Hook. & Arn.) W.L. Wagner & Hoch. Annual. Occasional in canyons disturbed by cattle grazing, 1000 m (3300 ft). Shevock 11406 (CAS).

TETRAPTERON PALMERI (S. Watson) W.L. Wagner & Hoch. Annual. Common on bajadas and in washes and loose sandy soil, 1100 m (3600 ft). Gardner & De Groot 691.

OROBANCHACEAE

CASTILLEJA APPLEGATEI Fernald subsp. DISTICHIS (Eastw.) T.I. Chuang & Heckard. Perennial herb (parasitic). Uncommon in pinyon woodlands and along the Pacific Crest Trail, 1800 m (5900 ft). York 736 (CAS).

CASTILLEJA APPLEGATEI Fernald subsp. MARTINEI (Abrams) T.I. Chuang & Heckard. Perennial herb (parasitic). Common in pinyon woodlands, in washes and along the Pacific Crest Trail, 1700–2000 m (5600–6600 ft). Gross 2471.

CASTILLEJA CHROMOSA A. Nelson. Perennial herb (parasitic). Common on rocky sandy slopes, and in washes, 1200–2000 m (4000–6600 ft). Gardner & Stoughton 540.
CASTILLEJA EXSECTA (A. Heller) T.I. Chuang & Heckard subsp. EXSECTA. Annual. Common on bajadas and desert slopes, 900–1300 m (3000–4300 ft). Gardner, Poutasse, & Chumchim 1169.

CASTILLEJA MINOR (A. Gray) A. Gray subsp. SPIRALES (Jeps.) T.I. Chuang & Heckard. Annual. Uncommon in wet soil in drainages, 1500 m (4900 ft). Gardner & Forgive 420.

# CORYDANThUS RIGIDUS (Benth.) Ieps. subsp. BREVI brACTEATUS (A. Gray) Munz. Annual (parasitic). Rare in pinyon woodlands, 1900 m (6300 ft). Shevock 6550 (CAS).

KOPSIOPSIS STROBILACEA (A. Gray) Beck. Perennial herb (parasitic). Rare in pinyon woodlands on ridges, 1900 m (6300 ft). Shevock 10804 (CAS).

OROBANCHE UNIFLORA L. Annual. Uncommon on post-burn sites by downed logs, 1900 m (6300 ft). Gardner & Pilagil 436.

PENEStemon SPOCIOUS Lindl. Perennial herb. Occasional on steep sandy exposed mountain slopes, 1900–2100 m (6300–6900 ft). Gardner & Fraga 239.

VERONICA AMERICANA Benth. Perennial herb. Uncommon in seeps and springs, 2000 m (6600 ft). Gardner & Columbus 344.

POLEMONIA CEAE

ALLOPhYLLUM GILIOIDES (Benth.) A.D. Grant & V.E. Grant subsp. GILIOIDES. Annual. Occasional in post-burn site in soft well drained soil in disturbed soil along the Pacific Crest Trail, 2000 m (6600 ft). Gardner & Columbus 936.

ALLOPHYLLUM GILIOIDES (Benth.) A.D. Grant & V.E. Grant subsp. VIO LACEUM (A. Heller) A.G. Day. Annual. Occasional in drainages, in pine duff and exposed sandy soil, 1900–2100 m (6300–6900 ft). Gardner & Fraga 197.

ERIASTRUM DENSIFOLIUM (Benth.) H. Mason subsp. ELONGATUS (Benth.) H. Mason. Perennial herb. Occasional on exposed steep slopes, 1600 m (5300 ft). Gardner 36.

ERIASTRUM EREMICUM (Jeps.) H. Mason subsp. EREM ICUM. Annual. Occasional on bajadas and compact soil, 1100 m (3600 ft). Gardner & Paik 1445.

ERIASTRUM SAPPHIRINUM (Eastw.) H. Mason subsp. BREVI brACTEATUM S. De Grooth. Annual. Uncommon on desert slopes and bank of wash, 1500 m (4900 ft). Gardner & Poutasse 920.

