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VASCULAR FLORA OF ADOBE VALLEY AND SURROUNDING HILLS, MONO COUNTY, CALIFORNIA

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ABSTRACT

Adobe Valley and the Adobe Hills lie east of the Sierra Nevada in Mono County, California, and are within the Great Basin Floristic Province. The flora of Adobe Valley and the surrounding hills is influenced by the Great Basin Desert to the east, the Sierra Nevada to the west and the northern Mojave Desert to the south. Adobe Valley is surrounded by the Adobe Hills, Benton Range and Glass Mountain region, creating a circular closed basin with many small tributaries feeding into it. This topography contributes to the creation of a rare wetland complex, including alkali meadows, marshes, and lakes at the base of the hills, which represent some of the more botanically interesting terrain in the region. Prior to this study, the wetland complex of Adobe Valley had not been systematically investigated with regard to its botanical diversity. The vegetation types associated with the wetland complex are listed as threatened by the California Natural Diversity Database and face a number of conservation concerns including water pumping, overgrazing, and possible wind energy development. A total of 1525 herbarium specimens were collected within the study area over 59 days in the field from 2016 to 2018. The vascular flora of the Adobe Valley and Hills includes 397 minimum-rank vascular plant taxa, representing 194 genera and 61 families. Six taxa are only known from historical collections, 21 taxa are non-native and 27 taxa have conservation status. The results of the study are presented here in an annotated checklist, along with descriptions of vegetation alliances.

Key words: Adobe Valley, alkali meadow, California, Eastern California, flora, floristics, Great Basin, Mono County, rare plants, wetlands.

INTRODUCTION

Adobe Valley and the Adobe Hills in Mono County, California, had not been explored botanically with any intensity prior to this study, as evidenced by the 126 herbarium specimens that were collected previously within the study area (CCH 2019). The study area contains vegetation alliances that are of conservation concern due to long-term drought, trampling and grazing by cattle and feral horses, off-road vehicle use, water diversion and pumping, and invasive species (Elmore et al. 2006). Alkali meadows and inland marshes are more common across the border in Nevada and the rest of the Great Basin Desert and this study is an attempt to further understanding of them in California, where they are limited in their extent. Many of the rare plant taxa documented in this study are associated with the Great Basin Desert in Nevada and little is known of their abundance and distribution within California.

The Bureau of Land Management (BLM), California Department of Fish and Wildlife (CDFW), Inyo National Forest (INF), Eastern Sierra Land Trust (ESLT), the historical Adobe Ranch and other private landowners manage the area within the study site. The CDFW manages the River Spring Lakes Ecological Reserve (RSLER, Ellsworth 2016), which is at the center of the study site and is 258 ha (638 acres) of alkali and freshwater wetlands (Fig. 1). This reserve emphasizes the importance of the alkali flat ecosystem, a habitat that is representative of the Owens Valley, but severely threatened. Many similar alkali line ecosystems that occur farther south in the Owens Valley have experienced more severe water pumping and diversion effects. A botanical study of Adobe Valley and Hills provides an ideal baseline of information to make comparisons with other wetlands in the region to better understand this ecosystem and promote management that will support sustainable groundwater extraction. Throughout the entire Great Basin Desert, lack of baseline vegetation data has made it difficult to assess the effects of groundwater pumping (Elmore et al. 2006; Pritchett and Manning 2009). This study also contributes towards a research need that has been outlined in the Management Plan for the RSLER (Ellsworth 2016), which states that it is in need of a floristic checklist.

Physical Setting

Location.—The study area is located in eastern California along the Nevada border in Mono County, between Mono Lake and Benton Station along the north side of State Route 120 (Fig. 1). Adobe Valley (Fig. 2) is an enclosed valley, surrounded by hill ranges on all sides. Beyond the adjacent hills, the study area is located between two large north-south mountain ranges, the White Mountains to the east and the Sierra Nevada to the west. The study site is 241 km² (93 sq mi; Fig. 1). The boundaries of this study were mostly political and human made. Due to the expansive hill ranges extending to the north and east, a geographic boundary was difficult to determine. State Route 120 serves as the southwest boundary of the site for 20.5 km (12.75 mi). The northeastern boundary is the California-Nevada border.

The other boundaries are a power line road that lies just east of the ridgeline of the Benton Mountains to the southeast, and State Route 120 to the west and southwest, Dobie Meadows Road to the northwest, and a 4WD road that intersects Huntoon Creek at the Nevada border to the north. The boundary of the study site...
Fig. 1. A map of the study site, which is outlined in black. Geographic features mentioned in this study are labeled. Map layers were sourced from Open GeoData Portal for Mono County and the Town of Mammoth Lakes (http://gis-monomammoth.opendata.arcgis.com/pages/open-data) and ArcGis (ESRI, Redlands, CA).
Fig. 2. Northwest-facing view of Adobe Valley from a slope dominated by pinyon-juniper woodland on Antelope Peak.
was designed to center around the alkali meadows and marshes (Fig. 3, 4), but also includes upland habitats with pinyon and juniper woodlands and arid lowland habitats composed of sagebrush and rabbitbrush vegetation (Fig. 5). The Adobe Hills enclose Adobe Valley on the north-northeast side, and the highest point of these hills within the study area is 2444 m (8018 ft).

The study area incorporates portions of the Benton Range and the Adobe Hills but does not include the Glass Mountain Range, which was the subject of a botanical inventory conducted by Michael Honer (2001). Honer’s study included the western portion of Adobe Valley to State Route 120, which forms the western border of this study and bisects the valley.

Hydrology.—Prior to 40 million years ago (MYA) the portion of California that is currently recognized as the Great Basin Desert was part of the Nevadaplano, an ancient plateau that drained westward into the Pacific (Millar and Woolfenden 2016). As the current topography of the Great Basin began to develop during a time of much volcanic activity, the landscape we see today began to form, creating closed basins and mountain ranges with no outlets to the Pacific Ocean (DeCourten 2003). Today, the name Great Basin refers to a large region characterized by the lack of an outlet to the ocean. Throughout eastern California and Nevada, snow melts off mountain ranges and drains locally into basins, often forming permanent or ephemeral lakes. The study site is an example of this physiographic pattern. Water from the surrounding mountain ranges including the Adobe Hills, Benton Range, and Glass Mountain Range flows into Adobe Valley creating an enclosed wetland complex. In addition to underground water movement, there are two aboveground creeks that run from Glass Mountain to the east side of the valley: Adobe Creek in the northern part of the valley and Black Canyon Creek in the southern part of the valley; however, Black Canyon Creek was not flowing throughout the duration of this study. Most of the water that drains from the Adobe Hills and Glass Mountain terminates in the low areas of Adobe Valley; however, some water instead travels underground and resurfaces in Fish Slough, 40 km (25 mi) to the south (Zdon et al. 2019).

Springs.—There are seven springs within the study area (Fig. 1). Five springs are located along the eastern edge of Adobe Valley. From south to north they are Browner Spring, Michelle Spring, Antelope Spring and two springs at River Spring (Fig. 6). Some snowmelt from the nearby Glass Mountain Range runs aboveground by way of Adobe Creek; however, most of the water travels across the valley underground and resurfaces at these springs. The two remaining springs are located in the Adobe Hills and are named Pizona Spring and Upper Pizona Spring.

Lakes.—There are three ephemeral lakes (Adobe, Antelope and Lake McNamara) and one perennial lake (Black Lake) in the study area (Fig. 1). Black Lake contained water for the entirety of this study. The first year Black Lake was clear and deep blue in color; however, in the second year there was what appeared to be an increase in sedimentation and the color of the lake changed to tan or dark brown. Adobe Lake occurs at the northern end of the valley and was dry during the study, except for April–June 2017 when there was a small amount of water in the lowest sags of the lake. Antelope Lake (Fig. 3) is an ephemeral lake that filled in winter 2016–2017 and remained full for a few months throughout spring 2017, but was dry throughout 2018. Antelope Lake forms a salt flat when it is dry, as does the shoreline of Black Lake. Lake McNamara is located in the hills on the border between California and Nevada and was dry when it was surveyed in August 2017. Based on the condition of the lakebed and the vegetation present, it appeared to have been dry for an extended period of time.

Topography.—Elevation at the site ranges from 2012 m (6600 ft) on the valley floor to the highest point at 2445 m (8018 ft) in the Adobe Hills. The highest peaks in the study area are an unnamed high point in the Adobe Hills (2445 m), Trafton Peak (2383 m), and Antelope Mountain (2322 m) (Fig. 1). The highpoint of the Adobe Hills is unnamed on USGS topographic maps, but will be herein referred to as “Adobe Peak”; it is surrounded by hills of almost the same elevation and does not stand out as an isolated peak of promience, as Trafton Peak and Antelope Mountain do.

The Benton Range has a ridge that runs 12 km (7.5 mi) north to south in the southern part of the study area. There are a few canyons that cut through the range, the deepest being a canyon that bisects through a series of large granite outcrops near Benton Hot Springs. The Adobe Hills do not have a distinct crest, but rather are part of a more extensive rolling hill range that stretches to the east where it meets the Huntoon Range and continues to the north outside the study area into Nevada.

The east side of Adobe Valley is 60–90 m (200–300 ft) lower than the west side of the valley. This elevation difference allows the water that drains from Glass Mountain to pool at the low point of the valley, creating ephemeral and perennial wetland complexes including Antelope Lake, Adobe Lake and River Spring Lakes (Fig. 6). The ephemeral wetlands become dry in the summer and form salt flats and dry lake beds (Fig. 3).

Geology.—The granodiorite of the Benton Range is the oldest rock type within the study area and was formed around 210 MYA during the Triassic (Krauskopf and Bateman 1977). Within the study area, the Benton Range granite is exposed along the western slope and is dominated by pinyon-juniper woodland.

A later pulse of magma formed the granite of Casa Diablo Mountain during the Jurassic, 160 MYA (Krauskopf and Bateman 1977). This granite is found at the southern tip of the study area and has a unique botanical assemblage when compared with the rest of the study area (Fig. 7). The plants of the Casa Diablo granite are comprised of mixed shrubland and many herbs not found anywhere else in the area, including Cerocarpus ledifolius var. intermontanus (Rosaceae), Chamaebatitia millefolium (Rosaceae), Heuchera rubescens (Saxifragaceae) and Holodiscus discolor (Rosaceae). This geologic feature is easy to identify from State Route 120 as it forms large weathering piles of boulders at the southwestern end of the study area. While the Benton Range granodiorite has phenocrysts, dark inclusions and variable coarseness, the granite of Casa Diablo is coarse and does not have potassium-feldspar phenocrysts.

The more recent exposed rock is of volcanic origin and covers much of the Adobe Hills; these rocks were formed during the Miocene when the valley experienced a series of rhyolitic explosions (Krauskopf and Bateman 1977; Fig. 9). This area is covered in rocks of dense material, more so than other areas dominated by pinyon-juniper woodland. It hosts some species not found elsewhere in the area including Calochortus bruneanus (Liliaceae) and Salvia dorrii var. pilosa (Lamiaceae). This
Fig. 3–8. Vegetation types of Adobe Valley.—3. Alkali meadows dominated by *Distichlis spicata* along the margin of Antelope Lake.—4. Alkali marsh dominated by *Iris missouriensis* on the north shore of Black Lake.—5. Big Basin sagebrush scrub in the center of Adobe Valley.—6. Freshwater marsh at River Springs Lake Ecological Reserve.—7. Granitic outcrops of the Benton Range harbor many taxa not found elsewhere in the study area.—8. Sand dunes dominated by *Tetradymia tetramera*. 
Fig. 9. Rock types of Adobe Valley. Tertiary volcanic flow rocks with minor pyroclastic deposits dominate the majority of the uplands. The basin is alluvium, lake, and playa deposits. The Benton Range consists of granite, quartz monzonite, granodiorite, and quartz diorite (USGS 2019).

rock is not exposed in much of the study area and is instead overlain with andesite from an event ca. 22–16 MYA (Gilbert et al. 1968). These andesites are most abundant in the Upper Pizona area, where the rocks are noticeably more brown in color than in the surrounding areas.

Olivine basalt is the most recently formed layer of rock in the study area that was formed from volcanic explosions during the Pliocene. The majority of the exposed olivine basalt occurs in the Adobe Hills and is covered by pinyon-juniper woodland. Basalt scoria, intrusive rock and flows are identifiable because of their red coloring and piles of scoria (Krauskopf and Bateman 1977).

The surficial deposits that cover Adobe Valley formed in the Pleistocene and Holocene. The most recent volcanic explosion created the alluvial fan deposits in the valley referred to as Bishop Tuff that was created by the Long Valley Caldera, 760,000 years ago, and filled the valley (Krauskopf and Bateman 1977). An earlier volcanic episode deposited the pumice that is still exposed throughout much of the valley floor. Much of the soil of the entire study site, especially within the valley, is very well drained. This deep sand formed from volcanic ash and mixed alluvium. Sand dunes build up in the northeast section of the valley (Fig. 8), where westerly winds deposit airborne sand (NRCS 2018).

Climate

The Great Basin Desert is categorized as a “cold-desert shrubland” with a large temperature range between summer and winter (Lathrop and Rowlands 1983). Due to the rain shadow effect caused by the Sierra Nevada, precipitation reaching the study area from the west is relatively low. Storms on the west side of the Sierra Nevada often do not make it over the crest, and if they do, theywarm as they descend over the eastern slope (Hidy and Klieforth 1990). There are different precipitation regimes throughout the year. In the winter, which is the wettest season, the Great Basin is influenced by Pacific cyclones. In the summer, warmer thunderstorms that come up from the Gulf of Mexico provide little precipitation (Hidy and Klieforth 1990). The closest weather station to the study area at Benton receives annually on average 19 cm (7.5 in.) of rain and 34.8 cm (13.7 in.) of snow (WRCC 2019), with the majority of the precipitation falling in December and January; however there are gaps in data collection from this station. Prior to this study, California re-
ceived below-average precipitation for five consecutive years (2012–2016). The rain year (October 2015–October 2016) prior to the onset of field work for this study provided above-average precipitation with 26.56 cm (10.46 in.; CDEC 2019). The timing and amount of precipitation caused prolific germination of many annual plant taxa which may have not been otherwise documented under drought conditions. The second field season in 2018 received below-average precipitation, 9.8 cm (3.85 in.), and the diversity of annual and herbaceous plant species was observed to be lower. The closest consistent snowfall data available is from the Lee Vining Weather Station, 35 miles from the study area, which reported 232 cm (91.5 in.) for 2016–2017, with the majority of snow in January and February. For 2017–2018, 56.9 cm (22.5 in.) of snow was reported (NOAA 2019). Many plants in the mustard family (Brassicaceae), especially Thelypodium, and Boehmera A. Löve & D. Löve, were observed in 2018 because many are biennials and had germinated with the 2016 precipitation.

Temperature.—Temperature fluctuations between seasons increase and differences between daytime and nighttime temperatures also increase east of the Sierra Nevada crest. There is an extreme difference between winter and summer high and low temperatures (Hidy and Klieforth 1990). July is the hottest month of the year with an average high of 33.9°C (93°F) and December is the coldest month of the year with an average low of -9.4°C (-15°F) as recorded by the Benton weather station (The Weather Channel 2019).

Wind.—Winds throughout the Great Basin Desert often play a large role in the geomorphology of the region as well as the development of sand dunes in basins (Hidy and Klieforth 1990; Fig. 8). Due to the location of the study area, with the Sierra Nevada to the west, many of the winds reaching the study area originate from the south and north and blow parallel to the Sierra Nevada (Zhong et al. 2008).

Paleo-Vegetation

The rain shadow effect and aridity of eastern California caused by the formation of the Sierra Nevada has had a significant effect on the current distribution of plant taxa in the study area (Axelrod and Raven 1985). The extent distribution of plant taxa is the result of a history of disturbances affecting climate, causing cycles of cooling and warming throughout geologic time (Millar and Woolfenden 2016). Taxon identifications based on seed and pollen have been used to understand past plant distributions in the eastern Sierra Nevada (Woolfenden 2003). During the Pleistocene, conifers throughout the Great Basin Desert existed at lower altitude than they do today (Millar and Woolfenden 2016). Within the study area, this applies to the juniper and pinyon belt, which is located at elevations of ca. 2000 m in the modern era, but is thought to have occurred at lower elevations extending across basins that are now dominated by Ericameria nauseosa (Asteraceae) and Grayia spinosa (Chenopodiaceae). As climate warmed, Pinus monophylla (Pinaceae) and Juniperus osteosperma (Cupressaceae) reseeded to the range they are currently found (Millar and Woolfenden 2016).

A pollen core sampled from within the study area at Black Lake dates to the early Holocene. The majority of the plants identified in the core were Amaranthus L. (Amaranthaceae), Ambrosia L. (Asteraceae), Carex L. (Cyperaceae) and Pinus L. (Pinaceae), all lacking species identifications. The sampled pollen core coincides with the aridification and transition to the modern day halophytic flora of the region (Davis 1999). This early-Holocene transition is characterized by a transition from Juniperus (and other Cupressaceae throughout California) pollen fossils to an increase in percentages of Asteraceae, Chenopodiaceae and other halophytic taxa pollen fossils sampled in pack rat middens in the greater region, including Owens Lake and high-elevation lakes in the Sierra Nevada (Davis 1999).

Wildlife

There is very little development within the study area, aside from high voltage power lines that cut across the study site, and one major paved road (State Route 120) that bisects Adobe Valley. The surrounding region is also minimally developed, which creates continuous habitat for wildlife, including animal species that require a large uninterrupted range.

