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## A FLORA OF THE HIGHER RANGES AND THE KELSO DUNES OF THE EASTERN MOJAVE DESERT IN CALIFORNIA

Robert F. Thorne, Barry A. Prigge, and James Henrickson

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### INTRODUCTION

The isolated higher mountains in the desert, like islands in an ocean, hold a peculiar fascination for biologists, partly because of their well-defined limits and partly because of their considerable endemism. Additionally, the desert itself has its own special appeal because of the many and often bizarre strategies plants and animals have undertaken to adapt to the difficult arid climate and the diverse desert land forms and varied substrates.

The authors were drawn into the desert time and again by this fascination for desert biology. Their choice of the higher ranges of the eastern Mojave Desert in California was largely prompted by their knowledge that the ranges possess a relatively rich flora, containing many species from the Great Basin and southwestern deserts not otherwise reported for California. The botanists of the Rancho Santa Ana Botanic Garden and Pomona College, especially Carl B. Wolf and Philip A. Munz, had already given considerable attention to some of these ranges, and Wolf had asked the senior author to resume the survey of the ranges and bring it to completion. Over the years, the authors have expanded the project to include additional ranges and the Kelso Dunes, and they have had great assistance from student groups at the University of California, Los Angeles and Santa Cruz, who have carried out their own resource surveys of the Granite Mountains and Kingston Range. Their enthusiastic cooperation has made the early termination of this project possible.

The Kelso Dunes and higher ranges of the eastern Mojave Desert lie between 34°45' and 36°00' N Latitude and 115°07' and 116°05' W Longitude (Fig. 1). The ranges included are, from south to north with approximate area and highest elevation, the Granite Mountains, 251 km<sup>2</sup> and 2068 m; Providence Mountains, 349 km<sup>2</sup> and 2148 m; Mid Hills, 359 km<sup>2</sup> and 1954 m; New York Mountains, 556 km<sup>2</sup> and 2296 m; Ivanpah Range (including the Mescal Range), 316 km<sup>2</sup> and 1840 m; Clark Mountain Range, 403 km<sup>2</sup> and 2416 m; Mesquite Mountains, 272 km<sup>2</sup> and 1573 m; and the Kingston Range, 643 km<sup>2</sup> and 2232 m. The Kelso dunes with 142 km<sup>2</sup> attain an elevation of only 950 m. All of these ranges lie within the northeastern corner of San Bernardino County, California, except for the northern part of the Kingston Range, which extends into Inyo County, and the northeastern end of the New York Mountains, which barely intrudes into Clark County, Nevada.

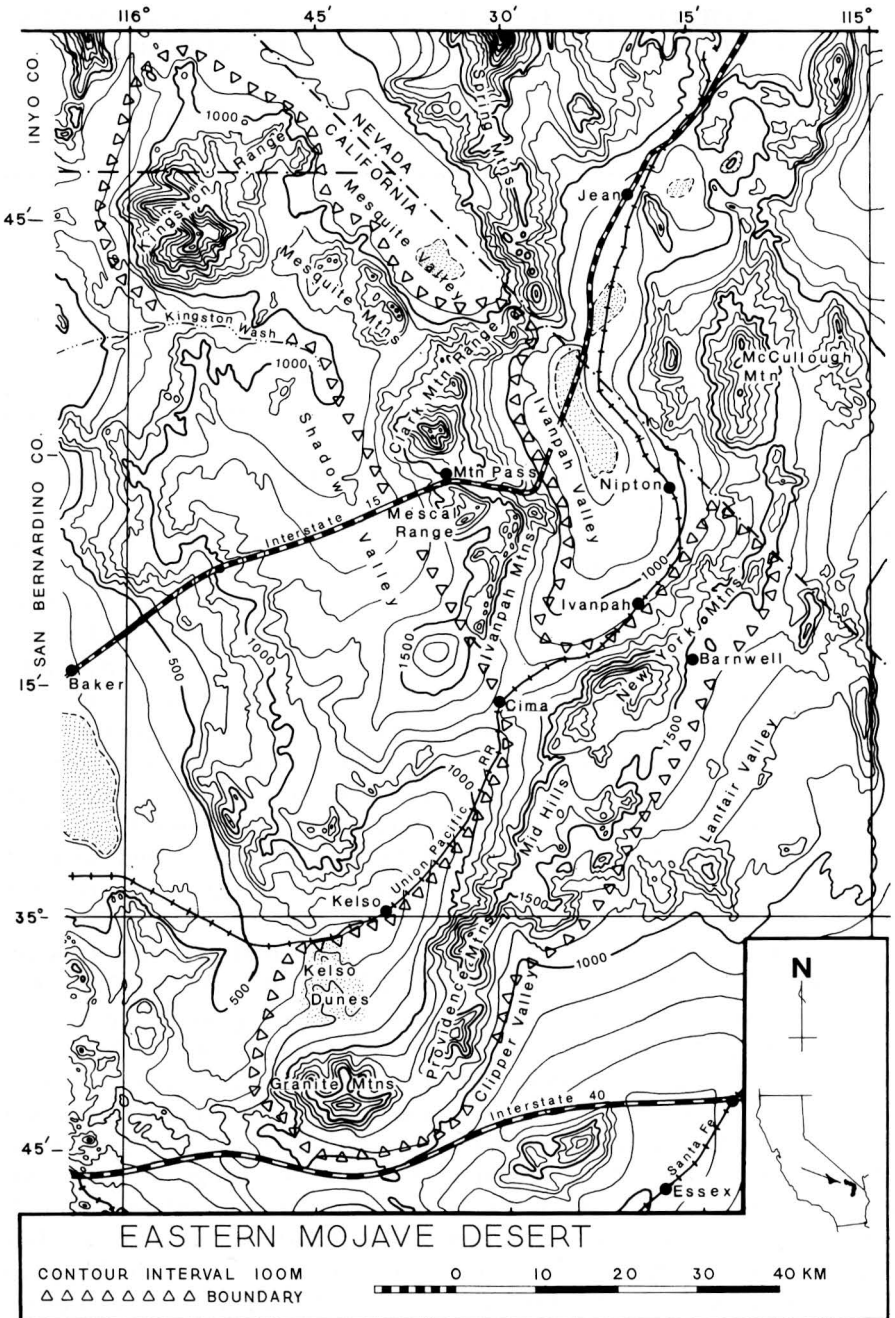


Fig. 1. Map of the higher ranges and the Kelso Dunes, of the eastern Mojave Desert, and approximate boundary of flora.

The approximate boundary for the flora is outlined in Fig. 1. Elevations range from 550 m on the west side of the Kelso Dunes to 2416 m at Clark Mountain. The total area surveyed is approximately 3290 km<sup>2</sup>.

### CLIMATE

The eastern Mojave Desert lies within the northern boundary of the hot desert climate of the southwestern United States (Major 1977; Russell 1926) and is transitional between the colder Great Basin Desert to the north and the warmer Sonoran Desert to the south. The climate is characterized by hot, dry summers and cool, dry winters. The ranges, however, are moister and cooler than the surrounding desert floor because of the effect of elevation, but they are still arid or semiarid throughout, except for some springs, seeps, and canyon bottoms that have saturated soils or free-flowing water and some high elevation, north-facing canyons where white fir occurs. These canyons may be subhumid.

Regional climate is determined by latitude, air circulation and pressure patterns, distance from moist air sources, and mountain ranges that intercept moist air masses, thus forming a rain shadow over the region.

The Pacific High is the dominant air circulation pattern that affects the region (Trewartha 1954, 1961; Sellers and Hill 1974; Miegs 1957; Bailey 1966). It is a semipermanent, subtropical high pressure cell over the eastern North Pacific Ocean and is the source of westerly and southwesterly winds that descend into the desert. Because of subsidence, the air mass over the Mojave Desert is dry, warm, and stable. The skies are clear permitting intense solar heating of the ground and atmosphere. Anticyclonic (diverging) air flow from the high generally deflects approaching storms and moist marine air masses away from the Mojave Desert. During cooler months, an intermittent high pressure cell forms over the Intermountain Region and it also deflects approaching storms.

Precipitation depends on movement of moisture-laden air over the region, and rising and cooling of the moist air through topographic obstruction, convergence with another air mass, or thermal heating, which results in convection, so that it is cooled sufficiently for condensation, cloud formation, and precipitation to occur. The position and intensity of the Pacific High, which changes with the seasons, largely determines whether moist air masses penetrate into the Mojave Desert.

Almost all fall, winter, and spring precipitation depends on the southward displacement and weakening of the Pacific High and the formation of a low pressure trough over the western United States. When this occurs, large scale cyclonic storms, which form in the Gulf of Alaska and are embedded in the prevailing westerlies, bring in moist, unstable air masses from the Pacific Ocean. These storms follow the prevailing westerly air flow, which is deflected southward by the Coast Ranges. Storms that travel as far south

as San Francisco or farther before they enter the continent have the greatest effect on the desert. Once these conditions are established, they tend to persist or reoccur. Thereby, several storms in succession may enter California and move across the Mojave Desert within a week (Sellers and Hill 1974). The amount of moisture that these storms deliver depends on their intensity. Most of their moisture is precipitated on the windward slopes of the Sierra Nevada and the Transverse Ranges, greatly reducing their moisture content, and as the air mass descends into the desert, it is heated by compression, thereby increasing its water holding capacity and stability. Only intense storms have moisture left to precipitate on the deserts. Cool-season storms can be of light to moderate intensity and produce almost continuous widespread precipitation for a day or two, but often bring only gusty winds and cool temperatures.

As a result of these cool-season storms, whether they come across southern California or across northern California, Oregon, or Washington, in which case no precipitation normally occurs in the eastern Mojave Desert, there is an accumulation of air which forms a high pressure cell over the Intermountain Region. Further eastward movement of these storms is blocked by the Rocky Mountains and the Canadian High over the north-central states and central Canada. Anticyclonic air flow from this high results in northeasterly winds over the Mojave Desert which develop into Santa Ana winds for southern California. This high often deflects other storms approaching from the Pacific Ocean leaving the eastern Mojave Desert relatively clear (Miegs 1957; Bailey 1966).

Rarely, when the Pacific High is extremely far north and well developed in the winter, the Mojave Desert can be hit with storms that have stagnated and intensified in the central Pacific Ocean before entering the continent. These storms generally drift eastward and by the time they come across the desert, they are well developed and capable of producing intense precipitation (Sellers and Hill 1974). In February, 1980, torrential rain occurred throughout southern California from this type of storm. Total rainfall for Mitchell Caverns, Providence Mountains, in February was 205 mm!

Summer precipitation is primarily brought about by thermal heating of moisture laden marine air and results in convectional storms that may be enhanced by convergence or topography. Huning (1978) reports that the greatest amount of summer convectional precipitation occurs where westerly and southerly winds converge in the eastern Mojave Desert. These storms are generally of short duration and are spotty. During July, August, and September, moist air is pumped into the desert from either the Gulf of Mexico or the Pacific Ocean. During this time, the Pacific High is farthest north and the westerly winds that normally keep the desert clear diminish and a high pressure cell protrudes into the central United States and a low pressure cell develops over Arizona (Sellers and Hill 1974; Trewartha 1954).

This results in a monsoonal indraft of moisture blown into the desert by southerly and southeasterly winds across Mexico from the Gulf of Mexico. Much of this moisture precipitates on the windward slopes of the Sierra Madre de Occidental and the eastern Sonoran Desert before reaching the eastern Mojave Desert.

Moist air surging up the Gulf of California from the Pacific Ocean (Hales 1972, 1974; Huning 1978) is generally associated with tropical hurricanes off the west coast of Mexico and a cyclonic low in the Mojave Desert that draws moisture-laden marine air up the Gulf of California into the Colorado River valley and adjacent areas.

Hurricanes that form in the Pacific travel northeast toward the coast of Mexico, and as they do, their intensity generally diminishes into that of a tropical storm. Although tropical storms seldom directly affect southern California and the deserts, they occasionally travel far enough north to result in the influx of moist marine air into the desert. When a tropical storm moves into California, it brings widespread, intense precipitation throughout the deserts. In September, 1976, Kathleen was the first tropical storm to directly affect southern California in 37 years (Huning 1978). She brought 45 mm and 39 mm of rain to Mitchell Caverns, Providence Mountains, and Mountain Pass, Clark Mountain Range, respectively. A more intense rainfall resulted from tropical storm Doreen in August of the following year. She brought 152 mm and 57 mm to Mitchell Caverns and Mountain Pass respectively.