ERIASTRUM SIGNATUM D. Gowen. Annual. Uncommon in dry flat meadows and drainages, 1900 m (6300 ft). Gardner & Fraga 161.

GILIA BRECCIARUM M.E. Jones subsp. BREE CIARUM. Annual. Common in washes and exposed rocky slopes and in pinyon woodlands, 1900 m (6300 ft). Gardner & Fraga 169.

GILIA BRECCIARUM M.E. Jones subsp. NEGLECTA A.D. Grant & V.E. Grant. Annual. Common on bajadas and desert slopes, 1300–1500 m (4300–4900 ft). Gardner & Fraga 197.

GILIA CLOKEYI H. Mason. Annual. Occasional in drainages and steep exposed slopes, 1900 m (6300 ft). Gardner & Fraga 235.

GILIA CAPITATA Sims subsp. ABBTOTANIFOLIA (Greene) V.E. Grant. Annual. Occasional on exposed rocky slopes and in seeps, 1300–2000 m (4300–6600 ft). Gardner & Columbus 372.

GILIA CLOKEYI H. Mason. Annual. Occasional in rock outcrops and drainages, 1200–2000 m (4000–6600 ft). Gardner & Fraga 190.

# GILIA INTERIOR (H. Mason & A.D. Grant) A.D. Grant. Annual. Common in disturbed sites and sandy soil, 900–2000 m (3000–6600 ft). Gardner & De Groot 610.

# GILIA LATIFLORA (A. Gray) A. Gray subsp. CUYAMENESIS A.D. Grant & V.E. Grant. Annual. Rare on desert slopes and in rock outcrops only found in Cholla Canyon, 1300 m (4300 ft). Gardner & De Groot 653.

GILIA LATIFLORA (A. Gray) A. Gray subsp. DAVI (Milliken) A.D. Grant & V.E. Grant. Annual. Uncommon on sandy slopes and banks of washes, 1100–1600 m (3600–5300 ft). Gardner & Poutasse 828.

GILIA LATIFLORA (A. Gray) A. Gray subsp. LATIFLORA. Annual. Common on bajadas and steep sandy slopes, 1100–1900 m (3600–6200 ft). Gardner & Columbus 924.

# GILIA LEPTANTHA Parish subsp. PINETORUM A.D. Grant & V.E. Grant. Annual. Rare on rocky flat ground on the plateau, 2000 m (6600 ft). Gardner & Nazaire 1024.
**ERIOGONUM** Bailey var. *Watsonii* M.E. Jones

Annual. Common in drainages and gravel slopes under Jeffrey pines, 2000 m (6600 ft). Gross 2591.

**ERIOGONUM** Bailey subsp. *TRANSVERSA* A.D. Grant & V.E. Grant. Annual. Rare around rock outcrops on ridges. Determination confirmed by Dr. J. Mark Porter, 2000 m (6600 ft). Gardner & Columbus 312.

**ERIOGONUM** Bailey var. *Dayi* & V.E. Grant. Annual. Uncommon on steep slopes and compact conglomerate soil, 1100–1300 m (3600–4300 ft). Gardner, Poutasse, & Chumchim 1189.

**ERIOGONUM** Bailey var. *Watsonii* M.E. Jones subsp. *Watsonii*. Annual. Common in drainages and gravel slopes under Jeffrey pines, 2000 m (6600 ft). Gross 2591.

**ERIOGONUM** Bailey var. *BAILEYI* (J.T. Howell) Reveal var. *Baileyi*. Annual. Common in drainages and gravel slopes under Jeffrey pines, 2000 m (6600 ft). Gross 2591.

**ERIOGONUM** Bailey var. *BAILEYI* (J.T. Howell) Reveal var. *Baileyi*. Annual. Common in drainages and gravel slopes under Jeffrey pines, 2000 m (6600 ft). Gross 2591.

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**ERIOGONUM** Bailey var. *BAILEYI* (J.T. Howell) Reveal var. *Baileyi*. Annual. Common in drainages and gravel slopes under Jeffrey pines, 2000 m (6600 ft). Gross 2591.
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# Delphinium Purpureum Brandegee. Geophyte. Rare along Highway 178 near Onyx, 900 m (3000 ft). Howald 2496 (UCR).