There is potential for Adobe Valley to serve as habitat for the Bi-State Distinct Population Segment of the greater sage grouse (Centrocercus urophasianus Bonaparte) although there are no active leks in the area. The Granite Mountain lek was historically located in Adobe Valley, but was determined to be inactive as of 2001. The Bi-State Action Plan (Bi-State Technical Advisory Committee Nevada and California 2012) identifies wild horses that occur in the study site, as a major threat to greater sage grouse. Other threats to greater sage grouse include livestock, pinyon-juniper woodland encroachment, and habitat conversion. Sage grouse avoid lekking and nesting in areas with Pinus monophylla and Juniperus osteosperma nearby (Casazza et al. 2011; Coastes et al. 2017) and prefer increased shrub cover (Kolada et al. 2009).

Wild horses (Equus caballus L.) are frequently seen in Adobe Valley (Fig. 10). In a 2015 survey, there were 314 adult horses and 40 foals counted (Ellsworth 2016). Over the course of this study, horses were often observed in the vicinity of River Spring during spring and summer. Smaller groups of horses were observed throughout the hills and around Adobe Lake.

Pronghorn (Antilocapra americana Ord) are often seen throughout the valley floor. There were three historical releases of pronghorn into the valley in the 1980s (Ellsworth 2016). Fences around River Spring are designed to discourage wild horses, though they typically jump over the fences, and encourage pronghorn, who can crawl under fences (Ellsworth 2016). There is a population of the Casa Diablo Herd of Rocky Mountain mule deer (Odocoileus hemionus Rafinesque) that seasonally use the hills south of the Pizona area. At River Spring, some notable wildlife include the naturally occurring Wong’s spring snail (Pyrgulopsis wongi Hershler) and the introduced Amargosa pupfish (Cyprinodon nevadensis amargosae Miller). The last known California locality of Pyrgulopsis wongi is in loamy soils of sagebrush islands (stands of taller sagebrush within a dominant sagebrush landscape) around Mono Lake, including Adobe Valley (Larrucea and Brussard 2008).

Human History

Prior to 1900.—Although people are thought to have lived in Mono County for the past 10,000 years, permanent settlements
are only known from the area for the past 1000 years (NRCS 2018). The indigenous people of the region are considered part of the Northern Paiute (Lawton et al. 1976). Paiute communities spanned the Owens Valley with the Sierra Nevada being the western edge of the area they occupied and Death Valley and Fish Lake Valley being the southern and eastern edges, respectively (Steward 1933). Important known food plants were *Elymus cinereus* (Poaceae), *Elymus triticoides* (Poaceae), and *Stipa hymenoides* (Poaceae), and the highly calorific *Pinus monophylla* (Pinaceae; Lawton et al. 1976). The Owens Valley was one of the most densely populated regions of the Great Basin Desert, with an estimated population of 6500 in the 1830s (Fowler and Beierle 2012). Ditch irrigation was used throughout communities south of the study area, but irrigation is not known from the Mono Lake area (Lawton et al. 1976). These irrigation systems enhanced native vegetation for consumption, but no crops were planted in the Owens Valley until after European settlement (Sauder 1990). Two important obsidian sources for arrowheads are found near the study area: Glass Mountain to the west and Truman Meadows to the east. The Benton Paiute Reservation, which is at the intersection of U.S. Route 6 and State Route 120, is 5 km (3 mi) east of the study site and currently has 138 members. Utu Utu Gwaitu, which means Hot Water Place people, is the Paiute name for the Benton Paiute.

In 1853, LeRoy Vining settled the west side of Mono Lake. Vining, along with other prospectors from this time, explored the eastern Sierra Nevada, Bodie Hills and Benton for potential mining. The Great Basin Desert as a whole was sparsely settled in the 1860s beyond the Mormon territories (Sauder 1990). As the gold rush west of the Sierran crest died down, the eastside mining towns of Aurora and Bodie began to take off. The study area was not historically mined, but it was used by ranchers beginning in the 1860s (NRCS 2018), predominantly for sheep and cattle grazing. George W. Parker was the first European settler to homestead in Adobe Valley. During this time, roads through the valley served to connect nearby towns. A historical stagecoach stop remains standing in the center of River Spring, along with associated horse corrals and irrigation ditches (Fig. 11, 12). One other remaining historical structure in the Adobe Hills is from a homestead called Pizona.

**Human Impacts to the Region.**—Between 1905 and 1930, the LADWP bought over a thousand farms and ranches throughout the Owens Valley and with it gained the water rights necessary to export water to Los Angeles (Libecap 2009). The first aqueduct was completed in 1913 and a second in 1970 to meet Los Angeles’ increasing water needs. The second aqueduct diverted water from the Mono Basin and ran east of the study area. Beyond surface water, harvesting of groundwater was also needed to meet water export quotas, especially during the droughts of the late 1980s, when groundwater made up a significant percentage of the water diverted from the Owens Valley (Elmore et al. 2003). As of 2010, LADWP owns over 300,000 acres of land in Mono and Inyo County (LADWP 2010). There are two springs, Michelle Spring and Browner Spring (Fig. 1), within Adobe Valley that are owned by the LADWP; however, they are not exporting water from the springs at this time.

A portion of the study area is also used by ranchers. There are grazing allotments throughout the Black Lake Preserve, the historical Adobe Ranch and areas managed by the BLM. The INF permits horse packers that lead summer trips from Adobe Valley into the Adobe Hills near Pizona and beyond to Nevada.
Table 1. Historical botanical collections.

| Collector                  | Years          | Number of specimens | Herbarium         | Area                          |
|----------------------------|----------------|---------------------|-------------------|-------------------------------|
| H. M. Hall                 | 1918, 1922, 1941 | 4                   | UC               | Black Lake, Adobe Valley     |
| C. B. Wolf                 | 1931, 1939      | 2                   | RSA              | Southern Benton Range        |
| V. G. Duran                | 1932, 1939, 1944| 4                   | UCD, UC, RSA     | River Spring, Antelope Spring, Black Lake |
| M. E. Kerr                 | 1948           | 3                   | SBBG, CAS        | Black Lake                    |
| R. S. Ferris               | 1957           | 5                   | CAS              | Black Lake, Southern Benton Range |
| J. L. Reveal               | 1957, 1974      | 6                   | CAS, UC          | Pizona, Black Lake, Southern Benton Range |
| R. E. Douglas              | 1964           | 3                   | SJSU             | Adobe Valley                  |
| B. D. Rodgers              | 1976           | 1                   | HSC              | Black Lake                    |
| B. Crampton                | 1976           | 3                   | UCD              | River Spring                  |
| D. W. Taylor               | 1988, 1994, 1998| 39                  | JEPS, UC, UCD    | Adobe Lake, River Spring, Southern Benton Range, Black Lake |
| M. DeDecker                | 1989           | 4                   | RSA              | Adobe Valley, Adobe Hills    |
| R. D. Goeden               | 1991           | 1                   | UCR              | Black Lake                    |
| R. W. Spellenberg          | 1996           | 1                   | NY               | Black Lake                    |
| G. K. Helmkamp & E. A. Helmkamp | 1998, 2008   | 8                   | UCR, CAS         | River Spring                  |
| N. H. Holmgren, P. K. Holmgren | 1998     | 2                   | NY               | Black Lake                    |
| K. Ferrell-Ingram, S. McCullough, K. Pavich | 2003 | 3                   | UC               | Black Lake                    |
| R. W. Spjut                | 2008           | 1                   | RSA              | Black Lake                    |
| J. André, T. La Doux, Ron Kelley | 2009      | 15                  | GMDRC            | Black Lake, Adobe Valley, Adobe Hills |
| S. E. Winitsky             | 2017, 2018     | 1525                | RSA              | Entire area                   |

Seasonal encampments to support these trips were observed near Pizona. Benton Hot Springs, which is 5 km east of the study area, is the closest attraction that brings people to the area for camping and hot springs.

Land Management.—Most of the valley floor is managed by the BLM, except for the alkali meadows, seeps and springs, which are mostly private parcels. The Eastern Sierra Land Trust manages the Black Lake Preserve and the southern end of Adobe Valley. North of Black Lake are two parcels with unnamed springs that are owned by the LADWP. RSLER is at the center of the study area and is the largest wetland complex in the valley; it is managed by the CDFW. North of River Spring is the historical Adobe Ranch, which is privately owned and includes Adobe Lake. The entirety of the Pizona and Adobe hills are managed by INF. There is minimal development on lands managed by the National Forest other than historic structures; however, there is a power line and affiliated access road running north-south through the hills. There is also a utility building on top of Antelope Mountain, including a geodetic GPS station, which measures movement between the Pacific and North American tectonic plates.

Conservation Concerns.—Off-road vehicle use is gaining popularity throughout eastern California. This activity was observed occasionally during fieldwork, throughout the BLM and INF lands, even in the most remote areas of the study site. Off-road vehicles’ use can cause habitat degradation. In addition, construction and maintenance of roads can cause population fragmentation, alter drainage and waterways, introduce non-native species, and cause soil compaction (Fig. 13).

Other threats to vegetation include trampling, grazing and soil compaction from the extensive herd of wild horses present within the study area. Trampling and grazing damage appeared to be most concentrated in the meadows and marshes that remain inundated with water year round. People often drive off the highway onto dirt access roads, or hike out into the valley, to get closer to the wild horses, usually to take photographs. Cattle grazing within the study area has also led to compaction, particularly in riparian areas. Wind development has been proposed in the area, at sites near Benton and Sagehen Peak, but proposed projects have not moved forward since the most recent proposal in 2010. If water pumping were to take place in the valley, on the land already owned by the LADWP, it could alter the water table and have a significant impact on the alkali meadows and marshes.

Botanical History.—Prior to this study 105 herbarium specimens had been collected within the boundaries of the study area (Table 1, Fig. 14). These represent 85 minimum-rank taxa. Forty-eight of these collections were made from the vicinity of Black Lake, which is the closest lake to the highway. Harvey Monroe Hall was the first botanist to collect in the study area (CCH 2019). He visited in 1912, the same year his Yosemite flora was published with Carlotta Case Hall. Hall studied Asteraceae and three of his four collections were in that family. Victor Duran visited the study area in 1927 and 1932, making four collections. However, he was known to collect upwards of 50 duplicates per collection (Lloyd and Mitchell 1973). Duran spent years studying the flora of the White Mountains and collected for the UC herbarium. Jim Reveal, expert in Erigeron Michx., collected plant specimens in the study area in 1962–1963.

Mary DeDecker, authority on the flora of the eastern Sierra Nevada and Owens Valley, collected Tetradymia tetrameres (Fig. 15) from the sand dunes (Fig. 8) in the northeast region of Adobe Valley. She was the author of Flora of the Northern...
Fig. 14. Map of collection localities. Dots represent specimens collected for this study and circles represent historic collections (CCH 2019). (Google Earth https://earth.google.com/web/).
Fig. 15–20. Sensitive taxa.—15. Tetradymia tetrameres (Asteraceae).—16. Astragalus johannis-howellii (Fabaceae).—17. Plagiobothrys parishii (Boraginaceae).—18. Calochortus excavatus (Liliaceae).—19. Aphyllon californicum subsp. nov. (Orobanchaceae).—20. Ivesia kingii var. kingii (Rosaceae).
Mojave Desert (1984) and Mines of the Eastern Sierra (1993) and founded the Bristlecone Chapter of the California Native Plant Society (CNPS). The known occurrences of most of the sensitive taxa in the area were documented by Dean Taylor throughout his floristic work in Mono County (Taylor 1981; Keeler-Wolf 1990).

There are several published floristic inventories that have contributed to our understanding of the Great Basin Floristic Province of California. The nearby White Mountains, which are visible from Adobe Valley, were inventoried by Lloyd and Mitchell (1973) and expanded upon by James D. Morefield, Dean W. Taylor and Mary DeDecker (Morefield 1988; Morefield et al. 1988) and Phil Rundel (Rundel et al. 2008). Michael Honer published a flora of the Glass Mountain region (2001), which documented 489 taxa and included the western side of Adobe Valley. Other floristic inventories conducted in Mono County and east of the Sierra include the Bodie Hills (Messick 2019), the Sweetwater Mountains (Hunter and Johnson 1983) and the Upper Walker River (Lavin 1983).

METHODS

Herbarium collection methods.—Prior to beginning fieldwork, a list of taxa known from the study area was compiled based on searches for herbarium specimens at the California Botanic Garden [formerly Rancho Santa Ana Botanic Garden] herbarium (RSA-POM) and on the Consortium of California Herbaria web database (CCH 2019). Permits were obtained from the BLM, INF, CDFW and LADWP to survey their lands and collect plants. Letters of permission were also obtained from the Adobe Ranch, the landowner of Antelope Lake and Black Lake Preserve. A total of 59 days were spent in the field with the majority of the field collecting taking place in the months of May, June and July in 2017 and 2018. Collection sites were planned based on phenology, with the explicit goal of surveying areas with few to no historical botanical collections and habitats identified as unique via satellite imagery and geologic maps, in order to document as many taxa as possible. Location, including longitude and latitude, elevation, plant abundance, associated taxa, vegetation type and habitat descriptions were recorded for every collection. Specimens were collected with diagnostic features including flower and/or fruit whenever possible. Specimens were collected in triplicate whenever possible. All specimens have been deposited at California Botanic Garden RSA-POM, with duplicates deposited at University Herbarium at Berkeley UC-JEPS and Reno Herbarium RENO. The RSA-POM herbarium was used as a reference to help verify plant identifications, along with the Jepson eFlora (Jepson Flora Project 2019) and the Intermountain Flora (Cronquist et al. 1972–2017). The classification follows the Jepson Flora Project (2019), except for Boraginales, which follows Luebert et al. (2016) and Cryptantha, which follows Hasenstab-Lehman et al. (2012). Family classifications follow Angiosperm Phylogeny Group IV (Stevens 2001 onwards). RSA-POM, CAS, JEPS and UC were visited to annotate and verify determinations of historic collections from within the study area. Common names were sourced from the Calflora Database (Calflora 2018).

Vegetation.—A list of major vegetation types was compiled during the first collecting season. During the second field season vegetation plot data were collected from each of these vegetation types to inform vegetation descriptions (see Appendix 1). Data collected within each vegetation plot included percent species cover, life form percent cover, a complete list of plant taxa, aspect, elevation, latitude, longitude, shrub height, seral stage and disturbance level. These plots, combined with field observations and vegetation alliances previously described by Sawyer et al. (2009), were used to generate the vegetation descriptions in this flora. The plot center was chosen by ensuring the entirety of the plot occurred within a cohesive stand and did not occur within a transition between vegetation types. The plots have a 10-meter radius and most vegetation types were represented by two to three plots. These were not randomly placed, but chosen based on vegetation signatures visible from satellite imagery.

RESULTS

Floristic Provinces

Adobe Valley and the surrounding hills are within the Great Basin Floristic Province, which includes two sub-regions in Mono County: east of the Sierra Nevada and the White/Inyo Mountains (CCH 2019). The Great Basin Desert is characterized as a region that has no hydrologic outlet and is primarily dominated by Artemisia tridentata in the low-lying valleys. Ninety-seven percent of the taxa documented in this study have been associated with the Great Basin Floristic Province, based on their distributions in the Jepson eFlora (Jepson Flora Project 2019) and representation in herbarium collections (CCH 2019), the remaining 3% were associated with the Desert Floristic Province or California Floristic Province.

Fifty-seven percent of the taxa documented in this study, or 226 taxa, are also found in the Desert Floristic Province. The Great Basin Desert differs from the Mojave Desert by an increase in elevation, decrease in winter temperatures and increase in winter precipitation (Beatley 1975). Vegetatively, the boundary of the Mojave Desert and Great Basin Desert are characterized by the switch from creosote bush scrub to sagebrush steppe and pinyon-juniper vegetation (Jepson Flora Project 2019).

U.S. Route 395 is used in the Jepson Manual (Baldwin et al. 2012) as the boundary between the Sierra Nevada Region and the Great Basin Province. Sixty percent, or 236 taxa, documented in this study are categorized as Sierra Nevada taxa. Forty-eight minimum-rank taxa, or 12% of the flora, are considered widespread throughout California.

Vegetation

The distribution of plants and the assemblages they form is influenced by geology, water availability, aspect, temperature, elevation and soil type. The following section describes the main vegetation types found in the study area. In nature, plants often do not follow the descriptions provided by books, so the following descriptions are based on field observations, but are informed by the classification of Sawyer et al. (2009).

Woodlands

Pinyon-juniper woodland is the dominant vegetation found in the highest elevation belt of the study area. Within the Adobe Hills, Pinus monophylla is the dominant tree cover, while Juniperus osteosperma forms a less dense tree cover. Within the
woodlands of the study area there are two main vegetation alliances: Pinus monophylla/Cercocarpus ledifolius-Artemisia tridentata-Purshia tridentata and Pinus monophylla-Juniperus osteosperma (Sawyer et al. 2009).

MIXED SHRUB/WOODLAND: Pinus monophylla/Cercocarpus ledifolius-Artemisia tridentata-Purshia tridentata.—This vegetation alliance is found on the granitic outcrops of the Benton Range (Fig. 7). It often occurs among large boulders and hosts many rock-dwelling plant species. Although usually containing less than 20% shrub cover, it has the greatest diversity of shrubs of all the vegetation types. This vegetation type covers less than 1% of the study area, but supports more than 30% of the floristic diversity (118 taxa). In addition, 66 taxa (17% of the flora) documented in the study area were endemic to this vegetation type. This is the highest diversity and endemism of any vegetation type documented in the study area.