Because of latitude, the seasonal variation in temperature is large, but the temperatures are not extremely cold. Temperature also varies with the passage of storms and fronts and with diurnal fluctuations brought about by cold-air drainage, insolation, and radiation. Diurnal fluctuation is great because clear skies permit high insolation causing high daytime temperatures, and low humidity results in little retention of heat radiated from the ground during the night. Diurnal fluctuation is accentuated in enclosed valley floors that form cold-air sinks.

Climatological data for the higher ranges of the eastern Mojave Desert are available from only two weather stations—Mitchell Caverns State Park (34°56'N; 115°32'W) on the eastern slopes of the Providence Mountains at an elevation of 1326 m, and Mountain Pass (35°28'N; 115°32'W), south side of the Clark Mountain Range, 1440 m. These two stations have similar temperature and rainfall values and represent only a narrow band of the climatic range that occurs in the area of this study. To obtain estimates of climatic parameters for various plant communities, we have to resort to temperature and precipitation curves calculated from lapse rates. We have calculated lapse rates between Mountain Pass and Needles FAA AP (34°36'N; 114°37'W, elev. 279 m) and between Mountain Pass and Las Vegas WSO AP, Nevada (36°05'N; 115°10'W, elev. 659 m). Weather data for the

period of April, 1955, to December, 1980, were used for both Mountain Pass and Needles (U.S. Dept. Commerce 1955–1980) and the 20-year summary, 1950–1970, was used for Las Vegas (U.S. Dept. Commerce 1980). Major (1977) also calculated lapse rates between Mountain Pass and Las Vegas to determine the precipitation and potential evapotranspiration (PotE) rates for high elevations in the Clark Mountain Range, but Rowlands (1978) preferred to use Mountain Pass and Needles because these two stations have unimpeded air drainage and Las Vegas has slightly cooler temperatures because of a cold-air sink. Rowlands is perhaps correct with regard to temperature, but Las Vegas and Mountain Pass probably provide more accurate precipitation rates because of similar distances from the source of moisture-laden air. Our results for temperature and precipitation are graphed in Fig. 5 and 7. From mean monthly temperature data for Needles, Las Vegas, and Mountain Pass and estimated mean monthly temperatures from lapse rates calculated for 1000, 1700, and 2100 m, PotE rates were calculated using Thornthwaite's equations (1948). PotE rates are graphed in Fig. 7 and are slightly different from values in Major (1977) and Rowlands (1978) because they are based on temperature values calculated for different time periods.

The distribution of precipitation is bimodal with peaks in summer and winter (Fig. 2). This rainfall pattern is characteristic of the eastern Mojave Desert (Huning 1978) and is intermediate between the summer precipitation of regions to the east (Chihuahuan Desert) and the winter precipitation of the Pacific Coast to the west. Mountain Pass, as well as nearby weather stations, Las Vegas and Searchlight, Nev. (35°28'N; 114°55'W; U.S. Dept. Commerce 1980) and Needles, Calif., receive 33% of their yearly rainfall in July, August, and September. Mitchell Caverns receives slightly less, 25% for the same period. Summer rainfall diminishes westward as the distance from the source of summer moisture increases. Barstow in the central Mojave Desert receives 20% and the town of Mojave in the western Mojave Desert receives only 5% for the same period. Yearly averages can be misleading because precipitation varies considerably from year to year (Fig. 3 and 4). Mountain Pass averages 202 mm per year with a maximum of 361 mm for the rainy season of July, 1977, to June, 1978, and a minimum of 93 mm in 1975–76. Mitchell Caverns averages slightly more at 229 mm per yr with a maximum of 753 mm in 1979–80 and a minimum of 121 mm in 1966–67 and 1970–71. Precipitation is estimated at 140 mm at the lowest elevations of our study and 340 mm at the highest elevations. Precipitation amounts for other elevations and zonal plant communities can be estimated from the lapse rates in Fig. 6 and 7.

The yearly temperature for Mountain Pass averages 13.6 C while Mitchell Caverns averages 17 C. January is the coldest month with a mean temperature of 4.3 and 7.6 C for Mountain Pass and Mitchell Caverns respectively, and July is the hottest month with a mean of 26.5 C for Mountain Pass and

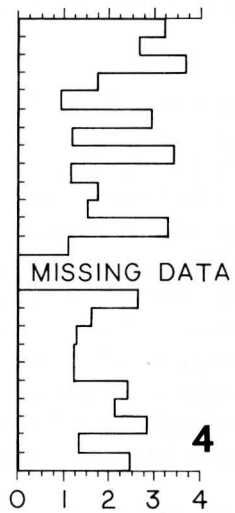
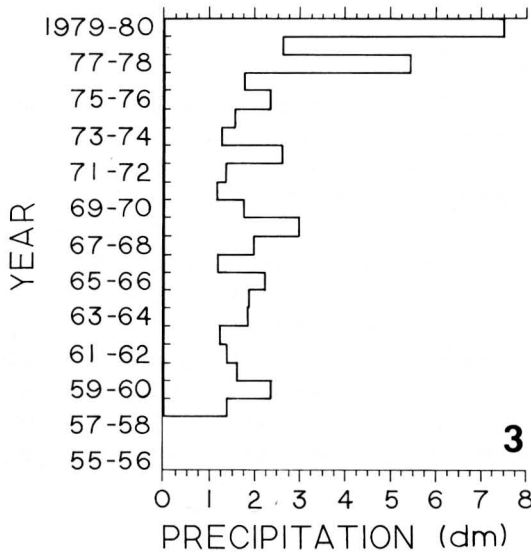
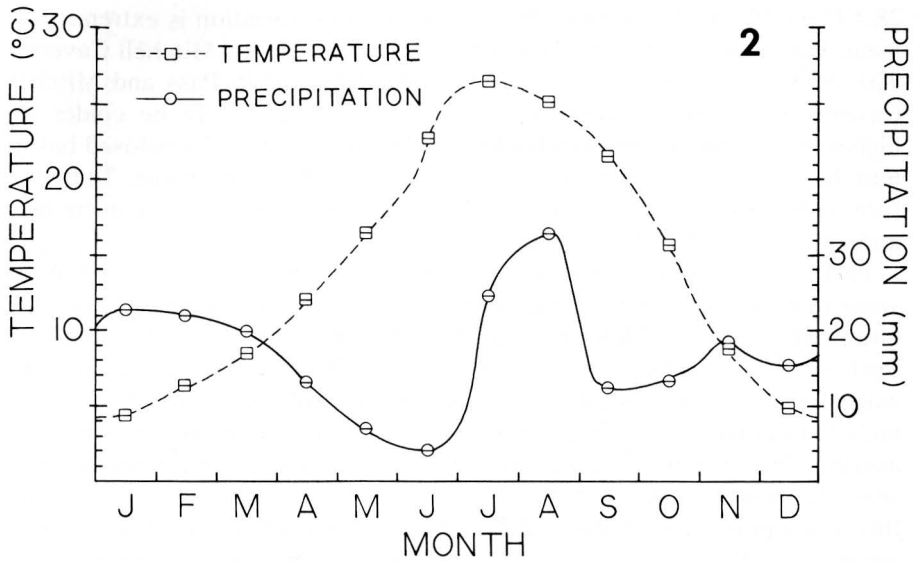


Fig. 2-4. Weather data.—2. Monthly mean precipitation and temperature for Mountain Pass, Clark Mountain Range.—3. Yearly (July to June) rainfall totals for Mitchell Caverns, Providence Mountains.—4. Yearly (July to June) rainfall totals for Mountains Pass, dimensions for abscissa and ordinate as in Fig. 3.



28.4 C for Mitchell Caverns. Diurnal temperature variation is extreme with mean values of 13.6 C for Mountain Pass and 10.2 C for Mitchell Caverns. The growing season is 196 and 234 days for Mountain Pass and Mitchell Caverns respectively. Temperature regimes will generally be colder for higher elevations and warmer for lower elevations although enclosed basins may have greater diurnal variation because of cold-air drainage. Temperature means for other elevations and zonal plant communities can be estimated from Fig. 5 and 6.

PotE rates provide an index of thermal efficiency and when given in the same units as precipitation, the index relates thermal efficiency to precipitation effectiveness (Thornthwaite 1948). Comparison of precipitation with PotE yields water deficiency (aridity) when PotE exceeds precipitation and water surplus when precipitation exceeds PotE. Although Thornthwaite also included actual evapotranspiration (ActE) and available soil moisture, we assume that available soil moisture is completely depleted between rainy seasons, thus resulting in ActE equaling precipitation. For lower elevations this assumption is probably valid, but at high elevations, perhaps pinyon-juniper woodland and above, this may be an oversimplification. Index of moisture ( $I_m$ ) that is used in classifying climates in Thornthwaite's scheme is calculated by the equation:

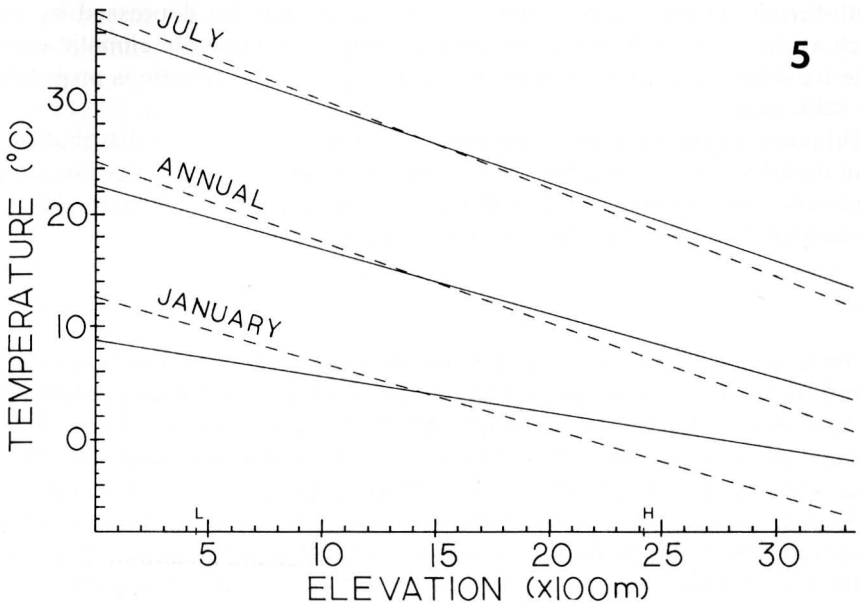
$$I_m = 100 [(precipitation/PotE) - 1]$$

Using values from the PotE curve (Fig. 7) and the above equation, the climate for various elevations can be classified. Thornthwaite and Mather (1955) classify climate as arid if  $I_m$  is less than  $-66.7$ , semiarid if  $I_m$  is greater than  $-66.7$  but less than  $-33.7$ , and dry subhumid if  $I_m$  is greater than  $-33.7$  but less than 0. Because PotE rates were calculated using data from exposed weather stations, our PotE rates are valid only for exposed areas and south-facing slopes. From our data, arid climates occur below about 1700 m and include blackbush scrub and lower communities. Above 1700 m the climate is semiarid and includes pinyon-juniper woodland and juniper-sage scrub and other communities of similar elevation or higher. North-facing slopes undoubtedly have lower PotE than south-facing slopes, and based on differences between elevational limits of plant communities on north- and

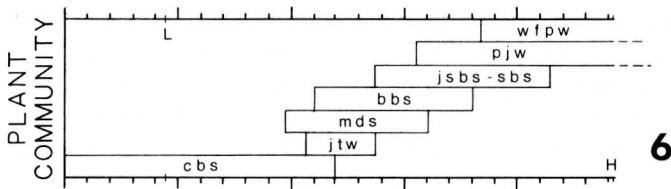
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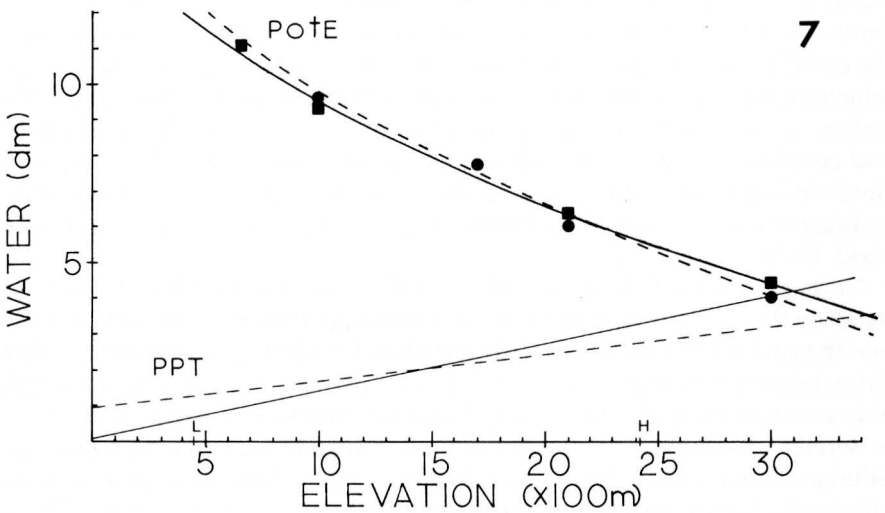
Fig. 5-7.—5. January, July, and annual mean temperature lapse rates for Needles and Mountain Pass (dashed lines) and for Las Vegas and Mountain Pass (solid lines). 'H' marks highest elevation in region and 'L' marks lowest elevation.—6. Elevational range of zonal communities, abbreviations as in text, abscissa has same dimensions as Fig. 6 and 7.—7. Regression of potential evapotranspiration (PotE) versus elevation and precipitation (PPT) versus elevation based on data for Needles and Mountain Pass (dashed lines) and for Las Vegas and Mountain Pass (solid lines).