Myosurus Minimus L. Annual. Uncommon in moist soil in open pinyon woodland, 1400 m (4600 ft). Ertter 6007 (UC).

Ranunculus Cymabaria Pursh. Perennial herb. Occasional in moist soil in springs, 1100–1800 m (3600–5900 ft). Gardner & Poutasse 860.

Rhamnaceae

Ceanothus Vestitus Greene. Shrub. Common in post-burn sites on the plateau in thickets, 1000–2000 m (3300–6600 ft). Gardner & Fraga 252.

Prunus Califorina (Eschsch.) A. Gray subsp. Cuspidata (Greene) Kartesz & Gandhi. Shrub. Uncommon in shade of pines in rock outcrops, 1500–2000 m (4900–6600 ft). Gardner, Elam, & Nico 394.

Rosaceae

Amelanchier Utahensis Koehne. Shrub. Uncommon in mountain drainages and near springs, 2000 m (6600 ft). Gardner & Columbus 917.

Cercocarpus Betuloides Nutt. var. Betuloides. Shrub. Occasional on mountain slopes and among pines, 1100–2100 m (3600–6900 ft). Gardner & Fraga 215.

Cercocarpus Ledifolius Nutt. Shrub. Rare on exposed mountain slopes, 1900 m (6300 ft). Shockey 10800 (CAS).

Coleogyne Ramossissima Torr. Shrub. Common on desert slopes and mountain slopes, 1200 m (4000 ft) Gardner & Sutton 1268.

Drymocallis glandulosa (Lindl.) Rydb. var. reflexa (Greene) Ertter. Perennial herb. Occasional in drainages and rocky soil, 1900 m (6300 ft). Gardner & Columbus 286.

Holodiscus Discolor (Pursh.) Maxim. var. Microphyllus (Rydb.) Jeps. Shrub. Common in rock outcrops and rocky moist drainages, 1900–2000 m (6300–6600 ft). Gardner & Fraga 227.

Horkeellia Purpurascens (W. Watson) Rydb. Perennial herb. Occasional in pinyon woodlands on level rocky soil in drainages, 1900–2000 m (6300–6600 ft). Gardner & Columbus 350.

Ivesia Santolinoides A. Gray. Perennial. Occasional in rock outcrops in mixed conifer forest, 1900 m (6300 ft). Gardner & Fraga 192b.

Ivesia Saxosa (Greene) Ertter. Perennial herb. Occasional in rock outcrops in mixed conifer forest, 1900–2000 m (6300–6600 ft). Gardner & Fraga 187.

Prunus Andersonii A. Gray. Shrub. Common on bajadas and desert slopes, 1400–1500 m (4600–4900 ft). Gardner & Paik 88.

Prunus Fasiculata (Torr.) A. Gray var. Fasiculata. Shrub. Uncommon on rocky mountain slopes along Highway 178, 900 m (3000 ft). Gardner & De Groot 679.

Purshia Tridentata (Pursh.) DC. var. glandulosa (Carrum) M.E. Jones. Shrub. Occasional in pinyon woodlands in rock outcrops, 1100 m (3600 ft). Gardner & De Groot 680.

Rubaceae

# Galium angustifolium A. Gray subsp. Oncense (Dempster) Dempster & Stebbins. Perennial herb. Rare in rocky drainages on plateau, 2000 m (6600 ft). Gardner & Columbus 932.

Galium Aparine L. Annual. Common under pinyon-oak understory and along the Pacific Crest Trail, 1900–2000 m (6300–6600 ft). Gardner & Fraga 202.

Galium Hallii Munz & I.M. Johnst. Perennial herb. Common on desert slopes and in open pinyon forests, 1800–1900 m (5900–6300 ft). Gardner & Fraga 225.

Salicaceae

Populus Fremontii S. Watson subsp. Fremontii. Tree. Occasional in desert springs and riparian areas, 1200 m (4000 ft). Gardner & Paik 102.