TREES AND SHRUBS: Amelanchier utahensis, Artemisia tridentata subsp. vaseyana, Cercocarpus ledifolius var. intermontanus, Chamaebatia millefolium, Ephedra viridis, Eriogonum ovalifolium, Grayia spinosa, Holodiscus discolor, microphyllus, Juniperus osteosperma, Opuntia polyacantha var. erinacea. Prunus andersonii, Pinus monophylla, Ribes velutinum. GRAMINOIDS [grasses and grass-like plants]: Bromus tectorum, Elymus elymoides, Festuca microstachys, F. octoflora, Poa secunda subsp. secunda. FORBS: Aliciella lottiae, Allium atrovirens var. cristatum, Antirrhinum kingii, Astraagalus malacus, A. newberryi var. newberryi, A. purshii var. tinctus, Boeckera bodiensis, B. cobrensis, Castilleja chromosa, Dieteria canescens var. canescens, Ericameria cuneata var. cuneata, E. nana, E. teretifolia, Eriogonum kennedyi var. purpuratis, Ionactis alpina, Ivesia saxosa, Lewisia rediviva var. minor, Pectocarya setosa, Penstemon floridus var. floridus, P. rostriflorous, Phoenicaulis cheiranthoides, Pleiaeanthus spinosus, Stenotus acacalis.

PINYON-JUNIPER WOODLAND: Pinus monophylla-Juniperus osteosperma/Artemisia tridentata.—This vegetation type is found throughout the volcanic uplands of the Adobe and Pizona hills. Pinus monophylla is the dominant tree with varying cover of J. osteosperma. There are some areas where J. osteosperma is absent and A. tridentata is co-dominant with P. monophylla. This vegetation type covers 31% of the study area. There were 109 taxa (28% of the flora) documented from this vegetation type and 36 taxa (9% of the flora) that were only found in this vegetation type. Many forbs and graminoids found in the vegetation type are also found in the sagebrush scrub.

TREES AND SHRUBS: Artemisia tridentata subsp. vaseyana, Chrysothamnus viscidiflorus, Ephedra nevadensis, E. viridis, Juniperus osteosperma, Opuntia polyacantha var. erinacea, Pinus monophylla, Purshia tridentata, Ribes velutinum. GRAMINOIDS: Bromus tectorum, Elymus elymoides, Stipa comata var. comata, S. hymenoides, S. speciosa. FORBS: Ceanothus pinosus, Chamaecrista xantiana, Eremogone ferrissiae, Erigeron breviflorus var. pinnatifidus, Gneeneocharis circumcissa var. circumcissa, Orocarya confertiflora, Orocarya flavocolata, Packera multilobata, Penstemon patens, Thelypodium laciniatum, T. milleflorum.

Shrublands

The majority of the study area is shrublands and the vast majority of the shrublands are dominated by sagebrush (Artemisia tridentata). Sagebrush shrublands are dominated by either of these subspecies: A. tridentata subsp. tridentata and A. tridentata subsp. vaseyana. The other shrubland alliances in the study area are dominated by Sarcobatus vermiculatus, Ericameria nauseosa or Ephedra nevadensis.

BIG BASIN SAGEBRUSH SCRUB: Artemisia tridentata subsp. tridentata.—This alliance makes up the vast majority of the valley floor (28.3% of the total study area; Fig. 5). It also comprises the dominant vegetation in the basins of the Adobe and Pizona hills. This vegetation type occurs in deep alluvium, and there is very little diversity in shrub taxa. The observed differences in annual herb diversity between 2017, which received above-average precipitation, and 2018, which received below-average precipitation, was greater than any other vegetation type. There were 75 taxa (19% of the flora) documented from this vegetation type and 22 taxa (6% of the flora) that were only found at this vegetation type. Although widespread, there are many conservation concerns facing the sagebrush steppe including: pinyon-juniper encroachment, wildfires, and impact from non-native plants (Schindler 2011). TREES AND SHRUBS: Artemisia tridentata subsp. tridentata, Chrysothamnus viscidiflorus, Ericameria nauseosa, Grayia spinosa. GRAMINOIDS: Stipa hymenoides, S. occidentalis var. californica, S. speciosa. FORBS: Abronia turbinata, Aliciella monoensis, Carsonia sparsifolia, Chrysmis claviformis subsp. lancefolia, Eriastrum signatum, Eriogonum baileyi var. baileyi, Euphrosyne nevadensis, Gouphalium palustre, Linanthus inyoensis, Oxytomea dendraea, Phacelia bicolour, Salsoala tragus.

MOUNTAIN SAGEBRUSH STEPEE: Artemisia tridentata subsp. vaseyana.—This alliance exists along the slopes and higher elevation shrublands. The eastern slopes of the Benton Range and the rockier areas of the hills are dominated by Artemisia tridentata subsp. vaseyana. This vegetation type can overlap with Pinus monophylla-Juniperus osteosperma woodland. The soils are less sandy than the soils where A. tridentata subsp. tridentata is found and the ground has higher percentages of rocks and gravel. The total coverage throughout the study site of this vegetation type is 24.15%. There were 53 taxa (13% of the flora) documented from this vegetation type and 5 taxa (1% of the flora) that were only found at this vegetation type.

TREES AND SHRUBS: Artemisia tridentata subsp. vaseyana, Chrysothamnus viscidiflorus, Eriogonum umbelatum var. nevadense, Grayia spinosa, Purshia tridentata, Ribes cereum var. cereum, Tetradyneana canescens. GRAMINOIDS: Elymus elymoides, Stipa comata var. comata, S. hymenoides, S. speciosa. FORBS: Aliciella leptomeria, Ammiscia intermedia, Chorizanthe brevicornu var. brevicornu, Delphinium ander sonii, Ephedra viridis, Gilia modestissimus, Lupinus argen tious var. heteranthus, Malacothrix glabrata, Phacelia vallis mortae, Sphaeralcea ambigua var. ambigua, Stephanomeria exigua subsp. exigua, Toxicocortis paniculatum.

MORMON TEA INTERMONTANE SCRUB: Ephedra nevadensis.—This vegetation type is mostly found in the exposed east-facing slopes of the Benton Range. Ephedra nevadensis and Ephedra viridis are both found throughout other shrubland vegetation types in the area, which are mostly dominated by shrubs in Asteraceae. Areas where Ephedra becomes dominant are also highly diverse shrublands. This vegetation type covers 1% of the total study area. There were 20 taxa (5% of the flora) documented from this vegetation type and Descurainia incisa subsp. incisa was only found at this vegetation type.
TREES AND SHRUBS: Artemisia tridentata, Cylindropuntia echinocarpa, Ephedra nevadensis, Grayia spinosa, Pursoria tridentata, Tetradymia axillaris var. longispina. GRAMINOIDS: Stipa occidentalis var. californica. FORBS: Amsinckia tesselata var. tesselata, Anisocoma acutis, Cryptantha pterocarya, Greenocharis circumcissa var. circumcissa, Mentzelia albicaulis, Nama aretioides var. multiflora, Tiuliula nuttallii.

**RUBBER RABBITBRUSH INTERMONTANE SHRUBLAND:** Erica canadensis. This alliance occurs along the major highways and other disturbed areas along the valley floor. This is an early seral vegetation type that often has a dense canopy. There are fewer annual herbs in this vegetation alliance than are found in other shrubland assemblages, but there is more abundance of non-native grasses due to the disturbance level and proximity to the roads. This vegetation type covers 8.4% of the study area. There were 15 taxa (4% of the flora) documented from this vegetation type and three taxa that were only found in this vegetation type. TREES AND SHRUBS: Artemisia tridentata, Atriplex canescens, Chrysothamnus viscidiflorus, Erica canadensis, Grayia spinosa. GRAMINOIDS: Bromus tectorum, Poa pratensis subsp. pratensis, Tragopogon dubius. FORBS: Aphyllon californicum subsp. nov., Erigonum maculatum, Melilotus albus.

**GREASEWOOD ALKALI BASEN:** Sarcobatus vermiculatus.—This vegetation type lines the eastern edge of Adobe Valley at the toe slope of the hills, along lakeshores and throughout alkali meadows. It has a more open canopy than the surrounding shrublands, saline and alkaline soil and can have a varying percent cover of Distichlis under the shrub canopy. These basins can be seasonally wet, but are often very dry in the summer. This vegetation type covers 4.5% of the study area. There were 22 taxa (6% of the flora) documented from this vegetation type and five taxa that were only found in this vegetation type. TREES AND SHRUBS: Artemisia tridentata, Atriplex canescens, Chrysothamnus viscidiflorus, Erica canadensis, Sarcobatus vermiculatus. GRAMINOIDS: Distichlis spicata, Elymus cinereus, Juncus balticus subsp. ater, Poa pratensis subsp. pratensis. FORBS: Chenopodium nevadensis, Cleomella parviflora, Crepis runcinata subsp. hallii, Erigonum nummulare, Micromonolepis pusilla, Nitrophila occidentalis, Pyrocoma racemosa, P. uniflora var. uniflora, Stutzia covillei.

**SAND DUNE HORSEBRUSH SHRUBLAND:** Tetradymia tetrameres.—This vegetation type is only represented in the northeast corner of Adobe Valley, where westerly winds carry and deposit sands to create vegetated and non-moving sand dunes and interspersed through the sandiest basins of the Adobe Hills (Fig. 8). Although this vegetation type is not widespread, it is included here because the dominant species is rare to California. The sand is very deep and the canopy cover is sparse. Total vegetation cover is less than found anywhere else in the study area, except for exposed salt flats of ephemeral lakes during summer months. This vegetation type covers 2.1% of the study area. There were 17 taxa (4% of the flora) documented from this vegetation type and four taxa that were only found in this vegetation type. TREES AND SHRUBS: Chrysothamnus viscidiflorus, Erigonum microtheca var. ambiguum, Linanthus pungens, Tetradymia tetrameres. GRAMINOIDS: Stipa hymenoidea, S. occidentalis sub. californica. FORBS: Astragalus lentiginosus var. semotus, Camissonia pusilla, Chenopodium leptophyllum, Cymopterus globosus, Erigonum maculatum, Eriogonum nummulare, Gayophyllum diffusum subsp. parviflorum, Linanthus inyoensis, Tiuliula nuttallii.

**SPRAY BLUEGRASS ALKALI MEADOW:** Spergularia atropurpurea. This vegetation type is widespread in the Owens Valley in areas that had water tables 1–3 m deep and alkaline soil (CNPS Bristlecone Chapter 2018: Fig. 3). Since groundwater pumping began throughout eastern California, this habitat type has been in decline. The herbs and grasses are similar to the Sarcobatus shrublands but these are meadows and have no shrub canopy. They are located along the toe slope of the Adobe Hills and Benton Range, where water pools in the winter and dries out in the summer. This vegetation type covers 3.5% of the study area and 37 taxa (9%) were documented from this vegetation type, but only six were only found here; many taxa found in alkali meadows were also documented in alkali shrublands. TREES AND SHRUBS: None. GRAMINOIDS: Amphicarpus nevadensis, Distichlis spicata, Juncus mexicanus, Schoenoplectus pungens, Spartina gracilis. FORBS: Cleome callitricha, Crepis runcinata subsp. hallii, Erigonum amplifolium, Hesperochiron californicus, Ivesia kingii var. kingii, Micromonolepis pusilla, Nitrophila occidentalis, Sphaeromera potentilloides var. nitrophila, Stutzia covillei.

**WET ALKALI MARSH:** Iris missouriensis.—Surrounding the springs throughout the valley and hills are areas that are wet almost all of the year and have more wetland-obligate taxa. The riparian vegetation types are dependent on either springs, lakes or creeks and the taxa found there are dictated by whether water is seasonal or permanent. There are two year-round creeks, Adobe Creek and Pizona Creek, that harbor montane riparian scrub-dominated riparian belts along the creek shores. River Spring is the largest spring and emergent freshwater marsh dominated by Schoenoplectus acutus. As water moves from the source of the springs and through the very alkaline soils of the study area it quickly becomes an alkaline marsh, dominated by Iris missouriensis and Carex spp. The water table lowers moving farther from the springs and the dried alkali meadows begin. These also line the shores of the lakes of Adobe Valley.
Table 2. Numerical summary.

| Flora   | Minimum-rank Taxa | % of flora |
|---------|-------------------|-----------|
| Number of families | 61                |           |
| Genera   | 194               |           |
| Minimum-rank taxa | 397               |           |
| Non-native | 21                | 5.3       |
| Native   | 376               | 94.7      |
| Life form |                   |           |
| Annual herbs | 137               | 34.5      |
| Perennial herbs | 143               | 36.0      |
| Shrubs   | 49                | 12.3      |
| Trees    | 8                 | 2         |
| Geophytes | 3                 | 0.7       |
| Parasitic herbs | 4                | 1         |
| Aquatics | 9                 | 2.3       |
| Graminoids | 52                | 13.1      |
| Five Largest Families |       |           |
| Asteraceae | 71                | 17.9      |
| Poaceae  | 37                | 9.3       |
| Brassicaceae | 29               | 7.3       |
| Polemoniaceae | 24               | 6.0       |
| Boraginaceae | 23                | 5.8       |

* Some taxa have been counted more than once if they have variable life forms and so the percentages do not add up to 100.

Table 3. Sensitive taxa.

| Taxon                        | Family         | CNPS Rare Plant Ranking |
|------------------------------|----------------|-------------------------|
| Allium atrovirubens var. cristatum | Alliaceae      | 4.3                     |
| Astragalus johannis-howellii  | Fabaceae       | 1B.2                    |
| Astragalus oophorus var. oophorus | Fabricaceae    | 4.3                     |
| Boechera bodensis            | Brassicaceae   | 1B.3                    |
| Boechera dispars             | Brassicaceae   | 2B.3                    |
| Calochortus excavatus        | Liliaceae      | 1B.1                    |
| Crepis runcinata subsp. andersonii | Asteraceae     | 2B.2                    |
| Crepis runcinata subsp. hallii | Asteraceae     | 2B.2                    |
| Cryptantha scoparia           | Boraginaceae   | 4.3                     |
| Cymopterus globosus          | Apiaceae       | 2B.2                    |
| Eremothera boothii subsp. boothii | Onagraceae    | 2B.3                    |
| Eremothera boothii subsp.    | Onagraceae     | 2B.3                    |
| Intermedia                   |                |                         |
| Eriatrump sparsiflorum       | Polemoniaceae  | 4.3                     |
| Eriyramia nana               | Asteraceae     | 4.3                     |
| Euphorosyne nevadensis       | Asteraceae     | 4.3                     |
| Goodmania latera*            | Polygonaceae   | 4.2                     |
| Ivessia kingii var. kingii   | Rosaceae       | 2B.2                    |
| Micrononolepis pusilla       | Chenopodiaceae | 2B.3                    |
| Pilagiotborys parishii       | Boraginaceae   | 1B.1                    |
| Primula pauciflora           | Primulaceae    | 4.2                     |
| Ranunculus hydrocharoides    | Ranunculaceae  | 2B.1                    |
| Spartina gracilis            | Poaceae        | 4.2                     |
| Sphaeromiera potentilliosa var. nitrophi | Asteraceae | 2B.2                    |
| Teradymia tetrarmeres        | Asteraceae     | 2B.2                    |
| Thelypodium integrifolium subsp. complanatum | Brassicaceae | 2B.2                    |
| Thelypodium milleflorum      | Brassicaceae   | 2B.2                    |

* Signifies taxon was not recollected during this study.

A total of 397 minimum-rank taxa (species, subspecies, varieties, named hybrids) were documented throughout the 1525 herbarium vouchers collected for this study (Fig. 14), representing 61 plant families, 194 genera, and 370 species (sensu Jepson eFlora [Jepson Flora Project 2019]) (Table 2). The most diverse families were Asteraceae (71 taxa), Poaceae (37), Brassicaceae (29), Polemoniaceae (24) and Boraginaceae (23). The largest genera in the study area are Eriogonum (15), Carex (12), Cryptantha (10) and Astragalus (9).

There were only 85 minimum-rank taxa documented from the study area prior to this study, thus 312 minimum-rank taxa were documented for the first time as part of this study. There are 12 taxa known historically from within the study area that were not rediscovered. This study additionally documented 76 minimum-rank taxa that were not known in the broader region when compared to the checklist for the Glass Mountain Region (Honer 2001) and historical collections made in the surrounding area in Benton and at Benton Hot Springs.

Sensitive Taxa

Astragalus johannis-howellii (Fig. 16) is the only plant documented in this study that is listed by the California Endangered Species Act as Rare (CR), which means it has an extremely high risk of extinction in the wild (CDFW 2020).
No taxa included are listed federally. The CNPS Rare Plant Rankings (CNPS 2018b) are used in this study to quantify rarity. The ranks that have been assigned to sensitive taxa within the study area are 1B, 2B and 4. Plants with a rare plant rank of 1B are considered rare throughout their range and often endemic to California. Plants with a rare plant rank of 2B are considered rare in California but are more common elsewhere. Plants of a rank of 4 are of limited distribution in California. The number that follows the rare plant rank is a threat assessment rating on a scale of one to three, with one being taxa facing severe or immediate threats to over 80 percent of their populations and three having a low degree of threats (less than 20% of their populations face immediate threats; CNPS 2018a).

There are 27 taxa included in this study that have conservation status (Table 3), six of which are shown in Fig. 15–20. One species of conservation concern was not rediscovered during the study: Goodmania luteola (Polygonaceae), documented by Dean Taylor near River Spring in 1998 (JEPS96605, Taylor 16730). Nine taxa of conservation concern were newly documented from within the study area: Astragalus oophorus var. oophorus (Fabaceae), Boechera cobrensis (Brassicaceae), B. dispar (Brassicaceae), Eremothera boothii subsp. boothii (Onagraceae), E. boothii subsp. intermedius (Onagraceae), Erigeron sparsiflorum (Polemoniaceae), Micromonesipis pusilla (Chenopodiaceae), Thelypodium integrifolium subsp. complanatum (Brassicaceae) and T. milleflorum (Brassicaceae). Boechera cobrensis, B. dispar and Thelypodium integrifolium subsp. complanatum have previously been documented just east across the border in Nevada. Astragalus oophorus var. oophorus and Erigeron sparsiflorum have also been collected in the nearby foothills of the White Mountains. Micromonesipis pusilla was previously known just outside the study area from Benton Station. Thelypodium milleflorum has been collected within the Adobe Hills, but just north of the study area. Eremothera boothii subsp. boothii is known from the south end of Adobe Valley, but outside the study area. Eremothera boothii subsp. intermedius is known from the southern Mono Basin and Mono Mills.