5



6



7

south-facing slopes, the arid-semiarid boundary may be depressed by as much as 300 m to 1500 m on north-facing slopes. No reliable climatic estimate for white fir-pinyon woodland is available, but the climate is probably dry subhumid.

Although regional and local climate is very important in plant distribution, plant distribution is also dependent on the substrate structure, texture, and chemistry, microfauna and microflora of the soil, and microclimate. These are factors that have been poorly studied in the deserts.

## GEOLOGY

The geology of the higher ranges of the eastern Mojave Desert is very complex. Thrust faulting and folding, compression and extension, and uplifting and sinking have created chaos out of the stratigraphic column. Formations range in age from Precambrian to Holocene and include metamorphic, sedimentary, and intrusive and extrusive igneous rocks. The various rock types provide a diversity of substrates and habitats that contribute to the floristic diversity of the region and account for some plant distributions.

The oldest rocks exposed in the region are Precambrian metamorphic and igneous rocks that Lanphere (1964) dated at about 1.65 billion yr B.P. These rocks represent the continental margin of middle Precambrian North America and comprise much of the Providence, northern New York, Ivanpah, and Mesquite Mountains, Clark Mountain and Kingston Ranges, and possibly the Granite Mountains (Hazzard 1954; Hewett 1954; Cahn and Gibbons 1979). The contorted and highly complex character of the rocks and the large amounts of intruded granite suggest that this was a period of mountain building (Oakeshott 1971). After a long period of erosion, a marine trough formed in the Death Valley region and marks the beginning of a sinking of the earth's crust that probably continued into the Paleozoic. Into this trough, which included portions that are now the Kingston Range, about 2000 m of sediments were deposited and formed limestone, dolomite, shale, quartzite, and conglomerate rocks of the Pahrump Group. Following sedimentation of the Pahrump Group, there was a period of tilting, uplift, and erosion before sedimentation resumed in late Precambrian and early Cambrian Time (Oakeshott 1971).

During the early Paleozoic, sinking of the earth's crust formed a miogeosyncline throughout most of the Basin and Range Province. Seas encroached and the eastern Mojave Desert was a shallowly submerged continental shelf. From late Precambrian to Silurian deposition of marine sediments was probably continuous. Uplifting in early Devonian interrupted sedimentation and resulted in erosion, presumably accounting for the lack of Ordovician and Silurian formations in the eastern Mojave Desert. Sedimentation resumed after early Devonian and continued until Permian or Triassic (Fleck 1970).

All sediments of the Paleozoic are marine and include primarily limestone and dolomite, some shale, and very little sandstone. Total thickness of the sedimentary deposits in some areas of the Great Basin is between 10,000 and 15,000 m. Except for a marine incursion in the early Triassic, the late Permian deposits mark the end of Marine deposits in the region (Fleck 1970; Armstrong 1968). Paleozoic marine deposits, primarily of calcareous rocks, comprise much of the Providence and Mescal Mountains, the main mass and northeastern area of the Clark Mountain Range, most of the Mesquite Mountains, and parts of the New York Mountains around Caruthers and Keystone Canyons, and the northern area of the Kingston Range (Hazzard 1954; Hewett 1954).

Mesozoic geology of California is dominated by subduction of the East Pacific Plate (Farallon Plate) beneath the North American Plate (Hamilton 1969; Atwater 1970; Scholz et al. 1971; Burchfiel and Davis 1972) although Hill (1971) disagrees that global plate tectonics can be applied to the geology of the Great Basin. Seafloor spreading at the East Pacific Rise was the driving force to the subduction which resulted in compression of the North American Plate in the region of the Great Basin (Atwater 1970; Scholz et al. 1971) and the formation of the Sevier Orogenic Belt. This belt extended from eastern California to southern Wyoming and was characterized by thrust faulting and folding caused by compression. Subduction also resulted in considerable igneous activity. The granitic plutons of the Granite Mountains, Mid Hills, most of the New York and Ivanpah Mountains, and the Kingston Range are of Mesozoic age (Cahn and Gibbons 1979; Hazzard 1954; Hewett 1954). This was an era of erosion of uplifted mountains and sedimentation into valleys although almost no sedimentary deposits of Mesozoic age are exposed in the eastern Mojave Desert.

In the Cenozoic, not earlier than 30 million yr B.P. (Atwater 1970), the North American Plate overrode and annihilated the East Pacific Rise and eliminated the driving force of compression. This resulted in the release of compressional stress in the Great Basin and allowed the region to spread out laterally, producing crustal extension, Basin and Range faulting, and basaltic volcanism (Scholz et al. 1971). Tertiary volcanism began about 22 million yr B.P. in the beginning of the Miocene (Armstrong and Higgins 1973) and basalt or rhyolite of Tertiary age compose parts of the Providence Mountains, Mid Hills, and northern New York Mountains (Hazzard 1954; Hewett 1954). Based on deformation of Tertiary formations, McKee et al. (1970) suggest that most Basin and Range faulting took place in late Tertiary and accounts for the uplift of the ranges and downsinking of the valleys that characterize the Basin and Range Province. Fangulomerates of late Tertiary and Quaternary age and Quaternary lake beds represent the latest period of deposition of material eroded from mountains. Erosion and deposition were more intense during the pluvial periods of the Pleistocene than Holocene,

and older alluvial fans of Pleistocene age occur in the Granite, New York, and Ivanpah Mountains and the Clark Mountain Range.

Water is the primary erosional agent and has resulted in several geomorphic features that are characteristic of deserts. One of the larger features is the alluvial fan, a slope comprised of particles ranging in size from clay to boulders that have been sorted out along the gradient so that steeper, upper slopes have larger particles and lower slopes have finer particles. Throughout our area, erosion has been extensive and alluvial fans have coalesced into bajadas. These bajadas are dissected by water courses that are generally deeply cut and composed of coarse particles on the steep, upper slopes of the alluvial fan below mouths of canyons. These upper water courses are arroyos which also occur in wide canyons of the mountains. Water courses of the gentler, usually lower slopes of the bajadas are generally sandy and are not deeply incised into the bajada. These water courses are washes and form a dendritic pattern over the lower bajada slopes. Another water-eroded feature, which is primarily in granitic canyons, is the tenaja, a depression where water collects during rain storms and is very important as a watering hole for wildlife.

Wind is an ever present feature of the desert arising primarily from the prevailing westerlies or high pressure over the Intermountain Region. Although wind is not the primary erosional force, two desert features, desert pavement and sand dunes, result from the action of wind. Desert pavement results from deflation of fine particles leaving a tightly packed surface of rocks and stones. These pavements have not been worked by water for thousands of years as evidenced by the desert varnish on the surface of the rocks and stones. Sand deposits occur where winds of sufficient velocity to transport particles slow down and drop their suspended particles. Dunes usually occur on the leeward side of passes and ridges, topographic features that compress moving air masses and result in higher wind velocities. After passing these features, the air mass expands and wind velocity slows resulting in the deposition of particles. The largest sand dunes in the Mojave Desert are the Kelso Dunes which attain a height of more than 300 m above the valley floor. Smaller sandy areas commonly occur throughout the desert as at Coyote Holes along the Kingston Wash.

#### PLANT COLLECTING IN THE EASTERN MOJAVE DESERT

The first botanists to collect in the eastern Mojave Desert ranges appear to be T. S. Brandegee and Marcus E. Jones who explored in the Providence Mountains in 1902 and in 1906 respectively. K. Brandegee and T. Stith collected in the New York Mountains in 1911 and W. L. Jepson was in the New York Mountains in 1913, while S. B. Parish visited the Ivanpahs in 1915. P. A. Munz with I. M. Johnston and R. D. Harwood collected in the

Bonanza King Mine area of the Providence Mountains in 1920. E. C. Jaeger botanized in the Clark Mountains in 1925 and collected there many times in 1930 and 1931 and expanded his efforts into the Ivanpah and Granite Mountains and Kelso Dunes in later years. F. W. Peirson collected in the Clark Mountains in 1927 and 1945 and in the Ivanpah Mountains in 1930. Roxana Ferris was in the Clark Mountain Range and Reino Alava was in the Providence Mountains in 1928. In 1930 V. Newson and M. Hilend visited the Kelso Dunes and R. Hoffman collected in the Providence Mountains.

Really intensive collecting in the eastern Mojave ranges, however, began in 1932 when Carl B. Wolf of Rancho Santa Ana Botanic Garden began his studies of the flora of the eastern ranges with the ultimate intention of publishing a flora of the area. He botanized in the Ivanpahs in 1932, the New York Mountains in 1932, 1937, and 1940, the Kingston Range in six different trips between 1935 and 1941, the Clark Mountain Range during at least six trips between 1935 and 1941, the Providence Mountains in 1937 and 1941, the Mid Hills in 1940, and the Kelso Dunes and Granite Mountains in 1941. He collected with A. Chickering in 1940, I. M. Johnston and P. C. Everett in 1936, and with R. Wertheim, L. Abrams, and W. L. Jepson on different trips in 1941. P. A. Munz, with his associates, also did considerable collecting in the Clark, New York, and Kingston Mountains and Mid Hills between 1932 and 1952. J. C. Roos, often with L. or A. R. Roos, also collected rather heavily in the eastern ranges between 1937 and 1950, with special attention paid to the Clark, Kingston, Providence, and New York mountain ranges. Mary Beal took many specimens, especially from the Providence Mountains, between 1937 and 1951.

Between 1940 and 1970 many other botanists collected in these ranges. Listed chronologically they include: Mr. and Mrs. H. J. Ramsey, C. L. Hitchcock, F. W. Gould, B. D. Stark, K. C. Hughes, A. M. Alexander and L. Kellogg, R. S. Woglum, Alice Eastwood and J. T. Howell, H. D. Ripley and R. C. Barneby, R. J. Weatherby, G. R. Campbell, L. Benson, H. G. Rush, L. Constance and G. Gillett, R. Bacigalupi and L. T. Dempster, J. R. Haller, R. M. Straw, E. K. Balls and P. C. Everett, A. H. Kotecha, C. B. Hardham, E. R. Blakeley, F. Ehrendorfer, C. and A. Bonner, J. Peñu-losa, D. E. Breedlove, P. H. Raven, R. Moran, W. Gorelick, W. Klein, D. Gregory and K. Alt, and T. H. Mortenson.

Intensive collections were made in the Granite Mountains during a survey of the flora by H. J. Thompson and his taxonomy class from U.C.L.A. in the early 1970's. J. Henrickson began collecting in the Providence and Clark Mountains in 1970 and in 1972 B. Prigge began his survey of the flora of the Clark Mountains. In 1973, R. F. Thorne and J. Henrickson began active collecting for this flora. Since that time the three authors have each made thousands of collections in the eastern ranges, independently or often jointly

or with other associates. It is estimated that 10,000 to 12,000 collections from these ranges have been studied for this flora.

In recent years several floristic studies have been completed on these ranges. K. C. Hart, B. A. Stein, and S. F. Warrick in March through June and again in September, 1978, as part of the Environmental Field Program team of students from the University of California, Santa Cruz, made a thorough investigation of the flora and vegetation of the Granite Mountains. Similarly in 1980 another team of students, S. Castagnoli, G. de Nevers, and R. D. Stone, in the same program, made a similar resource survey of the Kingston Range. Our own collections in this range and the Clarks have continued until September of 1980 and the spring of 1981.