Salix Exigua Nutt. Shrub. Occasional in seeps in Jeffrey pine forest, 2000 m (6600 ft). Gardner & Paik 1465.

Salix Gooddingii C.R. Ball. Tree. Occasional in desert riparian areas, 1200–1500 m (4000–4900 ft). Gardner & England 757.

Salix Laevigata Bebb. Tree. Common in desert washes and mountain drainages, 1500–1900 m (4900–6300 ft). Gardner & Paik 95.

Sapindaceae

Salix Lasandra Benth. Tree. Common in desert washes and riparian areas, 1300 m (4300 ft). Gardner & Nazaire 1054.

Salix Lasiolepis Benth. Shrub. Occasional in mountain drainages, 2000 m (6600 ft). Gardner & Nazaire 1014.

Salix Lutea Nutt. Shrub. Occasional in drainages along the Pacific Crest Trail, 1600 m (5300 ft). York 744 (CAS).

Saxifragaceae

Heuchera Rubescence Torr. Perennial herb. Occasional in cracks of boulders and in shade of boulders, 2100 m (6900 ft). Gardner & Columbus 959.

Scrophulariaceae

Scrophularia Californica Cham. & Schult. Perennial herb. Occasional from base of boulders and in crevices of rocks, 1000–1400 m (3300–4600 ft). Gardner & De Groot 631.

Solanaeae

Datura Wrightii Regel. Perennial herb. Occasional on rocky desert slopes and banks of washes, 1300–1600 m (4300–5300 ft). Gardner & Forgrave 440.

Lycium Andersonii A. Gray. Shrub. Common on bajadas and desert slopes, 1000–1200 m (3300–4000 ft). Gardner & De Groot 665.

Lycium Cooperi A. Gray. Shrub. Common on bajadas and desert slopes, 1000–1400 m (3300–4600 ft). Gardner & De Groot 664.

Neotania Attenuata S. Watson. Annual. Common in pinyon woodlands and along the Pacific Crest Trail and disturbed soils, 1300–2000 m (4300–6600 ft). Gardner, Elam, & Nico 386.

Solanus Xanti A. Gray. Perennial herb. Occasional in open pine woodland around base of boulders, 1900–2100 m (6300–6900 ft). Gardner & Columbus 930.

Urticaceae

Urtica Dioica L. subsp. Holosericea (Nutt.) Thorne. Perennial herb. Occasional in seeps and desert washes on banks of washes, 1300 m (4300 ft). Gardner & Nazaire 1046.

Valerianaceae

Plectritis Congesta (Lindl.) DC. subsp. Brachystemon (Fisch. & C.A. Mey.) Morey. Annual. Occasional in drainages in mixed conifer forests, 2000 m (6600 ft). Gardner & Columbus 368.

Violaceae

Viola Purpurea Kellogg subsp. Quecetorum (M.S. Baker & J.C. Clausen) R.J. Little. Perennial herb. Rare in unburned Jeffrey pine forest in pine duff, 2100 m (6900 ft). Gardner & Columbus 990.

Viscaceae

Arceuthobium Campylopodum Engelm. Perennial herb (parasitic). Common on gray pines and in pinyon woodlands, 1100–1900 m (3600–6200 ft). Gardner & Paik 107.

Phoradendron Juniperinum A. Gray. Perennial herb (parasitic). Occasional on junipers, 1500 m (4900 ft). Gardner & Paik 109.

Phoradendron Leucarpum (Raf.) Reveå & M.C. Johnst. subsp. Tomentosum (DC.) J.R. Abbott & R.L. Thomps. Perennial herb (parasitic). Common on oaks, 1900 m (6300 ft). Gardner & Fraga 251.

Zygophyllaceae

Larrea Tridentata (DC.) Coville. Shrub. Common on bajadas and desert floor, 1100–1200 m (3600–4000 ft). Gardner & Forgrave 443.