Rare taxa that were not documented but have potential to occur in the area include Mentzelia albicaulis (Onagraceae), Phacelia gymnocolada and P. inyoensis (Hydrophyllaceae). Mentzelia monensis was recently described as a cryptic species in Mentzelia sect. Trachyphymon from the Mono Basin, only 20 km west of the study area. Mentzelia albicaulis and M. montana are both morphologically similar to M. monensis and are both commonly seen throughout the study area. Mentzelia monensis is thought to be edaphically restricted to silica-rich rhyolite tephra of the Mono Craters, and this substrate does not occur within the study site (Brokaw et al. 2015). Phacelia gymnocolada was collected in 2011 by Jim André (UCR236144, André 18468) only three kilometers south of the southeastern corner of the study area, near Truman Canyon. Phacelia gymnocolada has been collected in adjacent regions of Nevada and is likely to occur within the study area. Phacelia inyoensis has also been collected southwest of the study area in the Benton Crossing area and is affiliated with alkaline meadows.

Only two species in the study area are endemic to California: Plagiobothrys parishii (Fig. 17) and Calochortus excavatus (Fig. 18). Two other species restricted to California and Nevada, but with limited distributions, are Astragalus johannis-howelli and Boechera bodiensis. Astragalus johannis-howelli is restricted to Mono County within California; one population was found in the Adobe Hills, north of Adobe Lake; however, most known locations are from the vicinity of Long Valley, southwest of the study area (CNPS 2018a). In Nevada, A. johannis-howelli is known from Mineral County. Boechera bodiensis is known from Mono and Inyo counties in California and also occurs in Mineral County, Nevada. There are 22 known extant occurrences of B. bodiensis according to NatureServe (2018).

Calochortus excavatus and Plagiobothrys parishii both have ranges that extend from Lone Pine to the Bodie Hills through the Owens Valley, with the study area being close to the northern extent of their distributions. Although this is a relatively large geographic range, most of their habitat is owned and managed by LADWP, which owns much of the alkali marsh habitat of the Owens Valley.

Calochortus excavatus (Fig. 18) is a halophytic perennial geophyte that is associated with alkaline soils that are perennially moist. This species is generally restricted to alkali meadows and marshes of Inyo and Mono counties, and is usually found within the shadscale scrub plant community dominated by Atriplex confertifolia (Sawyer et al. 2009), although within the study area it was documented to be co-occurring with Eriocereus nauseosus. Shadscale scrub is widespread throughout the Owens Valley, but the alkali meadows with perennial water found within the shadscale scrub are decreasing rapidly due to both drought and groundwater pumping. Alkali meadows were once common throughout the Owens Valley and are now considered “very threatened” as a community type (CNPS Bristlecone Chapter 2018). CNPS has ranked C. excavatus as a 1B.1, which means it is rare and severely threatened in California (CNPS 2018a). Globally C. excavatus is ranked as G2 (imperiled) and has a state rank of S2 (imperiled; NatureServe 2018). It is identified as a Species of Conservation Concern for both the National Forest and the BLM. Other than monitoring related to Habitat Conservation Plans and Environmental Impact Statements, which have not been continuous, there has been little systematic demographic data collection and no conservation plans implemented for C. excavatus.

Plagiobothrys parishii (Fig. 17) is also ranked 1B.1 by CNPS (2018a) and globally ranked G1 (critically imperiled) and state ranked S1 (critically imperiled), with only 14 extant occurrences (NatureServe 2018). The major threat facing P. parishii is water pumping, and half of the occurrences are on LADWP property throughout the Owens Valley and half of these occurrences have not been documented in over 20 years, according to the California Natural Diversity Database (2017). Plagiobothrys parishii has a disjunct population that has been documented multiple times in the Lucerne Valley of the Mojave desert as well.

Non-Native Taxa

A total of 21 non-native taxa were found throughout this fieldwork, 13 of which had not been documented from the study area. The majority of the non-native taxa are found in riparian areas (Table 4). These areas are the most utilized of the valley and hills and have the easiest road access. The only areas within the sagebrush scrub and pinyon-juniper uplands that have non-native taxa are along roads. The exception to this is Bromus tectorum, which is found throughout the study area, although it is never a dominant groundcover anywhere.
Table 4. Non-native taxa in the study area.

| Taxon                             | Family   | Habitat                                      |
|-----------------------------------|----------|----------------------------------------------|
| Agrostis gigantea                 | Poaceae  | Disturbed riparian areas                     |
| Agrostis stolonifera              | Poaceae  | Disturbed riparian areas                     |
| Atriplex micrantha                | Chenopodiaceae | Disturbed riparian areas                   |
| Bassia hyssopifolia               | Chenopodiaceae | Freshwater marshes               |
| Bromus tectorum                   | Poaceae  | Mixed shrub woodland, Big Basin sagebrush scrub |
| Cirsium arvense                   | Asteraceae| Alkali marshes                               |
| Cirsium vulgare                   | Asteraceae| Alkali marshes                               |
| Descaria amaroides                | Brassicaceae  | Alkali marshes                               |
| Holcus lanatus                    | Poaceae  | Freshwater marshes                           |
| Hornania procumbens               | Brassicaceae  | Alkali marshes                               |
| Lactuca serriola                  | Asteraceae| Alkali marshes                               |
| Lepidium appelianum               | Brassicaceae  | Alkali marshes                               |
| Melilotus albus                   | Fabaceae  | Sagebrush scrub, along roadsides             |
| Poa pratensis subsp. pratensis    | Poaceae  | Montane riparian scrub, wet alkali marsh, greasewood alkali basin |
| Polygagon monspeliensis           | Poaceae  | Alkali marshes                               |
| Rumes crispus                     | Polygonaceae | Disturbed riparian areas                   |
| Salisola tragus                   | Chenopodiaceae | Sagebrush scrub, along roadsides             |
| Taraxacum officinale             | Asteraceae| Disturbed riparian areas, dry sagebrush steppe |
| Tragopogon dubius                 | Asteraceae| Rabbitbrush intermontane scrub              |
| Veronica catenata                 | Plantaginaceae | Disturbed riparian areas                  |
| Vicia villosa subsp. varia        | Fabaceae  | Disturbed riparian areas                     |

**Noteworthy Discoveries**

An undescribed subspecies of Aphyllon californicum (Fig. 19) was collected along River Spring Road, one half kilometer northeast of the main spring at the center of River Spring Lakes. Previous collections from this population were determined as Orobanche ludoviciana and O. californica var. parishii. These collections key to Aphyllon californicum subsp. feudgei (Schneider and Colwell 2017) in the Jepson Flora Project (2019), which notes that plants of this taxon growing on Chrysothamnus are an undescribed subspecies. Host associations have been shown to be a driver for cryptic species diversification (Schneider et al. 2016), so it is important to note this population is parasitizing Ericameria nauseosa var. oreophila.

Nemacladus rigidus is another taxon that warrants further investigation into its range and abundance in California. It was found once during this study, on an east-facing slope of the Benton Range. Although there are many collections from Nevada, there are only a few collections from California. It is a small, easily overlooked annual plant that could potentially be more abundant than is reflected in its current known distribution. However, if it is not more abundant, then it should be considered for conservation status in California and should be evaluated by CNPS.

A collection by Mary DeDecker of Eriogonum heermannii var. humilis (DeDecker 6158, RSA626561) was the only taxon omitted from this inventory. It was verified to be correctly identified, but seems highly unlikely that this plant would occur in the study area, so it is assumed to be a location error on the label.

**Annotated Checklist**

The following annotated checklist (Appendix 2) represents taxa documented within the study area and is based on fieldwork I conducted in 2016–2018, including a review of historical herbarium specimens. All vouchers collected during this study have been deposited at California Botanic Garden RSA-POM. If a historical specimen is cited and that taxon was not relocated during the study, the herbarium where the specimen is housed is indicated if not RSA-POM. The classification follows the order of recognition classification of Angiosperm Phylogeny Group IV (Stevens 2001 onwards), familial classification of Jepson eFlora (Jepson Flora Project 2019), other than Boraginaceae, for which an updated treatment was utilized (Luebert et al. 2016) and Cryptantha which follows Hasenstab-Lehman (2012). Non-native taxa are designated by an asterisk (*), CNPS-listed rare taxa are shown with a dagger (†) and taxa previously found but not relocated during this study are indicated with a diamond (♦).

Scientific name, common name and life form are provided for each taxon. Abundance is noted by the following terms: rare, uncommon, occasional, locally common, common and dominant. Taxa were categorized as rare if they were only found once. Uncommon taxa refer to plants with more than one population throughout the study area, but with a limited distribution. Occasional refers to taxa that have a wider distribution than the uncommon taxa, but are still infrequently seen. Locally common refers to taxa that are common in certain vegetation types. Common refers to plants that are both abundant and widespread. Dominant refers to plants that form the dominant cover of vegetation types that are fairly widespread within the study area.

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APPENDIX 2
ANNOTATED CHECKLIST OF THE VASCULAR FLORA
FERNS AND FERN ALLIES
EQUISETACEAE
Equisetum laevigatum A. Braun. Smooth scouring rush. Fern. Occasional in wet alkali marsh, freshwater marsh, riparian scrub. Winitsky & Slaughter 1027.

Gymnosperms

Cupressaceae

Juniperus osteosperma (Torr.) Little. Utah juniper. Tree. Common throughout higher elevations. Dominant in pinyon-juniper uplands and pinyon-mixed shrub woodland. Winitsky & Cohen 1177.

Ephedraceae

Ephedra nevadensis S. Watson. Nevada ephedra. Dioecious shrub. Occasional throughout entire area and locally common on the east slope of the Benton Range. Intermontane scrub, mixed shrub woodland. Winitsky 285.

Pinaceae

Pinus monophylla Torr. & Frém. Pinyon pine. Tree. Dominant taxon throughout all higher-elevation hills. Mixed shrub woodland, pinyon-juniper woodland. Winitsky & Fraga 748.

Asteraceae

Anemopsis californica (Nutt.) Hook. & Arn. Yerba mansa. Perennial. Rare, found only once downstream from the main spring at River Spring. Wet alkali marsh. Winitsky, Berbee & Washburn 1440.

Euphorbiaceae

Amaranthaceae

Nitrophila occidentalis (Moq.) S. Watson. Western nitrophila. Perennial herb. Locally common in alkaline soils. Greasewood alkali basin, alkali meadow. Winitsky & Fraga 462.

Asteraceae

Angelica capitellata (A. Gray) Spalik, Reduron & S. R. Downie. Ranger’s buttons. Perennial herb. Uncommon in marshes. Montane riparian scrub. South of Black Lake, Pizona. Winitsky, Cohen, Mark, Martinez & Fram 1189.

Cicuta douglasii (DC.) J.M. Coul. & Rose. Western water hemlock. Perennial herb. Rare, one large population found in water at Adobe Creek. Montane riparian scrub. Winitsky & Winitsky 1409.

Cymopterus globosus (S. Watson) S. Watson. Globose cymopterus. 2B.2. Perennial herb. Rare, scattered throughout the largest sand dunes in the northeast section of Adobe Valley. Winitsky, Fraga & Hickman 755.

Cymopterus tererbethinus (Hook.) Torr. & A. Gray var. petraeus (M.E. Jones) Goodrich. Rock cymopterus. Perennial herb. Occasional throughout the granite outcrops in the Benton Range. Mixed shrub woodland. Winitsky & Fraga 528.

Lomatium nevadense (S. Watson) J.M. Coul. & Rose var. parishii (J.M. Coul. & Rose) Jeps. Parish’s lomatium. Perennial herb. Uncommon in sand throughout the Benton Range, flowering in April. Mixed shrub woodland. Winitsky, Fraga & Hickman 838.

Asteraceae

Achillea millefolium L. Yarrow. Perennial herb. Rare, only found along the shore of Adobe Creek. Montane riparian scrub. Winitsky & Winitsky 1470.

Agoseris glauca (Parsh) Raf. var. glauca. Pale agoseris. Perennial herb. Rare, only found once in alkali meadow near upper Pizona. Winitsky, Slaughter & Hickman 789.

Ambrosia acanthicarpa Hook. Annual burweed. Annual herb. Uncommon in alkali flats and along theshore of alkali lakes. Big Basin sagebrush scrub, Alkali meadow. Winitsky & Bourgois 1366.

Anisocoma acaulis Torr. & A. Gray. Scale bud. Annual herb. Common throughout higher elevation hills. Pinyon-juniper woodland, mormon tea intermontane scrub, mountain sagebrush steppe. Winitsky & Slaughter 982.

Arnica chamissonis Less. Chamisso arnica. Perennial herb. Rare, only found along the shore of Adobe Creek. Montane riparian scrub. Winitsky & Winitsky 1473.

Arnica sororia Greene. Twin arnica. Perennial herb. Rare, only found along the shore of Adobe Creek. Montane riparian scrub. Winitsky & Slaughter 1012.

Artemisia nova A. Nelson. Black sagebrush. Small shrub. Rare, only found at the summit of Trafton Peak with Artemisia tridentata and Pinus monophylla. Pinyon-juniper woodland. Winitsky & Slaughter 1520.

Artemisia tridentata Nutt. subsp. parishii (A. Gray) H.M. Hall & Clem. Parish’s sagebrush. Shrub. Uncommon in the higher sagebrush steppe in the eastern Benton Range. Winitsky & Bourgois 1365.

Artemisia tridentata Nutt. subsp. tridentata. Big sagebrush. Shrub. Dominant throughout entire region. Abundant everywhere other than shore of dry lakes and riparian zones. Big Basin sagebrush scrub, mountain sagebrush steppe, pinyon-juniper woodland, mixed shrub woodland. Winitsky 12.

Artemisia tridentata Nutt. subsp. vaezenana (Rhyd.) Beetle. Mountain sagebrush. Shrub. Dominant in the diverse shrubblands and steeper terrain of granitic outcrops, growing in sand or out of rock. Mountain sagebrush steppe, pinyon-juniper woodland, mormon tea intermontane scrub, mixed shrub woodland. Adobe Hills, Benton Range. Winitsky & Slaughter 1517.

Artemisia tridentata Nutt. subsp. wyomingensis Beetle & A.L. Young. Wyoming sagebrush. Shrub. Rare, only found once in the pinyon-juniper of the Adobe Hills, near the Nevada border. Expected elsewhere. Winitsky, Fraga, Bubh & Yhi 1322.

Bidens cernua L. Nodding beggar-tick. Perennial herb. Rare, found once, in a large population, around spring north of Black Lake. Wet alkali marsh. Winitsky & Winitsky 1460.

Calycoseris parryi A. Gray. Yellow tuckstern. Annual herb. Rare, only found in rocky outcrops of Upper Pizona. Pinyon-juniper woodland. Winitsky, Fraga & Hickman 814.

Chaenactis douglasii (Hook.) Hook. & A. Gray var. douglasii. Dusty maiden. Annual herb. Perennial herb. Occasional in dry streambeds and other sandy areas, alkaline and non-alkaline soils. Winitsky, Fraga & Hickman 846.

Chaenactis xantiana A. Gray. Xantus’ chaenactis. Annual herb. Rare, only found once in the Adobe Hills east of River Spring. Pinyon-juniper woodland. Winitsky & Slaughter 1469.

Chrysotoxum viscidiflorus (Hook.) Nutt. subsp. purerulus (D.C. Eaton) H.M. Hall & Clem. Sticky-leafed rabbitbrush. Shrub. Rare, only seen once in the Adobe Hills east of River Spring. Pinyon-juniper woodland. Winitsky, Berbee & Washburn 1444.

Chrysotoxum viscidiflorus (Hook.) Nutt. subsp. viscidiflorus. Green rabbitbrush. Shrub. Dominant species in sand and alkaline areas throughout the valley, occasional throughout uplands. Big Basin sagebrush scrub, pinyon-juniper woodland, mormon tea intermontane scrub, mountain sagebrush steppe, sand dune horsebrush shrubland. Winitsky, Fraga, Bubh & Yhi 1289.

Cirsium arvense (L.) Scop. Canada thistle. Non-native. Perennial herb. Rare, only found near Pizona homestead. Wet alkali marsh. Winitsky & Winitsky 1451.

Cirsium scariosum Nutt. var. congdonii (R.J. Moore & Frankton) D.J. Keil. Elk thistle. Perennial herb. Common, found throughout wetter areas, often with grasses and sedges. Wet alkali marsh. Winitsky, Fraga & Hickman 805.
*Erigeron breweri* A. Gray var. porphyreticus (M.E. Jones) Cronquist.

*Erigeron divergens* Torr. & A. Gray. Diffuse daisy. Annual herb. Rare, only found growing in wet alkali marshes and dry springs. Winitsky & Winitsky 1455.

*Erigeron canadensis* L. Canada horseweed. Annual herb. Rare, only found growing in wet alkali marshes and dry springs. Winitsky & Winitsky 1455.

*Eriophyllum wallacei* (A. Gray) A. Gray. Annual herb. Rare, only found in the uplands. Mountain sagebrush steppe of the eastern Benton Range. Winitsky & Fraga 333.

*Crepis runcinata* (E. James) Torr. & A. Gray subsp. andersonii Babc. & Stebbins. Anderson’s meadow hawkweed. 2B.2. Perennial herb. Rare in wet alkali marshes and dry springs. Winitsky & Winitsky 1455.

*Dieteria canescens* (Pursh) Nutl. var. canescens. Hoary aster. Perennial herb. Uncommon in sandy soil of uplands. Mixed shrub woodland. Winitsky, Fraga, Babb & Yhi 1533.