Floras have now been prepared for the Clark Mountain Range (Prigge 1975), Granite Mountains (Hart, Stein, and Warrick 1979), and the Kingston Range (Castagnoli, de Nevers, and Stone 1981). The Kelso Dunes and Providence and New York Mountains have been heavily botanized over the years and are perhaps nearly as well covered as the above ranges. The Mid Hills, Ivanpah-Mescal, and Mesquite ranges remain less thoroughly collected. Additional taxa will undoubtedly be found in these areas as collecting continues.

#### PLANT COMMUNITIES

Several species of conifers and woody flowering plants in the mountain ranges and bajadas of the eastern Mojave Desert are remarkable for their conspicuousness or their degree of dominance in certain habitats. Usually other plants of similar ecological tolerances are associated with these taxa and form associations that many botanists have termed plant communities. While it is realized that each taxon has its own distribution pattern resulting from varying amplitude of tolerance toward ecological factors and the vagaries of chance and geological and climatic history, those taxa with similar edaphic, climatic, and altitudinal tolerances commonly form aggregations over broad regions. It becomes useful to recognize these associations as plant communities. That the dominant species often have distribution patterns that exceed a given habitat and community makes the recognition of these communities more difficult and their classification admittedly more subjective.

The classification of floristic plant communities of the eastern Mojave ranges presented here is based primarily upon our field work in the eastern Mojave Desert since 1973 and upon a paper by Thorne (1979). We also have borrowed rather heavily from discussions of desert plant communities by Beatley (1976), Brown and Lowe (1974), Castagnoli, de Nevers, and Stone (1981), Cheatham and Haller (1975), Hart, Stein, and Warrick (1979), Henrickson (1980), Holstein (1980), Johnson (1976), Munz (1974), Munz and

Keck (1959), Prigge (1975), Thorne (1976), Twisselmann (1967), Vasek and Barbour (1977), Vasek and Thorne (1977), and Young, Evans, and Major (1977). We hope that this classification of desert plant communities, despite its largely qualitative basis, will be helpful to other botanists. It pertains, of course, only to this region.

The communities will be discussed zonally from the highest to lowest elevation with the azonal (edaphic, wash, spring and seep, streamside, and ruderal) aggregations following the zonal communities. The names of these communities combine floristic, physiognomic, and physiographic designations relying most heavily on the most conspicuous aspect of the community. For each community a minimum of ecological and distributional information and some discussion of dominant or other conspicuous species will be followed by lists of the taxa most characteristic of that plant community. Some taxa are restricted to a particular community. Other taxa, with greater ecological amplitude of tolerance, occur in several communities. More complete lists of species in each community can be gleaned from the annotated checklist.

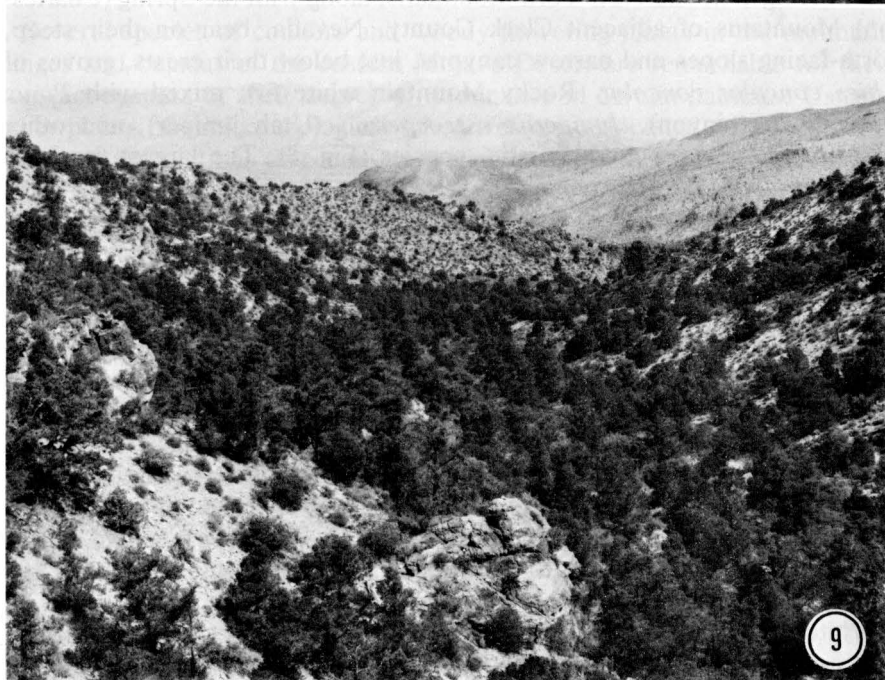
### White Fir-Pinyon Woodland

Three of the higher ranges of the eastern Mojave Desert in California, the Clark, Kingston, and New York Mountains, along with the Spring (Charleston) Mountains of adjacent Clark County, Nevada, bear on their steep, north-facing slopes and narrow canyons, just below their crests, groves of *Abies concolor concolor* (Rocky Mountain white fir), mixed with *Pinus monophylla* (pinyon), *Juniperus osteosperma* (Utah juniper), and other smaller, but no less characteristic, species (Fig. 8). The largest firs have been measured (Henrickson and Prigge 1975) at 71–87 cm dbh and 17–20 m in height, with ages estimated at 250 to 430 years. The pinyons and junipers also attain considerable size, being larger here than in surrounding pinyon-juniper woodlands.

This subhumid, montane, coniferous, open woodland seems to have adequate moisture and is protected during much of the day from the direct rays of the sun. Snow patches often remain on the ground under the firs until late April, and in some years until mid June. Precipitation for the year is estimated to range from 230 to 320 mm but doubtfully exceeds potential evapotranspiration. Potential evapotranspiration for this community, which has an altitudinal range in the Clark Mountains from about 1825 to 2345 m, is probably much lower than that indicated in Fig. 7. The woodland occurs on either limestone or granitic substrates and probably totals less than 100 hectares on the three California ranges.

White fir-pinyon woodlands differ from the pinyon-juniper woodlands of adjacent, more exposed slopes and crests by the presence of the dominant





fir and a variety of shrubby and herbaceous perennial species poorly represented in or entirely absent from the more xeric woodland. The most characteristic of these mesic species are the shrubby (rarely more than 2 m in height) *Acer glabrum diffusum*, *Amelanchier utahensis covillei*, *Chrysothamnus viscidiflorus viscidiflorus*, *Fendlerella utahensis*, *Forsellesia pungens*, *Fraxinus anomala*, *Holodiscus microphyllus microphyllus*, *Leptodactylon pungens hallii*, *Opuntia erinacea*, *Philadelphus microphyllus stramineus*, *Ribes cereum*, *R. velutinum*, *Sambucus caerulea*, and *Symphoricarpos longiflorus* and the herbaceous *Aquilegia shockleyi*, *Carex brevipes*, *Erigeron uncialis*, *Eriogonum panamintensis panamintensis*, *Galium hildendiae kingstonense*, *Halimolobos diffusa jaegeri*, *Heuchera rubescens pachypoda*, *Ivesia jaegeri*, *Lomatium parryi*, *Oryzopsis micrantha*, *Potentilla patellifera*, *Sedum niveum*, *Sitanion longifolium*, and *Woodsia oregana*. We have collected at least 66 species in this plant community. Further discussion of this montane woodland can be found in Beatley (1976), Bradley and Deacon (1967), Castagnoli, de Nevers, and Stone (1981), Henrickson and Prigge (1975), Miller (1940), Prigge (1975), Thorne (1979), and Vasek and Thorne (1977).

### Pinyon-Juniper Woodland

All the higher eastern Mojave ranges in California, whether granitic or calcareous, bear on their dry, rocky, upper slopes, mostly from about 1550 m to the summits, a low, usually open coniferous woodland visually dominated by *Pinus monophylla* and *Juniperus osteosperma* (Fig. 9). Rarely do these small trees exceed a height of 7 or 8 m. At higher elevations in the New York Mountains there exists a two-needled population of a pinyon which grades into the widespread one-needle pinyons at about 1800 m. Although no definitive analysis has been made of this population, it is treated here as a two-needled race of *Pinus monophylla* (Lanner 1974) instead of a population of *P. edulis*, as has been done by most California authors. In the Granite Pass area in the lower parts of the Granite Mountains is another species of juniper, *Juniperus californica*. The pinyons and junipers are commonly parasitized respectively by the mistletoes *Arceuthobium divaricatum* and *Phoradendron juniperinum*.

The flora of the pinyon-juniper woodland is relatively rich in shrubs, cacti, and perennial herbs; annuals are, as in the more mesic white fir-juniper

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Figs. 8-9.—8. White Fir-Pinyon woodland on north slope of Clark Mountain in Clark Mountain Range at 2100 m, showing *Abies concolor concolor* and *Pinus monophylla* among patches of snow on ground in April.—9. Pinyon-Juniper Woodland from 1700 to 2000 m in lower Fir Canyon on north slope of Clark Mountain.

woodlands, rather few and inconspicuous. We have listed at least 325 additional species, not counting the calcicoles and other members of azonal communities within the extensive pinyon-juniper woodlands. Only a few of the more characteristic species, however, are mentioned here. They include the following shrubby species: *Amelanchier utahensis*, *Artemisia nova*, *A. tridentata tridentata*, *Cercocarpus ledifolius*, *Chrysothamnus depressus*, *C. nauseosus hololeucus*, *Cowania mexicana stansburiana*, *Ephedra viridis*, *Eriogonum umbellatum ferrissii*, *E. wrightii wrightii*, *Fallugia paradoxa*, *Forsellesia nevadensis*, *Garrya flavescens flavescens*, *Gutierrezia sarothrae*, *Haplopappus linearifolius*, *H. cuneatus*, *Holodiscus microphyllus microphyllus*, *Nolina wolfii*, *Opuntia erinacea*, *Prunus fasciculata*, *Purshia glandulosa*, *Rhamnus ilicifolia*, *Rhus trilobata anisophylla*, *Salvia pachyphylla*, *Tetradymia argyreae*, *T. canescens*, and *Yucca baccata baccata*. Herbaceous species include: *Arabis perennans*, *Asclepias asperula*, *Caulanthus major*, *Chamaesyce fendleri*, *Dalea searlsiae*, *Eriogonum panamintense panamintense*, *Euphorbia incisa*, *Galium munzii*, *Hymenopappus filifolius eriopoda*, *Lesquerella kingii latifolia*, *Lithospermum incisum*, *Linum lewisii*, *Oenothera caespitosa*, *Orobanche fasciculata*, *Pellaea truncata*, *Penstemon bridgesii*, *P. eatonii*, *Poa fendleriana*, *P. scabrella*, *Sitanion longifolium*, *Stipa parishii*, *S. speciosa*, and *Streptanthus cordatus*. Various annuals are present, though not conspicuously so, among them species of *Astragalus*, *Cryptantha*, *Gilia*, *Mentzelia*, *Nemophila*, *Phacelia*, *Thysanocarpus*, and *Vulpia*.

Further information on the pinyon-juniper woodlands of the eastern Mojave Desert and their more important components can be obtained from Bradley and Deacon (1967), Castagnoli, de Nevers, and Stone (1981), Hart, Stein, and Warrick (1979), Lanner (1974), Mooney (1973), Prigge (1975), Reveal (1944), Roof (1978), Thorne (1976, 1979), Trombulak and Cody (1980), Twisselmann (1967), Vasek (1966), Vasek and Thorne (1977), Wells and Berger (1967); and West, Rea, and Tausch (1975).

A plant community essentially identical with the preceding woodland except for the absence of junipers can be found on steep, exposed, volcanic slopes of the Providence Mountains mostly on rhyolite. This is notable in the vicinity of Mitchell Caverns State Park. It is here designated as pinyon woodland.