Angiospermae—Monocotyledones

Agavaceae

Hesperoyucca Whipplei (Torr.) Trel. Perennial subshrub. Common on aluvial bajadas. Upper reaches of southern canyons, abundant in W and E canyons, 1700–2100 m (5600–6900 ft). Gardner, Elam, & Nico 410.
**ALLIACEAE**

- **ALLIUM BURLEWII** Davidson. Geophyte. Common in soft sandy granitic soil among pinyon woodlands, usually N-facing slopes, 1800–2100 m (5900–6000 ft). *Gardner & Freg. 174.*
- **ALLIUM PENINSULARE** Greene var. *ELEOCHARIS PARISHII* Britton. Perennial herb. Common in intermittent drainages and around watersources, 2000 m (6600 ft). *Gardner & Engeld 789.*
- **ALLIUM LACUNOSUM** S. Watson var. *KERNENSE* McNeal & Ownb. Geophyte. Common on Steve peaks and in shaded NW slopes of the Wilderness. Near Highway 178, 900 m (3000 ft). *Shevock 9572 (CAS).*

**CAREX DOUGLASII** Boott. Geophyte. Common in waters, intermittent streams and compacted soils, 2000 m (6600 ft). *Gross 2477.*

**JUNCUS BUFONIUS** L. var. *BUFONIUS* Sisyrinchium. Geophyte. Occasional on alkaline soils, 1900–2000 m (6300–6600 ft). *Gardner & Paik 97.*

**JUNCUS RUGULOSUS** Engelm. Perennial herb. Common in shaded NW slopes of the Wilderness. Near Highway 178, 900 m (3000 ft). *Shevock 9572 (CAS).*

**JUNCUS MEXICANUS** Willd. Perennial herb. Common in shaded NW slopes of the Wilderness. Near Highway 178, 900 m (3000 ft). *Shevock 9572 (CAS).*

**JUNCUS RUGULOSUS** Engelm. Perennial herb. Common in springs and seasonally wet locations, 1900 m (6300 ft). *Gardner & Freg. 209.*

**POTAMOGETON TETRANEMUS** (Trin.) Munro. Annual. Occasional in spring drainages and around watersources, 2000 m (6600 ft). *Gardner & Columbus 333.*

**POA SECUNDA** J. Presl subsp. *SECUNDA* Poa. Annual. Common in pinyon woodlands and desert woodlands, 1200–2000 m (4000–6600 ft). *Gardner & Paik 94.*

**RUPPIELLA PINETORUM** Davidson. Geophyte. Common in shaded NW slopes of the Wilderness. Near Highway 178, 900 m (3000 ft). *Shevock 9572 (CAS).*

**YUCCA BREVIFOLIA** Engelm. Tree. Occasional on rocky steep slopes and outcrops, 1200–1700 m (4000–5600 ft). *Gardner & Paik 98.*

**ALLIOIDEAE**

- **ALLIUM DENTICULATUM** (Traub) McNeal. Geophyte. Common in shaded NW slopes of the Wilderness. Near Highway 178, 900 m (3000 ft). *Shevock 9572 (CAS).*

**CÂRPEX ALMA** L.H. Bailey. Perennial herb. Common in springs and seeps, 2000 m (6600 ft). *Gardner & Nazaire 1013.*

**CAREX DOUGLASII** Boott. Perennial herb. Occasional in drained dry soils, intermittent drainages and around water sources, 2000 m (6600 ft). *Gardner & Columbus 370.*

**CÂRPEX MACROPHYLLUS** Coville. Perennial herb. Common in springs and drainages with standing water, 1200–2000 m (4000–6600 ft). *Gardner & Columbus 301.*

**JUNCUS BIFURCATUS** S. Watson var. *BIFURCATUS* S. Watson. Perennial herb. Common in springs and drainages with standing water, 2000 m (6600 ft). *Gardner & Columbus 345b.*

**JUNCUS BIFURCATUS** S. Watson var. *BIFURCATUS* S. Watson. Perennial herb. Common in springs and drainages with standing water, 2000 m (6600 ft). *Gardner & Columbus 346.*

**JUNCUS MEXICANUS** Willd. Perennial herb. Occasional in drainages in moist rocky soil, 2000 m (6600 ft). *Gardner & Columbus 295.*