*Eatonella nova* (D.C. Eaton) A. Gray. White eatonella. Annual herb. Rare, only one population found growing on a west-facing slope, in sandy, granitic soil. Mixed shrub woodland. Southern Benton Range. Winitsky & Fraga 479.

*Ericameria cuneata* (A. Gray) McClatchie var. cuneata. Rock golden-rose. Uncommon in the uplands. Mixed shrub woodland. Winitsky & Natalia 1340.

*Ericameria nauseosa* (Pall. ex Pursh) G.L. Nesom & G.I. Baird var. moehavensis (Greene) G.L. Nesom & G.I. Baird. Mojave rabbitbrush. Shrub. Uncommon, just found at River Spring upslope from freshwater marsh. Winitsky & Natalia 1340.

*Ericameria nauseosa* (Pall. ex Pursh) G.L. Nesom & G.I. Baird var. oreophila (A. Nelson) G.L. Nesom & G.I. Baird. Rubber rabbitbrush. Shrub. Common throughout the drier and more disturbed areas of the valley floor. Winitsky & Natalia 1347.

*Ericameria teretifolia* (Durand & Hilg.) Jeps. Round-leaf rabbitbrush. Shrub. Uncommon, found in lowest elevations of pinyon, east-facing slopes of the Benton Range. Mixed shrub woodland. Eastern Benton Range. Winitsky & Slaughter 1519.

*Eregeron aphanactis* (A. Gray) Greene var. aphanactis. Rayless shaggy fleabane. Perennial herb. Common throughout all non-alkaline uplands, usually found in or around rocks. Pinyon-juniper woodland, mixed shrub woodland. Winitsky & Fraga 332.

*Eregeron breweri* A. Gray var. porphyreticus (M.E. Jones) Cronquist. Fleabane. Perennial herb. Common in sandy soils of the sagebrush scrub or growing out of rocks or in the uplands. Pinyon-juniper woodland, mixed shrub woodland. Winitsky & Fraga 336.

*Eregeron canadensis* L. Canada horseweed. Annual herb. Rare, only found in riparian area along Adobe Creek. Winitsky & Winitsky 1474.

*Eregeron divergens* Torr. & A. Gray. Diffuse daisy. Annual herb. Rare, found in a freshwater marsh near River Spring. Winitsky & Natalia 1542.

*Eregeron lonchophyllum* Hook. Shortray fleabane. Perennial herb. Common in wet areas. Alkali meadow, wet alkali marsh, freshwater marsh. Winitsky & Robinson 1241.

*Eriophyllum pringlei* A. Gray. Pringle eriophyllum. Annual herb. Common in all sandy areas in 2017, very rare in 2018 after a drier season. Mixed shrub woodland, pinyon-juniper woodland, Big Basin sagebrush scrub, mountain sagebrush steppe. Winitsky 599.

*Eriophyllum wallacei* A. Gray. Annual herb. Rare, only found growing in sand in the granitic outcrops of the southern Benton Range. Winitsky & Fraga 549.

*Euphorhynx nevadensis* (M.E. Jones) Panero. Nevada wormwood. 4.3. Annual herb. Uncommon, mostly found in disturbed areas, along dirt roads, near corrals. Big Basin sagebrush scrub. Winitsky & Robinson 1252.

*Gnaphalium palestrum* Nutt. Western marsh cudweed. Annual herb. Rare, only found once along disturbed trail through riparian area north of Adobe Creek. Montane riparian scrub. Winitsky & Slaughter 1509.

*Ignatia alpina* (Nutt.) Greene. Perennial herb. Occasional throughout the granitic outcrops, sometimes growing out of rocks, sometimes in sand. Mixed shrub woodland, pinyon-juniper woodland. Winitsky & Winitsky 221.

*Iva axillaris* Pursh. Perennial herb. Uncommon in rocky outcrops. Pinyon-juniper woodland. Winitsky, Fraga & Hickman 812.

*Lactuca serriola* L. Annual herb. Naturalized. Non-native. Uncommon in disturbed non-alkaline areas, near water. Wet alkali marsh. Winitsky, Fraga, Babb & Yhi 1302.

*Lavina glandulosa* (Hook.) Hook. & Arn. Annual herb. Common in sagebrush scrub, occasional in uplands. Only collected in 2017 after sufficient winter rains, usually growing in very sandy soil. Winitsky & Slaughter 277.

*Lessingia glandulifera* A. Gray var. glandulifera. Sticky lessingia. Annual herb. Uncommon throughout sagebrush scrub, found in disturbed areas, near dirt roads. Winitsky 30.

*Malacothrix glabrata* (A. Gray ex D.C. Eaton) A. Gray. Desert dandelion. Annual herb. Common in sagebrush scrub, occasional in pinyon uplands, only collected in 2017 after sufficient winter rains, usually growing in very sandy soil. Winitsky & Slaughter 1004.

*Malacothrix sonchoides* (Nutt.) Torr. & A. Gray. Sow thistle malacothrix. Annual herb. Rare, found only once growing in sand in the uplands at the summit of a hill, near the Nevada border, in the Adobe Hills, northeast section of the study area. Winitsky & Cohen 1175.

*Packera multiflora* (Torr. & A. Gray) W.A. Weber & Á. Love. Lobefoliate groundsel. Perennial herb. Uncommon. Growing in dry sand in sagebrush scrub or in volcanic scoria in pinyon-juniper woodland. Winitsky, Cohen, Martinez, Marr & Frank 1190.

*Pleiacanthus spinosus* (Nutt.) Rydb. Thorn skeletonweed. Perennial herb. Uncommon in pinyon-juniper woodland and mixed shrub woodland. Anacapa spring, Trafton Peak. Winitsky & Natalia 1345.

*Psathyrotes annua* (Nutt.) A. Gray. Annual psathyrotes. Annual herb. Rare, only one population found on a south-facing, rocky slope in the Adobe Hills. Pinyon-juniper woodland. Winitsky, Fraga, Babb & Yhi 1332.

*Pyreothrum lancerolata* (Hook.) Greene var. lancerolata. Intermountain pyreothrum. Perennial herb. Collected by Roxana S. Ferris in a grazed alkali meadow. Ferris 13113 deposited at CAS.

*Pyreocoma racemosa* (Nutt.) Torr. & A. Gray var. paniculata (Nutt.) Kartesz & Gandhi. Panicked pyreocoma. Perennial herb. Locally common in alkaline soils. Winitsky & Robinson 1222.

*Pyreocoma racemosa* (Nutt.) Torr. & A. Gray var. sessiliflora (Greene) Mayes ex G.K. Br. & D.J. Keil. Racemose pyreocoma. Perennial herb. Common throughout alkaline soils. Black Lake, River Spring. Winitsky & Cohen 1131.

*Pyreocoma uniflora* (Hook.) Greene var. uniflora. Single-headed pyreocoma. Perennial herb. Locally common in a freshwater marsh and dry creek beds. Winitsky, Cohen, Marr, Martinez, & Frank 1191.

*Sedum hydropilum* Nutt. Alkali marsh sagwort. Perennial herb. Locally common in riparian areas, sometimes half-submerged in water. River Spring, Adobe Creek, Pizona. Winitsky 36.

*Sedum scorzonella* Greene. Sierra sagwort. Perennial herb. Collected at the western shore of Black Lake. Mark Kerr x.x., deposited at SBBG: 62583.

*Solidago spectabilis* (D.C. Eaton) A. Gray. Showy goldenrod. Perennial herb. Uncommon in wet areas. Montane riparian scrub, wet alkali marsh. Winitsky & Robinson 1265.

*Sphaerotheca potensileodora* (A. Gray) A. Heller var. nitrophila (Cronquist) A.H. Holmgren, L.M. Schultz & Lowrey. Alkali tansy-sage. 2B.2. Locally common in alkaline meadows. Winitsky & Slaughter 1099.
STENOTUS ACACILIS Nutt. Stemless mock goldenweed. Perennial herb. Common in rocky granitic slopes of the Benton Range. Mixed shrub woodland.
Winitsky & Winitsky 148.

STEPHANOEMERIA EXUGIA Nutt. subsp. CORONARIA (Greene) Gottlieb. Milk aster. Annual herb. Uncommon in sand of sagebrush scrub. Mountain sagebrush steppe. Big Basin sagebrush scrub. Winitsky 14.

STEPHANOEMERIA EXUGIA Nutt. subsp. EXUGIA. White plume wirelettuce. Annual herb. Occasional throughout area growing in sand. Mountain sagebrush steppe. Big Basin sagebrush scrub, pinyon-juniper woodland.
Winitsky, Fraga, Babb & Yhi 1294.

SYMPHYOTRICUM LANCEOLATUM (Wild.) G.L. Nesom var. HESPERIUM (A. Gray) G.L. Nesom. Western lance leaf aster. Rare, only found in an alkalai meadow, growing with alkaline associate species. Black Lake. Winitsky & Robinson 1264.

SYMPHYOTRICUM SPATHULATUM (Lindl.) G.L. Nesom var. INTERMEDIATE (A. Gray) G.L. Nesom. Larger western mountain aster. Perennial herb. Rare, only found in the montane riparian scrub along the shore of Adobe Creek. Winitsky & Winitsky 1475.

SYMPHYOTRICUM SPATHULATUM (Lindl.) G.L. Nesom var. SPATHULATUM. Western mountain aster. Perennial herb. Uncommon, found in grassy meadows near springs. Winitsky, Fraga, Babb & Yhi 1304.

TETRADYMIA AUREOLA R. Nelson var. LONGISPINA (M.E. Jones) Strother. LITTLE LEAF HORSEBRUSH. Perennial herb. Rare, only found once along the road between Pizona and Upper Pizona. Winitsky & Fhra 775.

TETRADYMIA AUREOLA R. Nelson var. XILLEA (T.J. & A. Gray). Little leaf horsebrush. Shrub. Occasional throughout both uplands and the valley floor, found in sandy soil and rocky outcrops. Winitsky & Fraga 879.

TETRADYMIA CANESCENS DC. Gray horsebrush. Shrub. Uncommon throughout uplands. Mountain sagebrush steppe. Upper Pizona. Winitsky, Fraga, Babb & Yhi 1315.

TETRADYMIA GLABRATA Tiot & A. Gray. Little leaf horsebrush. Shrub. Occasional throughout both uplands and the valley floor, found in sandy soil and rocky outcrops. Winitsky & Fraga 879.

TETRADYMIA TETRAMERES (S.F. Blake) Strother. Four-parted horsebrush. 2B.2. Shrub. Rare, only found on the sand dunes to the northeast of River Spring. Frequent throughout sand dunes. Winitsky & Robinson 1216.

TRAGOPOGON DUBUS Scop. Goat’s beard. Non-native. Perennial herb. Rare, only found once along the road between Pizona and Upper Pizona. Rubber rabbitbrush intermontane scrub. Winitsky & Medina 1493.

BORAGEACEAE

AMINSKIA INTERMEDIA Fisch. & C.A. Mey. Common fiddleneck. Annual herb. Uncommon in sandy soils of mixed shrub woodland. Eastern Benton Range. Winitsky & Fraga 251.

AMINSKIA TESELLALATA A. Gray var. TESELLALATA. DEVIL’S lettuce. Annual herb. Occasional in mormon tea intermontane scrub, pinyon-juniper woodland, alkali meadow, mixed shrub woodland. Winitsky & Fraga 497.

CRYPTANTHA AMBIGUA (A. Gray) Greene. Wilkes’ cryptantha. Annual herb. Uncommon throughout dry streambeds or in sand of the Adobe Hills. Mountain sagebrush steppe, pinyon-juniper woodland. Winitsky, Fraga & Hickman 779.

*CRYPTANTHA BABBIGERA (A. Gray) Greene. Bearded cryptantha. Annual herb. Collected in Adobe Valley, north of River Spring. Winitsky & Robinson 16736 deposited at UC.

CRYPTANTHA GRAECILIS Oester. Annual herb. Slender cryptantha. Uncommon in rocky outcrops. Big Basin sagebrush scrub, mountain sagebrush steppe. Winitsky, Fraga & Hickman 813.

CRYPTANTHA MURICATA (Hook. & Arn.) A. Nelson & J.F. Macbr. Prickly cryptantha. Annual herb. Rare, only found on the summit of Antelope Mountain. Pinyon-juniper woodland. Winitsky & Fraga 735.

CRYPTANTHA OXYGENA (A. Gray) Greene. Sharp nut cryptantha. Annual herb. Occasional in Big Basin sagebrush scrub, mixed shrub woodland, montane riparian scrub. Winitsky & Slaughter 946.

CRYPTANTHA PTEROCARYA Jeps. var. PTEROCARYA. Wingnut cryptantha. Annual herb. Occasional, growing out of rocks in uplands. Pinyon-juniper woodland, mornon tea intermontane scrub, mountain sagebrush steppe. Winitsky & Fraga 900.

CRYPTANTHA PTEROCARYA Jeps. var. PURPUSII Jeps. Purpus’ cryptantha. Annual herb. Uncommon, growing in rocky outcrops in pinyon-juniper woodland, mornon tea intermontane scrub, mountain sagebrush steppe. Winitsky & Fraga 1731.

CRYPTANTHA SCOPARIA A. Nelson. Gray cryptantha. Annual herb. Rare, found once growing in sand of pinyon outcrop at Cow Camp in Adobe Valley. Pinyon-juniper woodland. Winitsky & Fraga 662.

CRYPTANTHA TORREYANA (A. Gray) Greene. Torrey’s cryptantha. Annual herb. Rare, found only once along the ridgeline to Antelope Mountain, south of the summit, in sandy soil. Pinyon-juniper woodland. Winitsky & Fraga 750.

CRYPTANTHA WATSONI (Benth.) S. Watson. Watson’s cryptantha. Annual herb. Occasional throughout the entire area; uplands, rocky outcrops, and mature sagebrush stands. Winitsky, Fraga and Hickman 825.

EREMOCARYA MIRANTRA (Torr.) I.M. Johnst. var. MIRANTRA. Red-root cryptantha. Annual herb. Uncommon throughout sandy soils. mixed shrub woodland. Winitsky & Fraga 1579.

GREENEOCHARIS CIRCUMCISSA (Hook. & Arn.) Rydb. var. CIRCUMCISSA. Cushion cryptantha. Annual herb. Common throughout entire area in sandy soil of alkali meadows, greasewood alkali basin, Big Basin sagebrush scrub, mixed shrub woodlands, pinyon juniper woodlands, mornon tea intermontane scrub. Winitsky & Fraga 594.

LAPPULA REDOWSKI (Hornem.) Greene var. CUPULATA (A. Gray) M.E. Jones. Crowned stickseed. Annual herb. Rare, found only once near the Upper Pizona spring in an alkaline meadow. Winitsky, Fraga & Hickman 788.

LAPPULA REDOWSKI (Hornem.) Greene var. REDOWSKI. Western stickseed. Annual herb. Rare, found only once between Pizona and Upper Pizona in a dry alkali meadow. Winitsky, Cohen, Martinez, Marek & Fram 1208.

OREOCARYA CONFLERTIFLORA Greene. Yellow cryptantha. Perennial herb. Common throughout pinyon-juniper woodland, mixed shrub woodland. Winitsky & Slaughter 987.

OREOCARYA FLAVOCULATA A. Nelson. Rough-seed cryptantha. Perennial herb. Common throughout pinyon-juniper woodland, mixed shrub woodland. Winitsky, Slaton & Bourgeois 87.

PECTOCARYA SETOVA A. Gray. Moth combseed. Annual herb. Uncommon throughout the Benton Range, found in sand. Mixed shrub woodland. Winitsky & Fraga 394.

PLAGIOBOTHrys JONESII A. Gray. Mojave popcorn flower. Annual herb. Uncommon in rocky outcrops in the Adobe Hills and Pizona. Pinyon-juniper woodlands. Winitsky & Fraga 404.

PLAGIOBOTHrys KINGSII (S. Watson) A. Gray var. HARKNESSII (Greene) Jeps. HARKNESS’ Great Basin popcorn flower. Annual herb. Uncommon in sandy soils throughout the sagebrush scrub of the valley floor and the Benton Range. Winitsky & Fraga 477.

PLAGIOBOTHrys KINGSII (S. Watson) A. Gray var. KINGSII. Great Basin popcorn flower. Annual herb. Uncommon in sandy soils of the pinyon juniper woodlands in the Adobe Hills. Winitsky & Fraga 878.

PLAGIOBOTHrys PARISHI I.M. Johnst. Parish’s popcorn flower. 1B.1. Annual herb. Locally common in alkali marshes, very dense patches. Antelope Lake, Black Lake, Upper Pizona. Winitsky & Slaughter 937.

BRASSICACEAE

BOCCEHERA BODENRISS (Rollins) Al-Shelhaz. Bodie Hills rock cress. 1B.3. Perennial herb. Rare, found in rocky outcrop above a dry area of Pizona creek. Pinyon-juniper woodland. Winitsky & Fraga 442.

BOCCEHERA CORENRISS (M.E. Jones) Dorn. Masonic rock cress. 2B.3. Perennial herb. Uncommon in Benton Range throughout pinyon-juniper woodland and rare throughout alkali meadow of the west shore of Black Lake. Winitsky 593.

BOCCEHERA DISPAR (M.E. Jones) Al-Shelhaz. Pinyon rock cress. 2B.3. Perennial herb. Rare, only found once in the eastern Benton Range in sand on an east-facing slope. Pinyon-juniper woodland. Winitsky & Fraga 546.
Boechera inyoensis (Rollins) Al-Shehbaz. Inyo rock cress. Perennial herb. Uncommon in the Adobe Hills, usually growing out of rocks. Pinyon-juniper woodland. Winitsky, Fraga & Hickman 806.