### Pinyon-Juniper-Oak Woodland

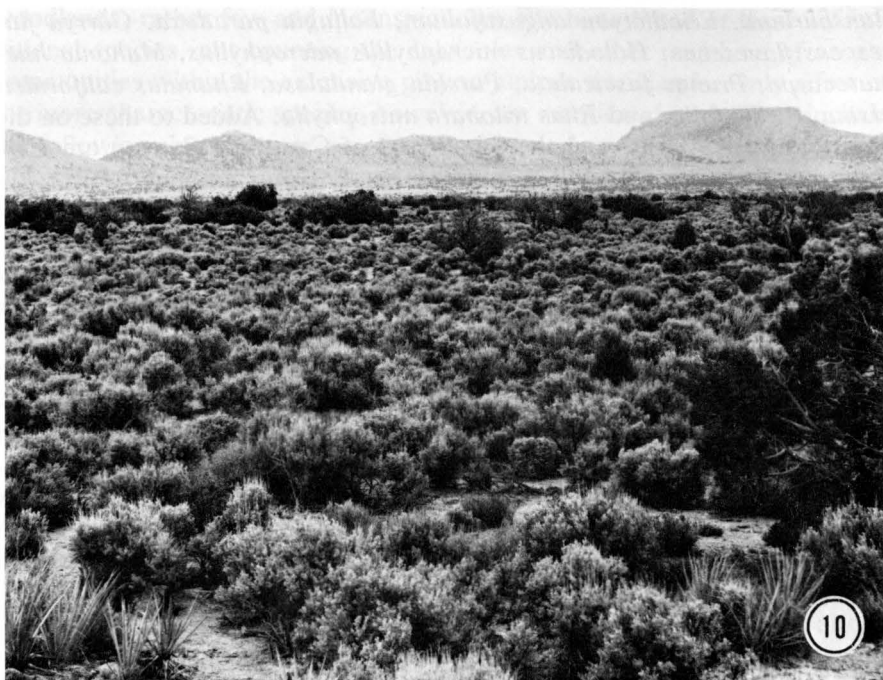
In the New York Mountains, especially in Caruthers and Keystone Canyons, is a special form of pinyon-juniper woodland much enriched by the addition, or greater abundance, of *Quercus chrysolepis*, *Q. turbinella*, and such desert-transition chaparral species as *Amelanchier utahensis covillei*, *Arctostaphylos pungens*, *Ceanothus greggii vestitus*, *Cowania mexicana*

*stansburiana*, *Eriodictyon angustifolium*, *Fallugia paradoxa*, *Garrya flavescens flavescens*, *Holodiscus microphyllus microphyllus*, *Mahonia haematocarpa*, *Prunus fasciculata*, *Purshia glandulosa*, *Rhamnus californica ursina*, *R. ilicifolia*, and *Rhus trilobata anisophylla*. Added to these on the limestone in Keystone and the upper part of Caruthers Canyon are *Cercocarpus intricatus*, *Forsellesia nevadensis*, *Fraxinus anomala*, *Petrophytum caespitosum*, *Philadelphus microphyllus stramineus*, and *Symphoricarpos longiflorus*. This enriched pinyon-juniper-oak woodland reaches to New York Peak (2241 m) where the two-needle phase of *Pinus monophylla* occurs along with *Juniperus osteosperma*. One can speculate that this rich flora of woody species, perennial herbs, and rupicolous ferns (MacNeill, Brophy, and Smith 1978) may result from a fortuitous combination of both granitic and calcareous substrates, elevation, and greater than usual moisture available in the two canyons as indicated by the intermittent stream in Caruthers Canyon and Keystone Spring in Keystone Canyon. The two canyons together perhaps support the richest flora (at least 273 indigenous species) of any two adjacent canyons in all the eastern Mojave ranges. Some discussion of desert chaparral can be found in Bradley and Deacon (1967), Hanes (1977), Thorne (1976, 1979) and Vasek and Thorne (1977).

### Juniper-Sagebrush Scrub

In the Pinto and Gold Valleys at about 1770 m between the Mid Hills and New York Mountains below the pinyon-juniper woodland is an extensive flat of *Artemisia tridentata tridentata* (Great Basin sagebrush) with conspicuous *Juniperus osteosperma* scattered through the sagebrush (Fig. 10). Presumably this is a phase of sagebrush scrub. Few species seem to be restricted to this community. No *Artemisia tridentata* was collected east of the Pinto Valley and lower Fourth of July Canyon in the rest of the New York Mountains nor was any found in the Clark Mountains. In these ranges and the Providence Mountains the Great Basin sagebrush seems to be replaced completely by *Artemisia nova*. Elsewhere in our ranges *A. tridentata* seems to be restricted to the Granite Mountains and Kingston Range well to the west and north.

Among the shrubby species collected in this juniper-sagebrush scrub were *Atriplex canescens*, *Ceratoides lanatum*, *Echinocereus engelmannii chrysoctrus*, *E. triglochidiatus mojavensis*, *Lycium andersonii*, *L. cooperi*, and *Phoradendron juniperinum juniperinum*. Somewhat more numerous were the herbs *Astragalus cimae cimae*, *A. lentiginosus fremontii*, *Chorizanthe thurberi*, *Cryptantha circumscissa*, *Dalea searlsiae*, *Eriastrum eremicum*, *Haplopappus ravenii*, *Lessingia lemmonii*, *Linanthus bigelovii*, *Lotus humistratus*, *Lupinus flavoculatus*, *Machaeranthera canescens canescens*, *Menodora scoparia*, *Mirabilis bigelovii*, *M. coccinea*, *M. comata*,



*M. multiflora pubescens*, *M. pumila*, *Penstemon palmeri*, *P. thurberi thurberi*, *Phlox viridis compacta*, *Plantago purshii oblonga*, *Stephanomeria exigua*, *S. parryi*, and *Verbena gooddingii*, and an impressive number of annuals for this elevation. This community certainly has the richest *Mirabilis* flora in the eastern Mojave. Among the grasses noted were *Aristida fendleriana*, *Bouteloua eriopoda*, *B. gracilis*, *Hilaria jamesii*, and *Sporobolus cryptandrus*.

### Sagebrush Scrub

*Artemisia tridentata tridentata* (Great Basin sagebrush) has a limited development in the eastern Mojave desert ranges, being restricted largely to the granitic soils of the Kingston Range, Granite Mountains, and Mid Hills, especially the Pinto and Gold Valleys. In the Granite Mountains this sagebrush is merely a component of the pinyon-juniper woodland above 1370 m, as it is in much of the Kingston Range. In the Mid Hills and Pinto and Gold Valleys it forms a community with *Juniperus osteosperma*, as discussed above. Only in the Kingston Range does it form its own community, largely in shallow soils on rocky or gravelly slopes between 1370 and 2135 m (Castagnoli, de Nevers, and Stone 1981). It forms a rather monotonous, species-poor community with an abundance of *Purshia glandulosa* (bitterbrush) and *Chrysothamnus nauseosus hololeucus* (rabbit brush) and such other shrubs as *Artemisia dracunculus*, *Ephedra viridis*, *Eriogonum wrightii wrightii*, *Garrya flavescens flavescens*, *Opuntia erinacea*, *Rhus trilobata anisophylla*, and *Symphoricarpos longiflorus*. The few herbs include *Brickellia oblongifolia linifolia*, *Penstemon eatonii*, *Phlox viridis compacta*, *Senecio multilobatus*, *Sitanion longifolium*, and *Viguiera multiflora nevadensis*.

### Mixed Desert Scrub

Mostly below the pinyon-juniper woodland usually below 1600 m, on rocky, noncalcareous slopes, is a complex desert scrub (Fig. 11) that is an impressive mixture of plants displaying most of the varied desert growth forms: stem-succulent cacti, as species of *Echinocactus*, *Echinocereus*, *Ferocactus*, *Mammillaria*, and *Opuntia* (both chollas and prickly-pears); leaf semisucculents like *Agave*, *Yucca* and *Nolina* (only in the Kingston Range); leaf-succulents of the genus *Dudleya*; gymnospermous species of *Ephedra*;

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Figs. 10–11.—10. Juniper-Sagebrush Scrub in Gold Valley at 1600 m, with *Artemisia tridentata tridentata*, scattered *Juniperus osteosperma* and many associates.—11. Mixed Desert Scrub at Snake Springs in Granite Mountains, 1250 m, showing wide diversity of plants on granitic soils.

shrubby, often microphyllous, species of *Brickellia*, *Chrysothamnus*, *Encelia*, *Euphorbia*, *Eriogonum*, *Gutierrezia*, *Haplopappus*, *Keckiella*, *Larrea*, *Leptodactylon*, *Salvia*, *Sphaeralcea*, *Tetradymia*, *Thamnosma*, *Rhus*, *Viguiera*, and *Xylorhiza*; subshrubs and perennial herbs of such genera as *Arabis*, *Arenaria*, *Artemisia*, *Baccharis*, *Cryptantha*, *Cymopterus*, *Dyssodia*, *Galium*, *Lepidium*, *Lomatium*, *Lotus*, *Mirabilis*, *Monardella*, *Nicotiana*, *Penstemon*, *Physalis*, *Pleurocoronis*, *Porophyllum*, *Senecio*, and *Stephanomeria*; perennial grasses of the genera *Agropyron*, *Aristida*, *Bothriochloa*, *Bouteloua*, *Melica*, *Muhlenbergia*, *Poa*, and *Stipa*; rock-fern species of *Cheilanthes*, *Notholaena*, *Pellaea*, and *Pityrogramma*; and numerous annuals, especially of the genera *Astragalus*, *Cryptantha*, *Eriogonum*, *Eriophyllum*, *Filago*, *Gilia*, *Perityle*, *Phacelia*, *Pholistoma*, *Pterostegia*, and *Syntrichopappus*. There seem to be no recognizable dominants though stem-succulent cacti, as *Ferocactus* and the chollas, *Agave deserti*, *Yucca schidigera*, *Nolina wolffii*, and *Encelia farinosa* often stand out from the rest of the mixed desert scrub because of size, bizarre appearance, silvery foliage, or massive display of bloom.

This complex, open scrub of rocky slopes and thin, impoverished, residual sands and gravels among the granitic boulders is a phase of the desert rupicolous scrub and the equivalent on nonbasic substrates of the desert calcicolous scrub of limestones, dolomites, and other basic substrates. However unlike its azonal equivalent, mixed desert scrub does seem to be a zonal community, occupying a zone of varying elevational extent between and intergrading with, pinyon-juniper woodlands above and blackbush scrub, joshua-tree woodland, creosote bush scrub, or desert wash communities below. Henrickson (1980) found a similar scrub vegetation in the northern Mojave Desert near the Coso Mountains. He considered it to consist of components of either creosote bush or blackbrush scrub or Joshua tree woodland communities which continue into areas that lack the indicator species of other readily recognized communities. That is, they lack *Coleogyne*, *Larrea*, and Joshua trees. Thus a floristic-based community designation cannot be applied. Often these same species occur as quantitative dominants in the understory of adjacent stands of Joshua tree woodland or creosote or blackbush scrub. Castagnoli, de Nevers, and Stone (1981) set wide limits on this community in the Kingston Range from 975 to 2225 m. It is best developed in our area in the Kingston Range and Granite Mountains.

Although rather hard to define, this catch-all community has been recognized under a variety of names by different botanists, including arid shrub association in Kern County by Twisselmann (1967), complex desert scrub by Cheatham and Haller (1975), nonbasic rock plant and Colorado Desert semisucculent scrub by Thorne (1976), mixed desert scrub by Thorne (1976)

and Henrickson (1980), and *Nolina* woodland by Castagnoli, de Nevers, and Stone (1981). We think the name most descriptive for this aggregation should be a physiognomic one, as mixed desert scrub or complex desert scrub. Careful ecological investigation of this community throughout its observed range in both California deserts might well lead to the conclusion that this is a highly variable community that could be divided into several communities or subcommunities. Further information about this community can be obtained in the references listed above.