**JUNCUS RUGULOSUS** Engelm. Perennial herb. Occasional in drainages in moist rocky soil, 2000 m (6600 ft). *Gardner & Paik 1446.*

**JUNCUS XIPHIDIOIDES** E. Mey. Perennial herb. Uncommon in desert riparian spring in shady wet rich soil, 1300 m (4300 ft). *Gardner & Nazaire 1049.*

**IRIDACEAE**

- **IRIS PSEUDACORUS** L. Geophyte. Rare in moist wet soils along Highway 178, found at only one site, 1200 m (4000 ft). *Gardner & Paik 1446.*

**LILIACEAE**

- **CALOCHLORIS INVENSTUS** Greene. Geophyte. Uncommon in springs, 2000 m (6600 ft). *Gardner & Columbus 335.*

- **SIVERICHUM HALOPIUM** Greene. Geophyte. Uncommon in springs, 2000 m (6600 ft). *Gardner & Paik 1446.*

**POACEAE**

- **AVENA FATUA** L. Annual. Uncommon only one patch found in Scodie Canyon along bank of wash, 1200 m (4000 ft). *Gardner & Paik 857.*
POLYPOGON INTERRUPTUS Kunth. Perennial. Uncommon in desert springs and loose sandy soil, 1400 m (4600 ft). Henry s.n (UCR).

POLYPOGON MONSPELIENSIS (L.) Desf. Perennial. Uncommon in springs in pinyon-pine forest, 2000 m (6600 ft). Gardner & Columbus 302.

POLYPOGON VIRIDIS (Gouan) Breistr. Perennial. Uncommon in desert riparian area of Sage Canyon, 1200 m (4000 ft). Gardner & Nazaire 1050.

SCHISMUS ARABICUS Nees. Annual. Common on bajadas and roadsides, 1100 m (3600 ft). Shevock 10369 (CAS).

SCHISMUS BARBATUS (L.) Thell. Annual. Common on bajadas and in pinyon woodlands, 900–1300 m (3000–4300 ft). Shevock 9208 (CAS).

STIPA HYMENORHIS Roem. & Schult. Perennial. Occasional on bajadas and well drained level sandy soil, 1000–1100 m (3300–3600 ft). Gardner & Columbus 1004.

STIPA LATIGLUMIS Swallen. Perennial. Occasional in rock outcrops, 1900–2000 m (6300–6600 ft). Gardner & Fraga 221.

STIPA OCCIDENTALIS S. Watson var. CALIFORNICA (Merr. & Burtt Davy) C.L. Hitch. Perennial. Occasional on exposed rocky clay soil and mountain slopes, 2100 m (6900 ft). Gardner & Columbus 948.

STIPA PARISHII Vasey var. PARISHII. Perennial. Uncommon in pinyon woodlands and drainages, 1900 m (6300 ft). Gardner & Fraga 290.

STIPA SPECIOSA Trin. & Rupr. Perennial. Common on desert slopes and in pinyon woodlands, 1200–2100 m (4000–6900 ft). Gardner & Columbus 289.

THEMIDACEAE

DIECLOSTEMMA CAPITATUM (Benth.) Alph. Wood subsp. CAPITATUM. Geophyte. Abundant and common, on dry, exposed rocky S-facing slopes and outcrops, 1000–2000 m (3300–6600 ft). Gardner, Alba, Alba, & Alba 126.

MUILLA CORONATA Greene. Geophyte. Uncommon on pebbly, sandy desert bajadas and steep sandy N-facing slopes of mountains, 1300–1700 m (4300–5600 ft). Gardner & Fisher 1285.

MUILLA MARITIMA (Torr.) S. Watson. Geophyte. Uncommon base of rock outcrops, desert bajadas, 1200–1400 m (4000–4600 ft). Gardner, Pontasse, & Chumchim 1149.

TYPHACEAE

TYPHA DOMINGENSIS Pers. Perennial herb. Rare in seeps in protected shaded canyon. Only found in Sage Canyon, 1600 m (5300 ft). Gardner & Columbus 375.