Boechera peregrina (Nutt.) Dorn. Silver rock cress. Perennial herb. Only found once in a small population near the summit of Antelope Peak in pinyon-juniper uplands. Winitsky & Fraga 704.

Boechera pulchra (M.E. Jones ex S. Watson) W.A. Weber. Beautiful rock cress. Perennial herb. Uncommon in sandy soils and in dry streams throughout the uplands. Pinyon-juniper woodland, mixed shrub woodland. Southern Benton Range, eastern Benton Range, Pizona, Adobe Hills. Winitsky & Fraga 299.

Boechera retrofracta (Graham) Á. Löve & D. Löve. Reflexed rock cress. Perennial herb. Rare, collected once in rocks near the Pizona homestead but this is an unsure determination, as no basal leaves were collected. Pinyon-juniper woodland. Winitsky & Fraga 409.

Caulanthus glaucus S. Watson. Glaucous caulanthus. Perennial herb. Rare, collected once in rocks near the Pizona homestead but this is an unsure determination, as no basal leaves were collected. Pinyon-juniper woodland. Winitsky & Fraga 409.

Descurainia californica (A. Gray) O.E. Schulz. Sierra tansy mustard. Perennial herb. Uncommon in heavily grazed marshes north of Black Lake. Wet alkali marsh. Winitsky & Slaughter 254.

Descurainia incisa (Engelm.) Britton subsp. incisa. Mountain tansy mustard. Biennial herb. Rare, only collected once in the eastern Bentons. Mormon tea intermontane scrub. Winitsky & Winitsky 210.

Descurainia longipesecellata (E. Fourn.) O.E. Schulz. Annual herb. Uncommon in sandy soils of the uplands in the eastern Benton Range. Mixed shrub woodland. Winitsky & Fraga 349.

Descurainia nelsonii (Ryd.) Al-Shehbaz & Goodson. Annual herb. Occasional throughout the granitic outcrops in the southern Benton Range. Mixed shrub woodland. Winitsky & Fraga 545.

Descurainia paradisa (A. Nelson & P.B. Kenn.) O.E. Schulz. Great Basin tansy mustard. Annual herb. Rare, found only in the dense riparian zone along Adobe Creek. Winitsky & Slaughter 1021.

Descurainia penata (Walter) Britton subsp. brachycarpa (Richardson) Detling. Western tansy mustard. Annual herb. Rare in the granitic outcrops of the southern Benton Range. Winitsky & Fraga 491.

*Descurainia sophia (L.) Webb ex Prantl. Herb sophia. Annual herb. Uncommon throughout the alkali basins in the Adobe Hills and Pizona. Winitsky & Winitsky 95.

Erysimum capitatum (Hook.) Greene subsp. capitatum. Sand dune wallflower. Perennial herb. Rare, only found near the summit of Adobe Peak in pinyon-juniper woodland. Winitsky & Cohen 1145.

Erysimum perenne (Coville) Abrams. Sand dune wallflower. Perennial herb. Rare, only found along and in road between Trafton Mountain and Antelope Mountain. Pinyon-juniper woodland. Winitsky & Fraga 1932.

*Hornungia procumbens (L.) Hayek. Prostrate hutchinsia. Non-native. Annual herb. Uncommon, found in wet areas throughout Pizona creek. Winitsky, Washburn & Berbeo 1452.

*Lepidium apenninum Al-Shehbaz. Hairy whitetop. Perennial herb. Non-native. Uncommon, only seen in wet alkali marshes north of Black Lake. Winitsky & Slaughter 1079.

Lepidium fremontii S. Watson. Desert alyssum. Perennial herb. Uncommon in sandy soils of Big Basin sagebrush scrub in Adobe Valley. Winitsky 16.

Lepidium montanum Nutt. Mountain pepper grass. Perennial herb. Common along shores and adjacent sagebrush surrounding alkaline areas. Antelope Lake, Antelope Spring, Adobe Lake, Black Lake. Winitsky & Fraga 582.

Nasturtium officinale W.T. Aiton. Watercress. Perennial herb, aquatic. Common in all riparian areas and around springs and creeks. Wet alkali marsh, montane riparian scrub. Adobe Creek, River Spring, South Black Lake, Pizona, Upper Pizona. Winitsky, Fraga & Hickman 860.

Phoenixus cheiranthoides Nutt. Dagger pod. Perennial herb. Uncommon in the granitic boulders of the Benton Range, found growing in sand of mixed shrub woodland. Winitsky & Fraga 1580.

Rhipigraphis curviserva Greene. Bluntleaf yellow cress. Annual herb. Uncommon on alkali shores of springs and lakes. Black Lake, Pizona, Upper Pizona. Winitsky, Fraga & Hickman 798.

Thelypodium crispum Payson. Wavy-leaved thelypodium. Biennial herb. Occasional in wetter alkaline areas of the valley floor. Antelope Spring, Black Lake. Winitsky & Slaughter 918.

*Thelypodium integrifolium (Nutt.) Endl. ex Walp. subsp. complanatum Al-Shehbaz. Lavender entire-leaved thelypodium. 2B.2. Biennial herb. Rare, only found in alkaline Ericameria nauseosa stand along the road from Pizona homestead to Upper Pizona Spring. Winitsky & Medina 1492.

Thelypodium laciniatum (Hook.) Endl. ex Walp. Featherly thelypodium. Biennial herb. Occasional throughout granitic outcrops of the pinyon juniper uplands. Antelope Mountain, Benton Range, Black Lake. Winitsky & Fraga 698.

*Thelypodium milliflorum A. Nelson. Yarrow-leaf thelypodium. 2B.2. Biennial herb. Occasional throughout the entirety of the hills. Pinyon-juniper woodland. Adobe Hills, Pizona, Upper Pizona. Winitsky & Fraga 454.

**Cactaceae**

Cylindropuntia echinocarpa (Engelm. & J.M. Bigelow) F.M. Knuth. Silver cholla. Shrub. Uncommon throughout sandy shrublands in the Benton Range. Winitsky, Berbeo & Washburn 1424.

Opuntia polyacantha Haw. var. erinacea (Engelm. & J.M. Bigelow) B.D. Parfit. Grizzlybear prickly pear. Shrub. Occasional throughout pinyon-juniper woodland and mixed shrub woodland. Winitsky & Fraga 700.

**Caryophyllaceae**

Symphoricarpos longiflorus A. Gray. Desert snowberry. Shrub. Occasional throughout the granitic outcrops of the Benton Range. Winitsky & Fraga 522.

**Eremogone ferrisiae (Abrams) R.L. Hartm. & Rabeler. Perennial herb. Common throughout uplands, but more abundant in the Benton Range than in the Adobe Hills. Winitsky & Fraga 891.

Silene argentea S. Watson. Sargent’s campion. Perennial herb. Rare, only found on the north slope of Trafton Peak in pinyon-juniper woodland. Winitsky, Berbeo & Washburn 1421.

Stellaris longipes Goldberg subsp. longipes. Chickweed. Perennial herb. Common in riparian areas, around streams and springs. Pizona, Upper Pizona, River Spring, Adobe Creek, Black Lake. Winitsky & Slaughter 271.

**Chenopodiaceae**

Atriplex canescens (Pursh) Nutt. Shadscaple. Shrub. Dominant shrub in alkaline areas near Adobe Lake and occasional throughout sagebrush scrub. Winitsky & Fraga 575.

Atriplex lentiformis (Torr.) S. Watson. Big saltbush. Shrub. Rare, only found once on River Spring Road, in an alkali meadow near the Old Stagecoach house. Winitsky & Fraga 29.

*Atriplex micrantha* Ledeb. Russian atriplex. Non-native. Rare, found only once in Salt-dominatetd riparian area along Pizona Road. Montane riparian scrub. Winitsky & Bell 1524.
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Vascular Flora of Adobe Valley and Surroundings

**Astragalus lentiginosus** Douglas var. ineptus (A. Gray) M.E. Jones. Perennial herb. Fumbling milk vetch. Uncommon in sandy soil in alkali meadow of dry lake and in the hills surrounding Adobe Lake. Winitsky & Winitsky 156.

**Astragalus lentiginosus** Douglas var. semotus Jeps. White mountains milk vetch. Perennial herb. Rare, only found in deep sand near sand dunes to the northeast of River Spring. Winitsky & Robinson 1726.

**Astragalus malacus** A. Gray. Shaggy milk vetch. Perennial herb. Occasional throughout higher elevations in mixed shrub woodland, pinyon-juniper woodland. Winitsky & Fraga 298.

**Astragalus newberryi** A. Gray var. newberryi. Newberry’s milk vetch. Perennial herb. Uncommon in sandy soils of mixed shrub woodland, Big Basin sagebrush scrub, mountain sagebrush steppe. Winitsky & Fraga 345.

**Astragalus oophorus** S. Watson var. oophorus. Bladder milk vetch. Annual herb. Uncommon throughout pinyon-juniper woodland. Winitsky, Fraga & Hickman 835.

**Astragalus purshii** Douglas var. tinctus M.E. Jones. Pursh’s milk vetch. Perennial herb. Unusual throughout entire study area, common in the granitic outcrops of the Benton Range. Winitsky 291.

**Lupinus argenteus** Pursh var. heteranthus (S. Watson) Barneby. Silver lupine. Perennial herb. Uncommon in mountain sagebrush steppe and pinyon-juniper woodland. Winitsky & Natalia 1358.

**Miellotus albus** Medik. White sweetclover. Non-native. Annual herb. Rare, found only in highly disturbed rubber rabbitbrush intermontane shrubland, roadside, approaching River Spring. Winitsky & Cohen 1130.

**Trifolium andersonii** A. Gray subsp. *beatleyae* J.M. Gillett. Beatley’s five-leaved clover. Perennial herb. Rare, only found in rocky outcrops along the eastern slopes of the Benton ridgeline. Mixed shrub woodland. Winitsky & Winitsky 217.

**Trifolium longipes** Nutt. subsp. *hanseni* (Greene) J.M. Gillett. Long-stalked clover. Perennial herb. Locally common in riparian areas along creeks and lake shores. Black Lake, Adobe Creek, Pizona, Upper Pizona. Winitsky, Fraga & Hickman 782.

**Vicia villosa** Roth. subsp. *varia* (Host) Corb. Smooth vetch. Non-native. Annual herb. Vine. Uncommon in *Salix* understory of montane riparian scrub. Pizona, Black Lake. Winitsky, Fraga & Hickman 801.

**Cleomelellaceae**

**Carsonia sparsifolia** (S. Watson) Greene. Few-leaf bee plant. Annual herb. Uncommon throughout the Big Basin sagebrush scrub of Adobe Valley. Winitsky & Slaughter 997.

**Cleomeella parviflora** A. Gray. Slender cleome. Annual herb. Common throughout the alkali meadow, greasewood alkali basin, sandy areas of the Benton Range. Pinyon-juniper woodland. Winitsky, Fraga & Yhi 1312.

**Laevigarcieae**

**Astragalus casei** A. Gray. Case’s milkvetch. Perennial herb. Common throughout the entire study area, in all non-alkaline vegetation types. Winitsky & Slaughter 263.

**Astragalus johnnianus** Barneby. Long Valley milk vetch. 1B.2. Perennial herb. Rare, one population seen 3 km northeast of Adobe Lake in the pinyon-juniper woodland of the Adobe Hills growing in a scoria outcrop. Winitsky & Fraga 1590.

**Astragalus lentiginosus** Douglas var. *albifolius* M.E. Jones. Northern loco milkvetch. Perennial herb. *Taylor* 16740 deposited at JEPS.
**Phacelia vallis-mortae** J.W. Voss. Death Valley phacelia. Annual herb. Common throughout all non-alkaline vegetation types in the valley and hills. Winitsky & Cohen 1165.

**Lamiaceae**

**Mentha canadensis** L. Wild mint. Perennial herb. Occasional in wet alkaline marshes and montane riparian scrub. Adobe Creek, Pizona, Upper Pizona. Winitsky, Berbee & Washburn 1449.

**Monardella linoides** A. Gray subsp. sierrae Elvin & A.C. Sanders. Narrow-leaved monardella. Perennial herb. Uncommon throughout uplands, mostly found in the Benton Range. Mixed shrub woodland, pinyon-juniper woodland. Winitsky & Fragla 543.

**Salvia dorrii** (Kellogg) Abrams var. dorrii. Dorr’s sage. Shrub. Rare, only found once in the beginning of the pinyon-juniper belt in the Adobe Hills in pinyon-juniper woodland. Winitsky, Medina, Bryant & Uno 1500.

**Salvia dorrii** (Kellogg) Abrams var. pilosa (A. Gray) Strachan & Reveal. Hairy sage. Shrub. Rare, only one population found on an east-facing slope south of Antelope Peak in pinyon-juniper woodland. Winitsky & Fragla 695.

**Loasaceae**

**Mentzelia alba** (Douglas) Douglas ex Torr. & A. Gray. White-stemmed blazing star. Annual herb. Common throughout all non-alkaline areas of the study site, usually in sand. Winitsky, Fragla & Hickman 807.

**Mentzelia congesta** Torr. & A. Gray. Clustered blazing star. Annual herb. Common throughout entire area, most abundant in the granitic area of the Benton Range. Winitsky & Fragla 543.

**Mentzelia laevicaulis** (Hook.) Torr. & A. Gray. Clustered blazing star. Annual herb. Common throughout entire area, most abundant in the granitic area of the Benton Range. Winitsky & Fragla 543.

**Mentzelia nitens** Greene. Shining blazing star. Annual herb. Uncommon in the granitic outcrops of the Benton Range. Mixed shrub woodland. Winitsky & Fragla 563.

**Mentzelia veitchiana** Kellogg. Veatch’s blazing star. Annual herb. Rare, only found once in the beginning of the pinyon-juniper belt in the Adobe Hills above River Spring. Greasewood alkali basin, mountain sagebrush steppe. Winitsky & Winitsky 113.

**Malvaceae**

**Sphaeralcea ambigu** A. Gray var. ambigu. Desert mallow. Perennial herb. Common throughout rocky outcrops of the pinyon juniper uplands. Winitsky & Slaughter 947.

**Montaneae**

**Calyptridium roseum** S. Watson. Rosy pseystew. Annual herb. Common throughout Adobe Valley in 2017 after sufficient rains and seen only once in 2018. Winitsky 588.

**Leucaena edgeworthii** Pursh var. minor (Ryd.) Munz. Bitter root. Perennial herb. Rare, a single population in Eriogonum kennedyi var. purpureum on west-facing sandy slope of southern Benton Range. Winitsky & Fragla 568.

**Myrosideae**

**Lysimachia maritima** (L.) Galasso, Banh & Soldano. Sea milkwort. Perennial herb. Rare, only found along the west shore of Black Lake, within Carex stands and at Upper Pizona Spring. Winitsky, Berkowitz, Feldman & Perez 1419.
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Gayophytum ramosissimum Tort. & A. Gray. Piney gayophytum. Annual herb. Common throughout entire study area in sandy areas. Abundant in 2017 after sufficient rain, not seen in 2018. Winitsky & Slaughter 1057.

Orthocarpus luteus Nutt. Yellow owl’s clover. Annual herb. Rare, found in a alkaline Sarcobatus stand near Adobe Lake. Greasewood alkaline basin. Winitsky & Slaughter 1000.

Orobanchaceae

Aphyllon californicum (Cham. & Schldl.) A. Gray undescribed subsp. nov. Parish broomrape. Perennial parasitic herb. Rare, growing on Eriocamera nauseosa var. oerophila near River Spring, where alkaline meadow and rubber rabbitbrush intermontane shrubland meet along River Spring Road. Winitsky & Bell 1522.

Aphyllon corymbosum (Rydb.) Ferris. Flat-topped broom rape. Annual parasitic herb. Uncommon throughout the highest elevations of the Benton Range, usually on or close to summits. Found once on the western shore of Black Lake. Winitsky & Fraga 320.

Aphyllon fasciculatum (Nutt.) Torr. & A. Gray. Clustered broomrape. Perennial parasitic herb. Rare, found in the granitic outcrops of the Benton Range in mixed shrub woodland. Winitsky & Fraga 573.

Castilleja chromosa A. Nelson. Desert paintbrush. Perennial herb. Common throughout entire study area, mostly in pinyon juniper uplands and rocky outcrops. Abundant in 2017 after sufficient rain, not seen in 2018. Winitsky & Fraga 295.

Castilleja liniarifolia Benth. Desert paintbrush. Perennial herb. Rare, found once in dry alkalai flat between Lower and Upper Pizona. Alkali Meadow. Winitsky & Fraga 219.

Erythranthes geringii (DC.) G. L. Nesom. Yellow monkeyflower. Annual herb. Rare, only found once along Adobe Creek. Big Basin sagebrush scrub. Winitsky & Fraga 471.

Gayophytum ramosissimum Tort. & A. Gray. Piney gayophytum. Annual herb. Common throughout entire study area in sandy areas. Abundant in 2017 after sufficient rain, not seen in 2018. Usually in large populations, dimorphic flower color. All non-alkali vegetation types. Winitsky & Fraga 708.

Papaveraceae

Artemesia munita Durand & Hilg. Prickly poppy. Annual or perennial herb. Rare, only found once, a single individual, in Big Basin sagebrush scrub near the house at the south end of Black Lake. Winitsky, Snyder & House 1398.

Eschscholzia minutiflora S. Watson. Pygmy poppy. Annual herb. Rare, only found out on a sandy east-facing slope in the eastern Benton Range in dense stand of annual plants. Winitsky & Fraga 382.

Phrymaceae

Diciclops mepriticus (Greene) G.L. Nesom. Skunky monkeyflower. Annual herb. Common throughout entire study area in sandy areas. Abundant in 2017 after sufficient rain, not seen in 2018. Usually in large populations, dimorphic flower color. All non-alkali vegetation types. Winitsky & Fraga 708.