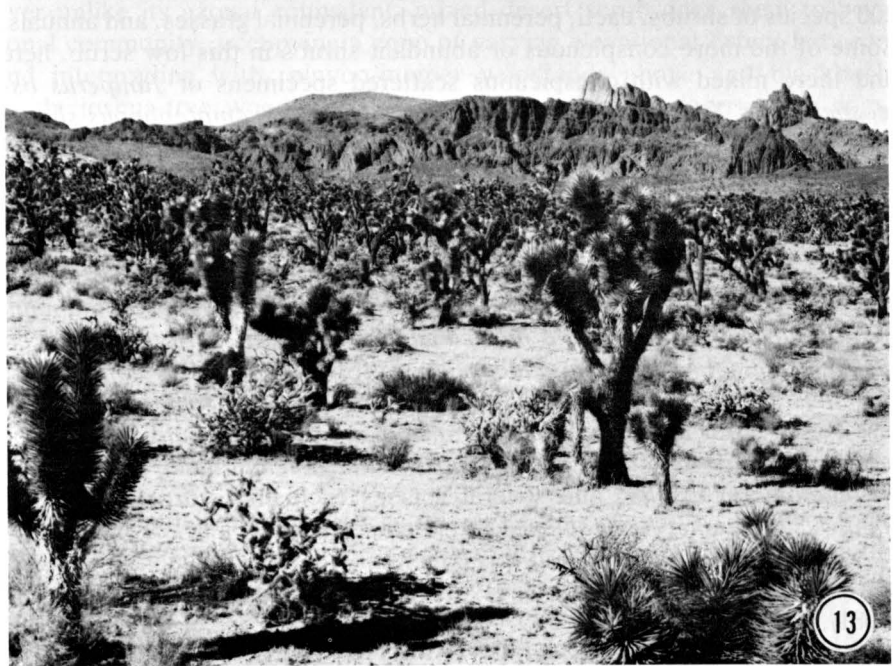
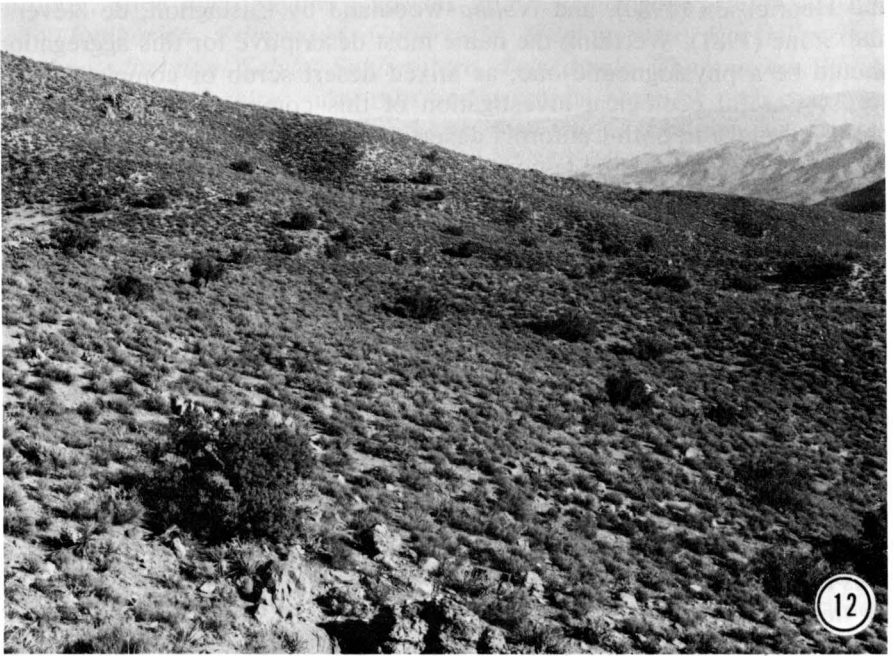
### Blackbush Scrub

An extensive, low, dark, monotonous scrub (Fig. 12), dominated by the rosaceous *Coleogyne ramosissima*, sometimes in apparently pure stands, occurs on shallow, rocky or gravelly, usually calcareous soils of flats and plateaux or relatively steep upper bajadas. It lies between the open coniferous woodlands or mixed desert scrub of the rocky mountain slopes above and the Joshua tree woodland or Creosote bush scrub on the sandier bajadas below. Mostly it lies between 1100 and 1800 m and on shallower, more stony soils than sagebrush scrub or Joshua tree woodland, which frequently overlap this elevational zone.

The composition of the blackbush scrub can be quite rich with at least 200 species of shrubs, cacti, perennial herbs, perennial grasses, and annuals. Some of the more conspicuous or abundant shrubs in this low scrub, here and there mixed with conspicuous scattered specimens of *Juniperus osteosperma* or *Yucca brevifolia jaegeriana*, include *Acamptopappus shockleyi*, *Agave utahensis nevadensis*, *Artemisia nova*, *Ceratoides lanatum*, *Cowania mexicana stansburiana*, *Echinocactus polycephalus*, *Ephedra nevadensis*, *Eriogonum fasciculatum polifolium*, *Grayia spinosa*, *Gutierrezia microcephala*, *Haplopappus cooperi cooperi*, *H. linearifolius*, *Krameria parvifolia*, *Menodora spinescens*, *Opuntia acanthocarpa coloradensis*, *O. echinocarpa*, *O. ramosissima*, *O. stanleyi*, *Petalonyx nitidus*, *Psorothamnus fremontii fremontii*, *Salazaria mexicana*, *Salvia dorrii dorrii*, *Sphaeralcea rusbyi eremicola*, *Tequilia canescens*, *Tetradymia spinosa longispina*, *Thamnosma montana*, *Yucca baccata baccata*, and *Y. schidigera*. Much less conspicuous are such herbs as *Amsinckia tessellata*, *Calochortus kennedyi*, *Phacelia distans*, *Porophyllum gracile*, *Prenanthes exigua*, and *Stephanomeria exigua*, and several species each of *Astragalus*, *Camissonia*, *Chorizanthe*, *Eriogonum*, *Gilia*, *Lotus*, *Lupinus*, and *Mentzelia*.

Additional information about this community can be obtained from Beatty (1976), Bradley and Deacon (1967), Castagnoli, de Nevers, and Stone (1981), Cheatham and Haller (1975), Prigge (1975), Thorne (1976, 1979), and Vasek and Barbour (1977).





## Joshua Tree Woodland

Rowlands (1978) has recently examined in great detail *Yucca brevifolia* and the Joshua tree woodlands described by many field botanists. He concluded that the community as such does not exist, that *Yucca brevifolia* is never quantitatively dominant in the community, and that the community is really a part of desert grassland or desert scrub steppe. If *Y. brevifolia jaegeriana* is never quantitatively dominant, it is very conspicuous and gives the appearance of an open, bizarre woodland on the looser, well-drained sandy or gravelly soils of mesas and slopes between 1065 and 1370 m (Fig. 13). Joshua tree woodland is an arid community with precipitation ranging from 150 to 200 mm while the potential evapotranspiration is 810 to 900 mm (Fig. 6, 7). Minimum temperatures for January average 4.5 C and mean maximum temperatures for July are 30 C. The yearly average is between 14.8 and 17.2 C for the upper and lower limits (Fig. 5, 6). Joshua trees extend upward into pinyon-juniper woodlands, sagebrush scrub, or blackbush scrub and downward into creosote bush scrub. In the community, *Y. brevifolia jaegeriana*, often several m in height, dominates in stature the numerous perennial grasses, shrubs, and cacti that abound. In good years the Joshua tree woodlands of the eastern Mojave Desert produce an abundance of grasses and showy annuals and do approach a desert grassland. Perhaps if these open woodlands had not been so badly overgrazed by cattle, there would be more grass cover and fewer shrubs and cacti. At least 240 species of vascular plants were found within the bounds of this community, including at least 15 different cacti of the genera *Coryphantha*, *Echinocactus*, *Echinocereus*, *Ferocactus*, and *Opuntia* and at least 20 grass species of *Aristida*, *Bouteloua*, *Bromus*, *Erioneuron*, *Hilaria*, *Oryzopsis*, *Muhlenbergia*, *Poa*, *Scleropogon*, *Sitanion*, *Sporobolus*, *Stipa*, and *Vulpia*. There is indeed much merit in Johnson's suggestion (1976) that the grassy woodland of *Yucca brevifolia jaegeriana* about the New York Mountains be called Joshua tree grassland. Most diverse, however, are the many shrubby species of such genera as *Acamptopappus*, *Ambrosia*, *Atriplex*, *Ceratoides*, *Coleogyne*, *Encelia*, *Ephedra*, *Eriogonum*, *Grayia*, *Gutierrezia*, *Haplopappus*, *Hymenoclea*, *Krameria*, *Lycium*, *Menodora*, *Polygala*, *Prunus*, *Salazaria*, *Salvia*, *Sphaeralcea*, *Tetradymia*, and *Yucca*. Less conspicuous are perennial herbs of the genera *Astragalus*, *Calochortus*, *Cas-*

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Figs. 12-13.—12. Blackbush Scrub on slopes below Colosseum Mine in Clark Mountain Range at 1500 m. *Coleogyne ramosissima* forms a monotonous scrub mixed with *Juniperus osteosperma*, *Yucca baccata*, and *Opuntia acanthocarpa*.—13. Joshua Tree Woodland showing portion of Castle Buttes in eastern New York Mountains in background and dense stand of *Yucca brevifolia jaegeriana* with *Opuntia acanthocarpa* and many other shrubs.

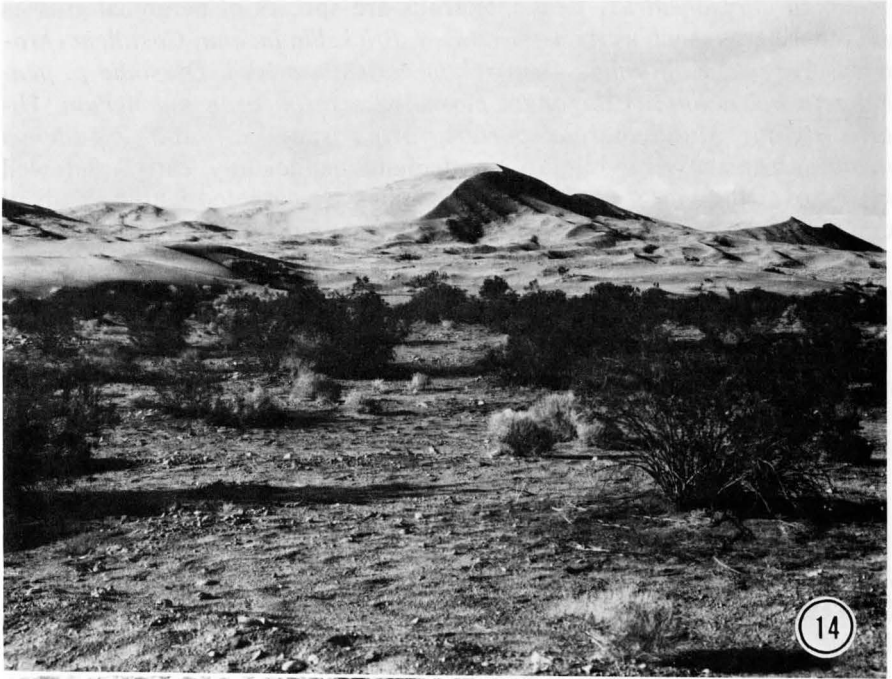
*tilleja*, *Cymopterus*, *Delphinium*, *Dichelostemma*, *Gaura*, *Hoffmannseggia*, *Leucelene*, *Lotus*, *Mirabilis*, and *Psilostrophe*. These grassy woodlands in wetter years are quite colorful with an abundance of annuals in the spring and sometimes in late summer or early fall after summer rains. In addition to the thesis by Rowlands (1978), more information about these woodlands in the eastern Mojave can be gleaned from Castagnoli, de Nevers, and Stone (1981), Henrickson (1980), Johnson (1976), Prigge (1975), Thorne (1979), and Vasek and Barbour (1977).

#### Creosote Bush Scrub

Creosote bush, *Larrea divaricata tridentata*, is ubiquitous on bajadas, flats, and basins with well-drained soils, and forms an open community (Fig. 14), generally below 1400 m, above which it is replaced by Joshua tree woodland, blackbush scrub, mixed desert scrub, or calcicolous scrub. Rainfall is meagre, usually less than 180 mm per year (Fig. 7) (Beatley 1976) and quite unreliable. Temperatures vary considerably, both seasonally and diurnally. Mean annual temperature is warmer than 15 C, and diurnal fluctuations are great within this community because cold-air drainage often forms lakes of cold air in basins. On lower bajadas and basins with finer soil texture and greater temperature extremes, *Larrea* may be the only conspicuous plant, up to 1.5 m tall, often widely and evenly spaced. With higher elevation on the upper bajadas with better cold-air drainage, and coarser soils with more available water, a rich flora of shrubs, perennial herbs, and, in moister years, a plethora of showy annuals are associated with creosote bush. We listed 290 species occurring in creosote bush scrub. Also conspicuous with the *Larrea* are *Ambrosia dumosa*, *Ephedra nevadensis*, *Krameria parvifolia*, *Lycium andersonii*, *Opuntia acanthocarpa*, *O. ramosissima*, and *Yucca schidigera*. Other conspicuous shrubs include species of *Acamptopappus*, *Atriplex*, *Encelia*, and other species of *Opuntia*. Other frequently encountered associates include *Amphipappus fremontii*, *Cassia armata*, *Ceratoides lanatum*, *Chrysothamnus nauseosus*, *Eriogonum fasciculatum polifolium*, *Grayia spinosa*, *Gutierrezia sarothrae*, *Haplopappus cooperi cooperi*, *Lepidium fremontii*, *Psilostrophe cooperi*, *Psoralea fremontii fremontii*, *Prunus fasciculata*, *Salazaria mexicana*, *Sphaeralcea ambigua*, *Stephanomeria pauciflora*, *Thamnosma montana*, *Xylorhiza tortifolia*, and such additional cacti as *Echinocactus polycephalus* and *Echinocereus en-*

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Figs. 14–15.—14. Creosote Bush Scrub with Kelso Dunes in background, showing scattered *Larrea divaricata tridentata* mixed with *Ambrosia dumosa* at 750 m.—15. Desert Wash Scrub in Cottonwood Canyon in Granite Mountains at 1300 m with *Chilopsis linearis* in center of wash associated with *Acacia greggii*, *Rhus trilobata anisophylla*, and *Prunus fasciculata*. Mixed Desert Scrub occurs on both sides of the wash.