Diciclops nanus (Hook. & Arn.) G.L. Nesom. Dwarf monkeyflower. Annual herb. Uncommon in pinyon-juniper woodland, mountain sagebrush steppe. Winitsky & Slaughter 995.

Erythranthe guttata (DC.) G.L. Nesom. Yellow monkeyflower. Annual or perennial herb, rhizomatous. Locally common in riparian areas. Winitsky 59.

Erythranthe rubella (A. Gray) N.S. Fraga. Red-stemmed himulus. Annual herb. Uncommon in the mixed shrub woodland, pinyon-juniper woodland, mountain sagebrush steppe throughout the Adobe, Pizona and Benton ranges. Winitsky & Fraga 552.

Erythranthe suksdorfii (A. Gray) N.S. Fraga. Suksdorff’s monkeyflower. Annual herb. Uncommon throughout the sagebrush scrub of the valley floor and throughout the uplands. Winitsky, Fraga & Hickman 763.

Plantaginaceae

Antirrhinum kingii S. Watson. King’s snapdragon. Annual herb. Uncommon, growing out of rocks in the pinyon-juniper woodlands near Pizona. Winitsky & Fraga 448.

Collinsia parviflora Lindl. Few-flowered blue-eyed mary. Annual herb. Rare, only found in granitic outcrops of the mixed shrub woodland of the Benton Range, only seen in 2017. Winitsky & Fraga 509.

Keckiella rothrockii (A. Gray) Straw var. rothrockii. Rothrock’s keckielia. Perennial herb. Rare, only found once in sandy soil in the granitic outcrops of the Benton Range. Mixed shrub woodland. Winitsky, Cohen, Martinez, March & Fram 1211.

Penstemon floridus Britton var. floridus. Rose penstemon. Perennial herb. Rare, found in growing underneath Parshia tridentata in a pinyon grove at the base of granitic bluffs of the Benton Range. Winitsky, Slaughter & Hickman 868.

Penstemon patens (M.E. Jones) N.H. Holmgen. Lone pine beardtongue. Perennial herb. Occasional in both the Adobe Hills and the Benton Range. Winitsky & Fraga 408.

Penstemon rostriflorus Kellogg. Bridge’s penstemon. Perennial herb. Uncommon in the Benton Range, in granitic outcrops, also found near summit of Antelope Mountain. Winitsky & Fraga 697.

Veronica americana Schwein. ex Bent. American brooklime. Perennial herb. Locally common submersed in springs and creeks. Montane riparian scrub. Winitsky, Fraga & Hickman 753.

Veronica catena Pennell. Chain speedwell. Non-native. Perennial herb. Rare, found only once on the shore of Adobe Creek, in Salix understory. Winitsky & Winitsky 1465.

Polemoniaceae

Aliciella hutchinsfolia (Ryd.) J.M. Porter. Desert pale gilia. Annual herb. Rare, only found once along Adobe Creek. Big Basin sagebrush scrub. Winitsky & Fraga 620.

Aliciella leptomeria (A. Gray) J.M. Porter. Sand aliciella. Annual herb. Common throughout entire study area in sandy areas. Abundant in 2017 after sufficient rain, not seen in 2018. Winitsky & Winitsky 93.

Aliciella micromeria (A. Gray) J.M. Porter. Dainty gilia. Annual herb. Common throughout entire study area in sandy areas. Abundant in 2017 after sufficient rain, not seen in 2018. Mountain sagebrush steppe. Winitsky & Fraga 737.

Aliciella lottiae (A.G. Day) J.M. Porter. Lott’s gilia. Annual herb. Uncommon throughout sagebrush scrub, only seen once in 2018. Winitsky & Winitsky 93.

Allophyllum giloides (Benth.) A.D. Grant & V.E. Grant subsp. violaceum (A. Heller) A.G. Day. Dense false gilia. Annual herb. Uncommon on ridgelines and summits in the Benton Range. Winitsky & Fraga 753.

Erariastrum diffusum (A. Gray) H. Mason. Miniature wool star. Annual herb. Rare, only found once along dry salt flat. Winitsky & Fraga 668.

Erariastrum signatum D. Gowen. Maroon-spotted woollystar. Perennial herb. Common throughout hills and valley, mostly seen in 2017. Winitsky, Fraga & Hickman 817.

Eriastrum sparsiflorum (Eastw.) H. Mason. Great Basin erariastrum. 4.3. Annual herb. Rare, only in deep sand of sand dunes, northeast of River Spring. Winitsky, Fraga & Hickman 775.

Eriastrum wilcoxii (A. Nelson) H. Mason. Wilcox’s erariastrum. Annual herb. Common throughout entire valley in sandy soils of Big Basin sagebrush. Abundant in 2017 after sufficient rain, not seen in 2018. Winitsky & Slaughter 1061.

Gilia brecciarum M.E. Jones subsp. brecciarum. Nevada gilia. Annual herb. Rare, found just once in the mountain sagebrush steppe of the Benton Range. Winitsky, Slaton & Bourgois 77.
Gilia cana (M.E. Jones) A. Heller subsp. cana. Showy gilia. Annual herb. Uncommon in pinyon-juniper woodlands near Pizona. Winitsky, Fraga & Hickman 820.

Gilia inconspicua (Sm.) Sweet. Shy gilia. Annual herb. Rare, found in the granitic outcrops of the Benton Range, growing in sand. Winitsky & Fraga 559.

Gilia modestissima Eastw. Modoc gilia. Annual herb. Uncommon but found throughout most vegetation types of the valley floor and uplands. Winitsky & Winitsky 139.

Gilia ochroleuca M.E. Jones. Volcanic gilia. Annual herb. Rare, only found in the mixed shrub woodland of the Benton Range in sandy soils. Winitsky & Fraga 511.

Linanthus pungens (Torr.) J.M. Porter & L.A. Johnson. Granite prickly flaxflower. Annual herb. Rare, only found in 2017 on a sandy east-facing slope in the eastern Benton Range. Mixed shrub woodland. Winitsky & Fraga 266.

Linanthus dichotomus Benth. subsp. dichotomus. Evening snow. Annual herb. Common throughout entire study area in sandy areas. Abundant in 2017 after sufficient rain, not seen in 2018. Winitsky & Fraga 379.

Linanthus inyoensis (I.M. Johnst.) J.M. Porter & L.A. Johnson. Inyo gilia. Annual herb. Common throughout entire study area in sandy areas. Abundant in 2017 after sufficient rain, not seen in 2018. Winitsky & Fraga 421.

Linanthus pungens (Torr.) J.M. Porter & L.A. Johnson. Granite prickly phlox. Shrub. Common throughout pinyon-juniper woodland. Winitsky & Fraga 658.

Navaretia breviflora (A. Gray) Greene. Brewer’s navaretia. Annual herb. Rare, found once in a diverse patch of annual plants within pinyon-juniper woodlands. Upper Pizona. Winitsky, Fraga & Hickman 870.

Phillodiscus brevifolius (Torr.) A. Heller subsp. stansburyi. Cold desert phlox. Perennial herb. Common throughout mixed shrub woodland and pinyon-juniper woodlands. Winitsky & Fraga 717.

PolYGONACEAE

Centrostegia thurberi A. Gray. Red triangles. Annual herb. Rare, found once in sandy soil in the mixed shrub woodlands of the Benton Range. Winitsky & Fraga 564.

Chorisanthum brevicornu Torr. var. brevicornu. Brittle spireflower. Annual herb. Common throughout entire study area in sandy areas, alkaline and non-alkaline areas. Abundant in 2017 after sufficient rain, not seen in 2018. Winitsky 594.

Chorisanthum brevicornu Torr. var. spathulata (Ryd.) C.L. Hitchc. Broad-leaf brittle spireflower. Annual herb. Common throughout entire study area in sandy areas. Frequent in 2017 after sufficient rain, not seen in 2018, less common than var. brevicornu. Winitsky, Fraga & Hickman 829.

Chorisanthum watsonii Torr. & A. Gray. Watson’s spireflower. Annual herb. Rare, found only on an east-facing slope in the pinyon-juniper woodlands of the Benton Range. Winitsky & Fraga 367.

Eriogonum ampullaceum J.T. Howell. Mono buckwheat. Annual herb. Uncommon in sandy soils around Black Lake. Winitsky & Cohen 1129.

Eriogonum baileyi S. Watson var. baileyi. Bailey buckwheat. Annual herb. Common throughout all sandy areas of Adobe Valley. Abundant in 2017 after sufficient rain, not seen in 2018, Winitsky 601.

Eriogonum brachyanthum Coville. Yellow buckwheat. Annual herb. Occasional throughout much of the study area in sandy areas. Abundant in 2017 after sufficient rain, not seen in 2018. Winitsky 9.

Eriogonum kennedyi Porter ex S. Watson var. purpusii (Brandegee) Reveel. Purpus’s buckwheat. Perennial herb. Locally common throughout the southern granitic outcrops of the Benton Range, dominant taxon in sandy soils at the southern edge of the study site. Winitsky & Winitsky 224.

Eriogonum latens Jeps. Inyo buckwheat. Rare, found in granitic outcrops of the Benton Range. Winitsky, Snyder & House 1399.

Eriogonum maculatum A. Heller. Angle-stemmed buckwheat. Annual herb. Uncommon but found throughout most vegetation types. Winitsky & Fraga 369.

Eriogonum microtheca Nutt. var. ambiguum (M.E. Jones) Reveel. Obscure buckwheat. Shrub. Occasional throughout the Benton Range and less common in the sagebrush scrub of Adobe Valley Winitsky & Robinson 1262.

Eriogonum nidularium Coville. Whiskbroom. Annual herb. Uncommon throughout Pizona Hills and southern Benton Range in mixed shrub woodland, mountain sagebrush steppe, and pinyon-juniper woodland. Winitsky, Fraga & Hickman 874.

Eriogonum nummulare M.E. Jones. Round-leaf buckwheat. Shrub. Uncommon throughout sagebrush scrub, except near the sand dunes northeast of River Spring, where it is the dominant shrub. Winitsky & Robinson 1231.

Eriogonum ovalifolium Nutt. var. nivalis (Canby ex Coville) M.E. Jones. Cushion buckwheat. Shrub. Rare in pinyon-juniper woodland throughout ridgeline of the Benton Range. Winitsky & Fraga 338.

Eriogonum ovalifolium Nutt. var. ovalifolium. Cushion buckwheat. Shrub. Occasional throughout entire area other than riparian and alkaline areas. Found in mixed shrub woodland, mountain sagebrush steppe and pinyon-juniper woodland. Winitsky & Winitsky 112.

Eriogonum purpuratum var. purpuratum (Nutt.) Durand. Purple cushion buckwheat. Shrub. Uncommon throughout the granitic outcrops of the southern Benton Range, sometimes growing with E. ovalifolium var. ovalifolium. Winitsky & Slaughter 246.

Eriogonum pusillum Torr. & A. Gray. Yellow turbins. Annual herb. Uncommon growing in sand in the granitic outcrops of the Benton Range. Only seen in 2017 in mixed shrub woodland. Winitsky & Slaughter 470.

Eriogonum umbellatum Torr. var. nevadense Gand. Sierra sulfur flower. Perennial herb. Common throughout all non-alkaline areas of the study area, but never the dominant shrub. Winitsky & Fraga 504.

Eriogonum Wrightii Torr. ex Benth. var. subcapitatum S. Watson. Wright’s buckwheat. Perennial herb or shrub. Occasional, interspersed in Eriogonum kennedyi stands in the granitic outcrops of the Benton Range. Winitsky & Natalia 1337.

*Goodmania luteola (Parry) Reveel & Ertter. Golden goodmania. 4.2. Annual herb. Taylor 16750 deposited at JEPS.

Oxyclea dendroidea Nutt. subsp. dendroidea. Tall oxyclea. Annual herb. Common throughout entire study area in sandy areas. Abundant in 2017 after sufficient rain, not seen in 2018. Big Basin sagebrush scrub, pinyon-juniper woodland. Winitsky & Fraga 736.

Persicaria amplexicaulis (L.) Delarbre. Water smartweed. Perennial herb. Rare, only one population found, downstream from the main spring at River Spring. Winitsky, Washburn & Berbeos 1459.

*Rubus chamaemorus L. Curly dock. Non-native. Perennial herb. Uncommon, only found at Adobe Creek and River Spring in riparian area, very close to water. Winitsky & Robinson 1236.

PRIMULACEAE

*Primula pumila (Greene) Mast & Reveel. Beautiful shootingstar. 4.2. Perennial herb. Occasional in wet alkaline marshes of Pizona and Black Lake. Winitsky & Slaughter 265.

RANUNCULACEAE

Aquilegia formosa Fisch. ex DC. Columbine. Perennial herb. Uncommon in riparian areas but dense populations where found. Montane riparian scrub. Pizona, South Black Lake. Winitsky, Fraga & Hickman 861.
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**DELPHINIUM ANDERSONII** A. Gray. Anderson’s larkspur. Perennial herb. Occasional throughout the uplands of the Benton Range, especially nearing summit areas, and rare throughout the Adobe Hills. *Winitsky & Winitsky* 174.

**DELPHINIUM PARISHII** A. Gray. subsp. PARISHII. Parish’s larkspur. Perennial herb. Uncommon in granitic outcrops of the Benton Range and throughout the uplands of the Adobe Hills. *Winitsky & Fraga* 406.

**RANUNCULUS ANDERSONII** A. Gray. Anderson’s buttercup. Perennial herb. Rare in the sandy soils of mixed shrub woodland in the southern Benton Range, first plant to flower in spring, March–April. *Winitsky & Fraga* 516.

**RANUNCULUS AQUATILIS** L. var. DIFFUSUS With. Whiterwater crowfoot. Perennial aquatic herb. Rare, found submersed in Adobe Creek. *Winitsky & Winitsky* 1464.

**RANUNCULUS CYMBALARIA** Parsh. Alkaline buttercup. Perennial herb. Common in all riparian areas. Wet alkaline marsh, montane riparian scrub. River Spring, Black Lake, South Black Lake, Adobe Creek, Pizona, Upper Pizona. *Winitsky & Slaughter* 245.

**RANUNCULUS HYDROCHARIDES** A. Gray. Frog’s bit buttercup. 2B.1. Perennial herb (aquatic). Rare, found once near the cow corral next to South Black Lake. Riparian area surrounded by *Artemisia*. Wet alkaline marsh. *Winitsky, Berbee & Washburn* 1432.

**ROSACEAE**

**AMELANCHIER UTAHENESIS** Koehne. Utah service-berry. Uncommon in the pinyon-juniper woodlands above Antelope Lake. *Winitsky, Winitsky & Bane-Herzog* 1379B.

**CERCOCARPUS LEFLOSIUS** Nutt. var. INTERMONTANUS N.H. Holmgren. Curl-leaved mountain mahogany. Tree or shrub. Relatively common in the granitic outcrops of the Benton Range, a major component of the mixed shrub woodland vegetation type. *Winitsky & Fraga* 517.

**CHAMAEBATILLARIA MILLEFOLIUM** (Torr.) Maxim. Fern bush. Shrub. Rare, only found growing out of granite in the Benton Range. *Winitsky, Cohen, Marx, Metzner & Fram* 1209.

**HOLODISCUS DISCOLOR** (Parsh) Maxim. var. MICHROPHYLLOUS (Rydby) Jeps. Small-leaved creambush. Shrub. Uncommon in the sandy soil of mixed shrub woodland in the Benton Range. *Winitsky & Fraga* 330.

**IVESIA KINGII** S. Watson var. KINGII. Alkaline ivesia. 2B.2. Perennial herb. Locally common in alkaline meadows. *Winitsky & Fraga* 654.

**IVESIA SAXOSA** (Greene) Ertter. Rock ivesia. Perennial herb. Occasional, growing out of granitic boulders in the Benton Range. *Winitsky & Cohen* 1181.

**POTENTILLA BIENNIS** Greene. Biennial cinquefoil. Perennial herb. Common in seeps, wet alkaline marshes and near springs. *Winitsky & Fraga* 440. **POTENTILLA GRACILIS** Hook. var. ELMERI (Rydby) Jeps. Elmer’s cinquefoil. Perennial herb. Abundant in wet alkaline marshes above Black Lake. *Winitsky & Fraga* 581.

**PRUNUS ANDERSONII** A. Gray. Desert peach. Tree or shrub. Uncommon in the southern Benton Range, a major component of the mixed shrub woodland vegetation type. *Winitsky & Fraga* 508.

**PURSHIA TRIDENTATA** (Parsch) DC. var. GLANDULOSA (Curran) M.E. Jones. Antelope brush. Shrub. Uncommon throughout entire pinyon-juniper woodland, mixed shrub woodland and mountain sagebrush steppe. *Winitsky & Fraga* 723.

**PURSHIA TRIDENTATA** (Parsch) DC. var. TRIDENTATA. Antelope bitterbrush. Shrub. Common in pinyon uplands and dominant in the mixed shrub woodland vegetation type in the granitic outcrops of the Benton Range. *Winitsky & Winitsky* 132.

**ROSA WOODSII** Lindl. subsp. ULTRAMONTANA (S. Watson) Roy L. Taylor & MacByrde. Interior rose. Shrub. Locally common in some riparian areas. *Winitsky & Slaughter* 282.

**RUBUSACEAE**

**GALIUM BIFOLIUM** S. Watson. Low mountain bedstraw. Annual herb. Rare, only found near shore of Adobe Creek. *Winitsky & Winitsky* 1476.

**GALIUM MULTIFLORUM** Kellogg. Many-flowered bedstraw. Perennial herb. Uncommon, growing out of granitic boulders in the Benton Range. *Winitsky & Fraga* 533.

**SALICACEAE**

**SALIX EXIGUA** Nutt. var. EXIGUA. Narrowleaf willow. Tree or shrub. Locally common in riparian areas. *Winitsky & Slaughter* 954.

**SALIX EXIGUA** Nutt. var. HINSDIANA (Benth.) Dorn. Sandbar willow. Small tree. Rare, found along Pizona creek in a highly disturbed horse-use area. *Winitsky, Berbee & Washburn* 1445.

**SALIX LASIOPLEPS** Benth. Arroyo willow. Small tree. Uncommon, overstory in dense riparian zone of Adobe Creek. *Winitsky & Slaughter* 279.

**SALIX LUTEA** Nutt. Yellow willow. Shrub. Uncommon, overstory in dense riparian zone of Adobe Creek. *Winitsky & Slaughter* 1024.

**SALIX PLANIFOLIA** Parsh. Diamondleaf willow. Shrub. Rare, overstory in dense riparian zone of Adobe Creek. *Winitsky & Slaughter* 1006.

**SANTALACEAE**

**ARCEUTHOBium CAMPYLOPODUM** Engelm. Pine dwarf mistletoe. Perennial parasitic herb. Uncommon on pinyon throughout the Adobe Hills. *Winitsky, Berbee & Washburn* 1422.

**SARCOCOBATAECEAE**

**SARCOCOBatus VERMICALICATUS** (Hook.) Tott. Greasewood. Shrub. Dominant in alkaline shrublands and alkaline meadows. *Winitsky & Fraga* 461.

**SAXIFRAGACEAE**

**HEUCHERA RUBESCENS** Tott. Pink alumroot. Perennial herb. Uncommon, growing out of granitic rocks in the southernmost part of the Benton Range included in the study area. *Winitsky & Fraga* 521.

**SCROPHULARIACEAE**

**SCROPHULARIA DESERTORUM** (Munz) R.J. Shaw. Desert figwort. Perennial herb. Rare, growing out of granitic rocks in the southernmost part of the Benton Range included in the study area. *Winitsky & Fraga* 523.

**SOLANACEAE**

**NICOTIANA ATTENUATA** Tott. ex S. Watson. Coyote tobacco. Annual herb. Uncommon in disturbed soil near riparian areas. *Winitsky & Slaughter* 1097.

**URTICACEAE**

**URTICA DIOICA** L. subsp. HOLOSERICEA (Nutt.) Thorne. Stinging nettle. Perennial herb. Uncommon in wet, disturbed seeps and montane riparian scrub. *Winitsky, Fraga, Baub & Yhi* 1300.

**VIOLACEAE**

**VIOLA PUPPUREA** Kellogg subsp. MOHAVENSIS (M.S. Baker & J.C. Clausen) J.C. Clausen. Mojave goosefoot violet. Perennial herb. Uncommon in dry streambeds of the pinyon-juniper woodland. *Winitsky, Fraga & Hickman* 853.

**MONOCOTS**

**ALLIACEAE**

**ALLIUM ATRORUBENS** S. Watson var. CRISTATUM (S. Watson) McNeal. Crested onion. 4.3. Perennial bulb, Occasional throughout granitic outcrops of the Benton Range. *Winitsky & Winitsky* 211.

**ALLIUM BICEPTUM** S. Watson. Twincrest onion. Uncommon in montane riparian scrub of the Adobe Hills. *Winitsky, Fraga & Hickman* 790.

**ARACEAE**

**LEMINA MINUTA** Kunth. Least duckweed. Perennial aquatic. Locally common in most freshwater within entire study area. *Winitsky, Fraga & Hickman* 863.
**Cyperaceae**

**AMPHICHRISPUS NEVADENSIS** (S. Watson) Oeng-Yeb. Great Basin bulrush. Perennial grasslike herb. Common in dry spring areas, alkali meadows and wet alkali marshes throughout entire valley. *Winitsky & Slaughter* 926.

**CAREX AQUATILIS** Wahlbr. var. *AQUATILIS*. Water sedge. Perennial grasslike herb. Uncommon in disturbed wet alkali marshes. Antelope Spring, expected elsewhere. *Winitsky & Winitsky* 1484.

**CAREX Aurea** Nutt. Golden-fruited sedge. Rare, in heavily disturbed seep within cattle allotment next to southern shore of Black Lake. *Winitsky, Berbee & Washburn* 1433.

**CAREX CUSICKII** Mack. ex Piper & Beattie. Cusick’s sedge. Perennial grasslike herb. Occasional in disturbed wet alkali marshes. *Winitsky & Fraga* 642.

**CAREX DOUGLASSI** Boott. Douglas sedge. Perennial grasslike herb. Common throughout alkali meadows of the entire valley. *Winitsky & Slaughter* 234.

**CAREX FILOFOLIA** Nutl. var. *EROSTRATA* Kük. Thread-leaf sedge. Perennial grasslike herb. Rare from freshwater marsh of River Spring Lakes. *Winitsky, Berbee & Washburn* 1442.

**CAREX LENTICULARIS** Michx. var. *IMPRESSA* (L.H. Bailey) L.A. Stundl. Lakeshore sedge. Perennial grasslike herb. Rare, only found at the upper spring of the Pizona springs. *Winitsky & Medina* 1496.

**CAREX NERRASCENSIS** Dewey, Nebraska sedge. Perennial grasslike herb. Occasional throughout shady montane riparian scrub and freshwater marshes. *Winitsky & Slaughter* 1016.

**CAREX PELLITA** Willd. Woolly sedge. Perennial grasslike herb. Rare within montane riparian scrub of Adobe Creek. *Winitsky & Slaughter* 1466.

**CAREX RAEGRACTIS** W. Boott. Field sedge. Perennial grasslike herb. Common throughout entire valley, found in alkali meadows and wet alkali marshes. *Winitsky & Slaughter* 1089.

**CAREX SIMULATA** Mack. Analogue sedge. Perennial grasslike herb. Locally common near springs, uncommon in pinyon-juniper uplands. *Winitsky, Cohen, March, Martineau* & *Fraga* 1192.

**ELEOCHARIS ACICULARIS** (L.) Roem. & Schult. var. *ACICULARIS*. Needle spikerush. Perennial grasslike herb. Occasional in wet alkali marshes. *Winitsky & Winitsky* 1458.

**ELEOCHARIS MACROSTACHYCHA** Britton. Spike rush. Perennial grasslike herb. Occasional in freshwater marshes of River Spring Lakes. *Winitsky & Robinson* 1246.

**SCHONOPLECTUS ACUTUS** (Muhl. ex Bigelow) Á. Löve & D. Löve var. *OCIDENTALIS* (S. Watson) S.G. Sm. Tule. Perennial grasslike herb. Dominant taxon in freshwater marshes of River Spring Lakes. *Winitsky & Bell* 1523.

**SCHONOPLECTUS AMERICANUS** (Pots.) Volkart ex Schinz & R. Keller. Chairmaker’s bulrush. Perennial grasslike herb. Uncommon in alkali meadows; western shore of Black Lake. *Winitsky & Slaughter* 1119.

**SCHONOPLECTUS PUNGENS** (Vahl) Pall. var. *LONGPICATUS* (Britton) S.G. Sm. Common threesquare. Perennial grasslike herb. Locally common in wet alkali marshes and freshwater marshes. *Winitsky & Slaughter* 1107.

**Iridaceae**

**IRIS MISSOURIENSIS** Nutt. Western blue flag. Perennial herb. Common throughout entire area in wet alkali marshes. *Winitsky & Slaughter* 266.

**SISYRINCHIUM HALophilUM** Greene. Nevada blue-eyed grass. Perennial herb. Locally common in wet alkali marshes. *Winitsky & Slaughter* 278.

**SISYRINCHIUM IDAHOENSIS** E.P. Bicknell var. *OCIDENTALAE* (E.P. Bicknell) Doglass M. Hend. Idaho blue-eyed grass. Perennial herb. Occasional around freshwater springs of River Spring. *Winitsky & Fraga* 465.

**Juncaceae**

**JUNCUS BALTRICUS** Willd., subsp. *ATER* (Rydby) Sognerup. Baltic rush. Perennial grasslike herb. Locally common within alkali meadows and shores of lakes and creeks, usually with *Carex* spp. *Winitsky & Slaughter* 1014.

**JUNCUS MACKANDRUS** Coville. Long-angled rush. Perennial grasslike herb. Rare, only found along the shore of Adobe Creek in montane riparian scrub. *Winitsky & Slaughter* 1515.

**JUNCUS MEXICANUS** Willd. Mexican rush. Perennial grasslike herb. Locally common in dry streambeds, wet alkali marshes and alkali meadows around springs and lakes. *Winitsky & Slaughter* 926.

**JUNCUS NEVADENSIS** S. Watson var. *NEVADENSIS*. Nevada rush. Perennial grasslike herb. Uncommon, found half submerged at the main spring of River Spring Reserve. *Winitsky, Berbee & Washburn* 1438.

**Juncaginaceae**

**TRIGLOCHIN CONCINNA** Burt Davy var. *HERBILIS* (M.E. Jones) J.T. Howell. Slender arrow grass. Perennial aquatic herb. Locally common throughout freshwater springs and marshes. *Winitsky & Slaughter* 1127.

**TRIGLOCHIN MARITIMA** L. Seaside arrow grass. Perennial aquatic herb. Locally common throughout entire valley. *Winitsky & Slaughter* 1080.

**Liliaceae**

**CALLOCORTUS BRUNEATUS** A. Nelson & J.F. Macbr. Pinyon mariposa. Perennial bulb. Uncommon throughout pinyon-juniper woodland. *Winitsky & Fraga* 691.

**CALLOCORTUS EXCAVATUS** Greene. Inyo county star tulip. *B.1*. Perennial bulb. Rare, and only occurring in 2017, after sufficient winter rains. Large population north of Black Lake, found where alkali marsh meets sandy shrublands. Found underneath sedgebrush as well as with alkali marsh species. *Winitsky & Slaughter* 1124.

**Melanthiaceae**

**TOXICOSCORDION PANICULATUM** (Nutt.) Rydb. Foothill death camas. Perennial herb. Occasional but widespread in montane riparian scrub. *Winitsky & Slaughter* 1467.

**TOXICOSCORDION VENENOSUM** (S. Watson) Rydb. var. *VENENOSUM*. Meadow death camas. Perennial herb. Uncommon throughout mountain sedgebrush steppe. *Winitsky & Slaughter* 215.

**Poaceae**

**+AGROSTIS GIGANTEA** Roth. Creeping bentgrass. Non-native. Perennial grass. Uncommon in disturbed areas of montane riparian scrub. *Winitsky & Slaughter* 1467.

**AGROSTIS SCARPA** Willd. Rough bentgrass. Perennial grass. Uncommon in disturbed montane riparian scrub of Adobe Creek and South Black Lake. *Winitsky & Slaughter* 1477.

**AGROSTIS STOLONIFERA** L. Redtop. Non-native. Perennial grass. Rare, found in meadow along Pizona Creek west of the homestead. Montane riparian scrub. *Winitsky, Fraga, Babh & Yhi* 1306.

**Alopecurus Aequalis** Sobol. var. *Aequalis*. Short-awn foxtail. Perennial grass. Rare, only found once at Adobe Creek, near the horse corral, where creek shoreline is disturbed by roads and there is sparser Salsu overstory in montane riparian scrub. *Winitsky & Slaughter* 1511.

**BROMUS TECTORUM** L. Cheatgrass. Non-native. Annual grass. Occasional but widespread throughout the entire area in mixed shrub woodland and Big Basin sedgebrush scrub. *Winitsky & Winitsky* 156.

**DICENTRIS SPLICATA** (L.) Greene. Salt grass. Perennial grass. Dominant in alkali meadows throughout the valley floor. *Winitsky & Fraga* 459.

**ELYMUS CINEREUS** Scribn. & Merr. Great Basin wild rye. Perennial grass. Occasional but widespread in alkali meadows, Big Basin sedgebrush scrub and greasewood alkali basin. *Winitsky & Fraga* 692.
**Vascular Flora of Adobe Valley and Surroundings**

**ELYMUS ELYMIDES** (Ra.) Sweezy var. **CALIFORNICUS** (J.G. Sm.) J.P. Sm. Squirrel-tail grass. Rare, only found once in sand in the southern Benton Range. Winitsky & Fraga 347.

**ELYMUS ELYMIDES** (Ra.) Sweezy var. **ELYMIDES**. Squirrel-tail grass. Widespread throughout entire study area. Winitsky & Fraga 354.

**ELYMUS TRITICIIDE** Buckley. Beardless wild rye. Perennial grass. Occasional throughout valley floor and near springs and lakes. Winitsky & Cohen 1133.

**FESTUCA BRACHYPHYLLA** Schultz. & Schultz. f. subsp. **BREVICULMIS** Fred. Short-leaved fescue. Rare, south facing rocky slopes of mixed shrubland. Winitsky, Slaton & Bourgeois 90.

**FESTUCA KINGI** (S. Watson) Cassidy. Spike fescue. Perennial grass. Rare, only seen once in the pinyon-Juniper woodland of the Adobe Hills. Winitsky, Fraga, Babb & Yhi 1355.

**FESTUCA MICROSTACHYS** Nutt. Small fescue. Annual grass. Uncommon in sand in the granitic areas of the mixed shrub woodland in the Benton Range. Winitsky & Fraga 510.

**FESTUCA OCTOFLORA** Walter. Sixweeks grass. Annual grass. Uncommon, growing out of granitic boulders of the mixed shrub woodland in the Benton Range. Winitsky & Fraga 550.

**HILARIA JAMESII** (Torr.) Benth. Galleta. Perennial grass. Occasional throughout entire area. Winitsky & Slaughter 977.

**POLYPODIUM MONSPELIENSIS** (L.) Desf. Annual beard grass. Non-native. Widespread throughout the entire study area. Winitsky & Fraga 931.

**POLYPODIUM MONSPELIENSIS** (L.) Desf. Annual beard grass. Non-native. Annual grass. Occasional in wet alkali marsh. Pizoma, River Spring, South Black Lake, Black Lake. Winitsky & Slaughter 1053.

**Puccinellia Lemmonii** (Vasey) Scribn. Lemmon’s alkali grass. Perennial grass. Rare, only found in the southern part of River Spring. Freshwater marsh, wet alkali marsh. Winitsky & Robinson 1219.

**SPARTINA GRACILIS** Trin. Alkali cord grass. 4.2. Perennial grass, rhizomatous. Locally common throughout alkali meadow. Adobe Valley, Black Lake, Adobe Lake, Antelope Lake, Pizoma. Winitsky & Slaughter 927.

**STIPA COMATA** Thorb. ex S. Watson var. **COMATA**. Needle-and-thread. Perennial grass. Common in sagebrush scrub, more commonly in hills than the valley floor. Pinyon-Juniper woodland, mountain sagebrush steppe, mixed shrub woodland. Benton Range, Adobe Hills. Winitsky & Fraga 360.

**STIPA HYMENOIDES** Roem. & Schult. Indian rice grass. Perennial herb. Common throughout hills and occasional throughout the valley floor. Winitsky & Fraga 412.

**STIPA OCCIDENTALIS** Thurb. ex S. Watson var. **CALIFORNICA** (Meert. & Burtt Davy) C.L. Hitch. California needle grass. Perennial grass. Occasional in shrublands throughout study area. Winitsky, Fraga & Hickman 795.

**STIPA OCCIDENTALIS** Thurb. ex S. Watson var. **PURBESCENS** (Vasey) J.R. Maze, Roy L. Taylor & MacBryde. Common western needle grass. Perennial grass. Rare, documented once from Adobe Valley, near Adobe Lake. Crompton 7057 deposited at UCD.

**STIPA SPECIOSA** Thorb. & Rupr. Desert needle grass. Perennial grass. Common throughout the Adobe Hills and Benton Range in Big Basin sagebrush scrub, pinyon-Juniper woodland and mixed shrub woodland vegetation types. Winitsky 288.

**STIPA THURBERIANA** Piper. Thurber’s needle grass. Perennial grass. Uncommon, documented once along ridgeline of Antelope Mountain, in pinyon-Juniper woodland, expected elsewhere. Winitsky & Fraga 846.

**STIPA WEBBERI** (Thurb.) B.L. Johnson. Webber’s needle grass. Perennial grass. Rare, only found once in the granitic outcrops of the southern Benton Range in mixed shrub woodland. Winitsky & Fraga 542.

**TORREYOCHELLO PALLIDA** (Torr.) G.L. Church var. **PAUCEFLORA** (J. Presl) J.J. Davis. Mamagrass. Perennial grass, rhizomatous. Rare, documented once in Adobe Valley. Rodgers s.n. deposited at HSC: 10870.

**Potamogetonaceae**

**Potamogeton pusillus** L. Small pondweed. Annual aquatic plant. Uncommon in freshwater marshes. Documented once from River Spring. Winitsky, Berbee & Washburn 1439.

**Ruppiaceae**

**Ruppiaria cirirosa** (Petagna) Grande. Ditch grass. Perennial aquatic herb. Uncommon in freshwater marshes. Documented from one collection from River Spring. Winitsky, Berbee & Washburn 1445.

**Ruscaceae**

**Maianthemum stellatum** (L.) Link. Starry false lily of the valley. Perennial herb. Common throughout montane riparian scrub and wet alkali marsh in Black Lake, Adobe Creek and Pizoma Creek. Winitsky & Slaughter 267.

**Typhaceae**

**Typha latifolia** L. Broad leaf cattail. Perennial herb. Rare, found only along Adobe Creek, where it intersects Highway 120, within a Salix exigua stand in montane riparian scrub. Winitsky, Medina, Bryant & Uno 1501.

**Zannichellaceae**

**Zannichellia palustris** L. Horned pondweed. Perennial aquatic herb. Uncommon, from one collection fully submerged at River Spring. Winitsky, Berbee & Washburn 1437.