*gelmannii chrysocentrus*. Less numerous are species of perennial grasses and other herbs, such as *Asclepias erosa*, *Brickellia incana*, *Castilleja chromosa*, *Cuscuta californica*, *Delphinium parishii parishii*, *Dyssodia p. pentachaeta belenidium*, *Eriogonum plumatella*, *Erioneuron pulchellum*, *Hilaria rigida*, *Muhlenbergia porteri*, *Stipa speciosa*, and *Zigadenus brevibracteatus*. When rainfall is adequate, sufficiently early, and well spaced over the season, the sandier openings are carpeted with myriads of annuals of numerous genera, including *Amaranthus*, *Amsinckia*, *Anisocoma*, *Astragalus*, *Atrichoseris*, *Bouteloua*, *Bromus*, *Camissonia*, *Chaenactis*, *Chamaesyce*, *Chorizanthe*, *Cryptantha*, *Descurainia*, *Eriastrum*, *Erodium*, *Eriogonum*, *Eriophyllum*, *Eschscholzia*, *Eucrypta*, *Geraea*, *Gilia*, *Langloisia*, *Layia*, *Linanthus*, *Lotus*, *Lupinus*, *Malacothrix*, *Mentzelia*, *Monoptilon*, *Nama*, *Nemacladus*, *Oligomeris*, *Oxytheca*, *Pectocarya*, *Phacelia*, *Pholistoma*, *Plantago*, *Rafinesquia*, *Stephanomeria*, *Streptanthella*, and *Syntrichopappus*.

Many botanists have published on the creosote bush scrub, including Beatley (1976), Bradley and Deacon (1967), Burk (1977), Castagnoli, de Nevers, and Stone (1981), Cheatham and Haller (1975), Hart, Stein, and Warrick (1979), Henrickson (1980), Prigge (1975), Thorne (1976, 1979), Twisselmann (1967), Vasek and Barbour (1977), and Wells and Hunziker (1976).

#### Desert Psammophytic Scrub

The desert dunes, at least the lower, stabilized dunes, bear on their slopes a psammophytic scrub, or desert dune sand plant community (Fig. 16), that is related, and transitional to, the sandier phases of the creosote bush and desert wash scrub. *Larrea divaricata tridentata* is often present and frequently is the most conspicuous plant in this community, which is distinguished by the large number of species restricted entirely or largely to desert dunes, though some are shared with adjacent sandy washes. In the area of our study this community is found mostly between 670 and 850 m at the Kelso Dunes and the Kingston Wash and Coyote Holes south of the Kingston Range. These areas are characterized by an accumulation of fine sand worked by the winds into large dunes. Among the most abundant and important plants on the more stabilized dunes, in addition to *Larrea*, are the sand-binding rhizomatous grasses like *Hilaria rigida* and *Panicum urvilleanum*, the bunch grass *Oryzopsis hymenoides*, the sometimes tree-sized *Chilopsis linearis* (desert-willow), and the perennial herbs, such as *Arge-*

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Figs. 16–17.—16. Desert Psammophytic Scrub on Kelso Dunes with *Larrea*, *Baileya pleni-radiata*, *Rumex hymenosepalus*, *Hilaria rigida*, and *Panicum urvilleanum*.—17. Desert Calicicolous Scrub on limestone outcropping with shrubs of *Mortonia utahensis* in foreground and rounded shrubs of *Eriogonum heermannii* in center with *Yucca schidigera* to left.



*mone corymbosa*, *Astragalus lentiginosus borreganus*, *Croton californicus mohavensis*, *Dalea mollis*, *Hesperocallis undulatus*, *Krameria* spp., *Mentzelia multiflora longiloba*, *Machaeranthera leucanthemifolia*, *Psoralea castorea*, *Rumex hymenosepalus*, *Stillingia spinulosa*, *Tequilia plicata*, and the root-parasitic *Pholisma arenarium* and *Orobanche cooperi*. In years of adequate rainfall the dunes can also be carpeted with such distinctive annuals as *Abronia micrantha*, *A. villosa*, *Achyronychia cooperi*, *Baileya pauciflora*, *Cycloloma atriplicifolia*, *Dithyrea californica*, *Eriogonum thurberi*, *Heliotropium convolvulaceum californica*, *Lupinus shockleyi*, *Nama depressum*, *Oenothera deltoides deltoides*, *Palafoxia arida arida*, and *Phacelia ivesiana*, along with some more widely distributed annuals. Although distinctive, the psammophytic flora is not a large one for we listed only 75 species as characteristic for the dunes.

Little attention has been given to the desert psammophytic scrub in transmontane California. Some further information, however, can be gleaned from Beauchamp et al. (1977), Bureau of Land Management (1976), Shreve (1951), and Thorne (1976, 1979).

#### Desert Wash Scrub

Among the azonal plant communities of this area the one closest to creosote bush scrub is the aggregation of plants found in the sandy bottoms of wide canyons, in incised arroyos across the upper bajadas, and in the sandy, abraded, shallow washes across the lower bajadas, all usually below 1525 m. It is a low shrubby community (Fig. 15) separable from the microphyll woodland of the Colorado Desert because of the paucity or absence of dominant, microphyllous trees. At only a few sites do the more conspicuous but usually scattered small trees or large shrubs of *Acacia greggii*, *Chilopsis linearis*, *Ephedra californica*, *Forestiera neomexicana*, *Mahonia haematacarpa*, and *Psorothamnus spinosus* grow densely and tall enough to be regarded as a microphyllous woodland. Almost everywhere in these ranges these larger woody species are scattered among and outnumbered greatly by the rather many shrubby species like *Ambrosia eriocentra*, *Artemisia dracunculus*, *A. ludoviciana albula*, *Atriplex canescens*, *A. polycarpa*, *Baccharis sergiloides*, *Bebbia juncea*, *Brickellia incana*, *B. multiflora*, *Cassia armata*, *Chrysothamnus paniculatus*, *Cleome isomeris*, *Encelia virginensis*, *Ephedra funerea*, *Eriogonum fasciculatum polifolium*, *Fallugia paradoxa*, *Hymenoclea salsola salsola*, *Larrea divaricata tridentata*, *Opuntia acanthocarpa coloradensis*, *Prunus fasciculata*, *Psorothamnus fremontii fremontii*, *Purshia glandulosa*, *Rhus trilobata anisophylla*, *Salazaria mexicana*, *Salvia dorrii dorrii*, and *Senecio douglasii monoensis*; the subshrubs and perennials like *Amsonia brevifolia*, *Argemone munita rotundata*, *Cirsium neomexicanum*, *Cucurbita palmata*, *Datura wrightii*, *Dyssodia coop-*

*eri*, *Nicolletia occidentalis*, *Nicotiana trigonophylla*, *Penstemon fruticiformis amargosae*, *P. palmeri*, *Sarcostemma cynanchoides hartwegii*, *Stanleya pinnata pinnata*, and *Stillingia linearifolia*; the root parasitic *Orobanche* spp. and *Pholisma arenarium* and the stem parasite *Phoradendron californicum*; 14 grasses of such genera as *Aristida*, *Enneapogon*, *Erioneuron*, *Muhlenbergia*, *Oryzopsis*, *Sitanion*, *Sporobolus*, and *Vulpia*; and many annuals. We listed a total of 186 species in this community.

Johnson (1976) described the community and designated it as cheesebush scrub. Although *Hymenoclea* is perhaps the most characteristic and abundant shrub at lower elevations in the community, desert wash scrub is a broader designation and indicates that no one species is really dominant in this wash community. Others who have discussed the community in the eastern Mojave are Beatley (1976), Bradley and Deacon (1967), Castagnoli, de Nevers, and Stone (1981), Cheatham and Haller (1975), Hart, Stein, and Warrick (1978), and Thorne (1979).

#### Desert Calcicolous Scrub

The desert calcicolous scrub (Fig. 17), is the subcommunity of the desert rupicolous scrub that is restricted largely to limestone and dolomitic substrates. It is azonal for it can occur from the peak of the Clark Mountains in pinyon-juniper or white fir-pinyon woodland down to 855 m in the Kingston Range in the creosote bush scrub zone, wherever basic rocks are exposed. Thus, it has no specific zone like that of the mixed desert scrub on nonbasic rocks. Many of the calcicoles grow from crevices where their roots can find a foothold and adequate moisture. They are variable in habit, including low, widely spaced shrubs like *Agave utahensis nevadensis*, *Aloysia wrightii*, *Brickellia arguta*, *Buddleja utahensis*, *Cercocarpus intricatus*, *Eriogonum heermannii*, *Fendlerella utahensis*, *Forsellesia nevadensis*, *F. pungens*, *Haplopappus brickelliioides*, *Hecastocleis shockleyi*, *Mortonia utahensis*, *Petalonyx nitidus*, *Petradoria pumila*, *Petrophytum caespitosum*, and *Peucephyllum schottii*; succulents like *Dudleya arizonica*, *Coryphantha vivipara*, and *Ferocactus acanthodes*; and such rock-crevice pteridophytes as *Selaginella leucobryoides*, *Cheilanthes feei*, *Notholaena cochisensis*, and *N. jonesii*; perennial herbs like *Abronia nana covillei*, *Anemone tuberosa*, *Brickellia watsonii*, *Calochortus flexuosus*, *Caulanthus crassicaulis*, *Cymopterus gilmanii*, *Dyssodia pentachaeta*, *Erigeron utahensis*, *Eucnide urens*, *Frasera albomarginata*, *Gilia ripleyi*, *Hedeoma nanum californicum*, *Linum puberulum*, *Maurandya antirrhiniflora*, *Perityle megalcephala*, *Physaria chambersii*, *Scopulophila rixfordii*, *Tragia stylaris*, and several species each of *Cryptantha*, *Mentzelia*, *Penstemon*, and *Phacelia*; perennial grasses like *Bouteloua trifida*, *Enneapogon desvauxii*, *Erioneuron pilosum*, *Melica frutescens*, *Muhlenbergia arsenei*, *Stipa arida*, and *Tridens muticus*;



and relatively few annuals such as *Antirrhinum filipes*, *Camissonia walkeri tortilis*, *Eriogonum glandulosum*, *Ipomopsis polycladon*, *Lappula redowskii*, *Mentzelia tricuspsis*, *Parietaria hespera californica*, and several species of *Phacelia*. Although we listed only 120 species from this diverse rupicolous community, the list is noteworthy because of the large percentage of species restricted, or nearly so, to a calcicolous habitat.

There is not an extensive literature on the calcicolous communities of the eastern Mojave ranges. Some further information, however, can be obtained from Beatley (1976), Castagnoli, de Nevers, and Stone (1981), Prigge (1975) as anomalous desert scrub, and Thorne (1976, 1979).

### Gypsiculous Scrub

If little attention has been accorded the preceding calcicolous community, hardly any has been given to the aggregation of species found on gypsum-rich soils in the eastern Mojave. Meyer (1980) has recently made an ecological investigation of such soils. Here we can merely list the species that we found on the Shire Gypsum Deposits, at Bear Poppy Saddle, or along the Powerline Road in the Clark Mountain Range, all sites that seem to be gypsiferous: the shrubs *Atriplex confertiflora*, *Psoralea fremontii fremontii*, *Peucephyllum schottii*, *Stanleya pinnata pinnata*, *Sphaeralcea rusbyi eremicola*, *Tidestromia oblongifolia*; and the herbs *Antirrhinum filipes*, *Arctomecon merriamii*, *Camissonia walkeri tortilis*, *Cryptantha confertifolia*, *C. virginensis*, *Cymopterus gilmanii*, *Enceliopsis nudicaulis*, *Eriogonum trichopes*, *Gilia filiformis*, *Langloisia setosissima*, *Mentzelia leucophylla*, *M. polita*, *M. pterosperma*, *Prenanthes exigua*, *Psathyrotes annua*, *P. ramosissima*, and *Tricardia watsonii*. The list of plants collected by Castagnoli, de Nevers, and Stone (1981) on dolomite-derived soils in the northern Kingston Range appears rather similar to the above listed plants of gypsiferous soils in the Clark Mountain Range and deserves further investigation. Possibly *Atriplex hymenelytra*, *Hecastocleis shockleyi*, *Mentzelia tricuspsis*, *Phacelia pulchella gooddingii*, and *Selinocarpus nevadensis* should be added to the list of potential gypsicoles.

*Eriogonum ericifolium thornei* (Fig. 18) is restricted to a small area in Fourth of July Canyon in the New York Mountains, which proved to be rich in copper (Reveal and Henrickson 1975). This and other edaphically

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Figs. 18–19.—18. *Eriogonum ericifolium thornei* on copper-containing slopes in upper Fourth of July Canyon in New York Mountains at 1800 m.—19. Desert Oasis Woodland at Cottonwood Springs (1300 m) in Granite Mountains showing *Populus fremontii*, *Salix lasiolepis* (foreground), and *Pinus monophylla* (to left) around a seep. *Baccharis sergiloides* is also common here.



interesting sites in the eastern Mojave ranges deserve much further investigation. Alkaline saltbush scrub (Thorne 1979) seems to be largely absent from the areas we have included in this flora although species that form their own subcommunities elsewhere do occur within nonalkaline communities in our area, as *Atriplex confertifolia* (shadscale), *A. polycarpa* (allscale), *A. canescens* (fourwing saltbush), *A. hymenelytra* (desert-holly), and *Grayia spinosa* (hopsage).

### Desert Oasis Woodland

Where permanent springs issue, there often develops a small woodland of such native trees (Fig. 19) as *Celtis reticulata*, *Populus fremontii*, *Prosopis glandulosa torreyana*, *Quercus chrysolepis*, *Salix gooddingii*, and *S. lasiolepis*. Also frequent in these areas are shrubs like *Amelanchier utahensis*, *Baccharis sergiloides*, *B. glutinosa*, *Forestiera neomexicana*, *Mahonia haematocarpa*, *Pluchea sericea*, *Robinia neomexicana*, *Salix exigua*, *S. hindsiana*, and the naturalized *Tamarix ramosissima*; and such native herbs as *Artemisia dracunculul*, *A. ludoviciana incompta*, *Cucurbita foetidissima*, *Eleocharis montevidensis parishii*, *Equisetum laevigatum*, *Epilobium ciliatum ciliatum*, *Juncus mexicanus* and other rush species, *Mimulus guttatus*, *Oenothera longissima clutei*, the mistletoe *Phoradendron californicum* on *Prosopis*, *Solidago confinis*, *Typha domingensis*, *Urtica dioica holosericea*, and *Veronica americana*. Where the alkalinity of the water is somewhat greater, as at Pachalka Springs in the Clark Mountain Range, *Anemopsis californica*, *Heliotropium curassavicum oculatum*, *Muhlenbergia asperifolia*, and *Suaeda torreyana* are present as well. Most of the springs have been so disturbed by grazing, mining, planting of trees, or other human intervention that they are today largely overrun by introduced weeds, or support a variety of planted fruit or shade trees.

Some springs produce so little permanent flow of water that they do not support an oasis community. They may be recognized along the canyons by the otherwise unexpected appearance of such large grasses as *Muhlenbergia rigens* or *Phragmites australis*, introduced grasses as *Agrostis semiverticillata* and *Polypogon monspeliensis* or *P. australis*, *Juncus mexicanus* or other rushes, or the naturalized *Tamarix ramosissima*.

For further information on this community in the Mojave and Sonoran Deserts see Burk (1977), Castagnoli, de Nevers, and Stone (1981), Kuchler (1977), and Thorne (1976, 1979).

### Streamside Marsh

A few of the larger granitic canyons in the desert ranges have, at least part of the year, some shallow water flowing over rocky or sandy bottoms, as Bull Canyon in the Granite Mountains and Caruthers Canyon in the New

York Mountains. Along these streamlets, especially where pools develop behind more resistant bedrock, may be found rather narrow fringing marshes of emerged semiaquatics, mostly species of *Agrostis*, *Artemisia*, *Bromus*, *Carex*, *Centaurium*, *Deschampsia*, *Eleocharis*, *Epilobium*, *Erigeron*, *Glycyrrhiza*, *Gnaphalium*, *Juncus*, *Lotus*, *Lupinus*, *Mimulus*, *Muhlenbergia*, *Nasturtium*, *Phacelia*, *Phragmites*, *Polypogon*, *Sisyrinchium*, *Solidago*, *Sonchus*, and *Typha*. Occasionally such woody species as *Baccharis sergiloides*, *Forestiera neomexicana*, *Salix lasiolepis*, and *Tamarix ramosissima* are present, the willow, for example, forming a dense thicket in an upper portion of Bull Canyon.

### Ruderal Plants

There is really no ruderal plant community. Weeds can be found along roadsides, near mines, at corrals and watering places, at ranches, in weedy washes, in overgrazed Joshua tree woodlands, and especially at the more disturbed permanent springs. *Bromus rubens* and *Erodium cicutarium*, however, are abundant through much of this area. Their impact on the native annual flora is not known. They become more abundant with grazing. We listed 66 introduced plants in this area, 22 of them annual grasses, and most of the remainder members of the Asteraceae, Brassicaceae, Chenopodiaceae, and Fabaceae.

For ruderals in the eastern Mojave Desert, see also Castagnoli, de Nevers, and Stone (1981).

### PHYTOGEOGRAPHICAL RELATIONSHIPS OF THE FLORA

An analysis of the distribution patterns of the indigenous taxa, both specific and infraspecific, of the eastern Mojave ranges and Kelso Dunes, was made essentially following the pattern established by Castagnoli, de Nevers, and Stone (1981) in their detailed analysis of the flora of the Kingston Range. Table 1 lists the number of taxa and the percentage of the total indigenous flora assigned to 14 geographic regions. The information on distribution ranges for each taxon was obtained largely from such sources as Abrams and Ferris (1923–1960), Beatley (1976), Benson (1969), Clokey (1951), Correll and Johnston (1970), Henrickson (1980), Kearny and Peebles (1964), MacNeill, Brophy, and Smith (1978), Munz (1974), Munz and Keck (1959), Shreve and Wiggins (1964), and Wiggins (1980), reenforced by use of the RSA-POM herbarium and various monographs and revisions. The ultimate assignment of each taxon to a given geographic region had to be arbitrary and was often done with misgivings; hence, the information in the table should be regarded as approximate. Because the Sonoran Desert plants obviously have here reached the eastern Mojave Desert, and some Mojave taxa have reached the northern portions of the Sonoran Desert, Sonoran/

Table 1. Phylogeographic relationships of indigenous flora.

Geographic range	Number of taxa	Percentage of total indigenous flora
1. Sonoran Desert	186	24.7
2. Southwestern North America	141	18.7
3. Mojave Desert	109	14.5
4. Intermountain Area (Great Basin)	86	11.4
5. Mojave/Great Basin Transition	64	8.5
6. Temperate North America	46	6.1
7. Pacific Coast/Cismontane	40	5.3
8. Colorado Plateau	23	3.0
9. Rocky Mountains	19	2.5
10. Amphitropical (Temperate N. A. & S. A.)	17	2.3
11. Endemic to These Ranges	9	0.9
12. Sierran	7	0.9
13. Subcosmopolitan	3	0.4
14. Holarctic (Temperate Eurasia & N. A.)	3	0.4

Mojavean taxa were assigned according to their presumed center of distribution.

Table 1 indicates that the relationship of the eastern Mojave Ranges is strongest to the south with the Sonoran Desert and southwestern North America, with a combined percentage of 43.4. Next strongest is the relationship to the north and east with the Intermountain Area, Mojave/Great Basin transition, and Colorado Plateau giving a combined percentage of 22.9. If the Mojave/Great Basin transition plants, many endemic to adjacent areas, are added to the Mojave Desert and Local Endemics, the total percentage of the largely Mojavean taxa is 23.9. The Pacific Coast/Cismontane California element reaching across the desert is 5.3 percent, but the nearby Sierran element is an inconsequential 0.9%, considerably less than the distant Rocky Mountain element of 2.5%. The remaining wide-ranging elements from Temperate North America, Amphitropical America, Holarctic, and Subcosmopolitan total only 9.2%.

The transitional nature of the flora of these eastern Mojave ranges, between the Sonoran Desert to the south and the Great Basin to the east and north, is shown also by the large number of taxa that appear to terminate in these ranges. We have listed, in addition to the 9 endemic taxa, 186 taxa that are believed to reach their western, southern, northern, or eastern terminus within these ranges, a total percentage of 25.8. From the east 85 taxa reach no further into California than these eastern Mojave ranges, though several also reach the Death Valley area to the north and a few the eastern Colorado or Mojavean Desert ranges farther south. Among the more notable of these are:

*Woodsia plummerae*  
*Cheilanthes feii*

*C. wootonii*  
*Notholaena cochisensis*

*N. limiteana limiteana*  
*Amaranthus pringlei*  
*Asclepias nyctaginifolia*  
*Cymopterus purpurascens*  
*Bahia neomexicana*  
*Erigeron utahensis*  
*Machaeranthera tanacetifolia*  
*Mahonia haematocarpa*  
*Lithospermum incisum*  
*Chamaesyce revoluta*  
*Euphorbia incisa*  
*Dalea searlsiae*  
*Phacelia anelsonii*  
*P. coerulea*  
*Linum puberulum*  
*Abutilon parvulum*  
*Menodora scabra*  
*Gaura coccinea*

*Eschscholzia californica*  
*mexicana*  
*Galium munzii*  
*Cordylanthus parviflorus*  
*Maurandya antirrhiniflora*  
*Chamaesaracha coronopus*  
*Verbena gooddingii*  
*Yucca baccata baccata*  
*Enneapogon desvauxii*  
*Bouteloua eriopoda*  
*B. trifida*  
*Robinia neomexicana*  
*Quercus turbinella turbinella*  
*Frasera albomarginata*  
*Eriodictyon angustifolium*  
*Elymus salinus*  
*Erioneuron pilosum*  
*Scleropogon breviflorus*  
*Stipa arida.*

From the north, at least 64 taxa, many of them from the Mojave/Great Basin Transition element and many characteristic of calcareous or gypsiferous substrates, appear to reach no further south in California than the eastern Mojave ranges. Among these some of the more interesting plants are:

*Ephedra funerea*  
*Cymopterus gilmanii*  
*Acamptopappus shockleyi*  
*Brickellia multiflora*  
*Cirsium nidulum*  
*Enceliopsis nudicaulis*  
*Haplopappus brickellioides*  
*Haplopappus nanus*  
*Hecastocleis shockleyi*  
*Cryptantha virginensis*  
*Physaria chambersii*  
*Halimolobos diffusa jaegeri*  
*Oxystylis lutea*  
*Scopulophila rixfordii*  
*Mortonia utahensis*  
*Lupinus flavoculatus*

*Phacelia barnebyana*  
*Mentzelia leucophylla*  
*M. reflexa*  
*Buddleja utahensis*  
*Sphaeralcea rusbyi eremicola*  
*Menodora spinescens*  
*Camissonia walkeri tortilis*  
*Gilia ripleyi*  
*Eriogonum heermannii ssp.*  
*Eriogonum panamintense panamintense*  
*Aquilegia shockleyi*  
*Amelanchier utahense covillei*  
*Galium mathewsii*  
*Muilla transmontana*  
*Agave utahensis nevadensis*  
*Yucca brevifolia jaegeriana.*

Plants of the Pacific Coast/Cismontane California from the west and Sonoran Desert from the south reach their northern and eastern limits in the

eastern Mojave ranges, often in the Granite and Providence Mountains, the southmost ranges, the adjacent Kelso Dunes, or the westernmost Kingston Range. Among 37 such taxa the more noteworthy are perhaps:

<i>Cheilanthes viscida</i>	<i>Sedum niveum</i>
<i>Notholaena californica</i>	<i>Nemophila menziesii integrifolia</i>
<i>Juniperus californica</i>	<i>Phacelia campanularia vasiformis</i>
<i>Ephedra californica</i>	<i>Pholisma arenarium</i>
<i>Sarcostemma cynanchoides</i> hartwegii	<i>Mentzelia multiflora longiloba</i>
<i>S. hirtellum</i>	<i>Camissonia californica</i>
<i>Dyssodia porophylloides</i>	<i>Gilia australis</i>
<i>Nicolletia occidentalis</i>	<i>G. splendens splendens</i>
<i>Trichoptilium incisum</i>	<i>Rhamnus ilicifolia</i>
<i>Trixis californica</i>	<i>Penstemon centranthifolius</i>
<i>Cleome isomeris</i>	<i>P. thurberi thurberi</i>
	<i>Kallstroemia parviflora</i>
	<i>Bouteloua aristidoides.</i>

The most exciting plants of any flora are generally those that are narrowly restricted, i.e. endemic, to the area being surveyed. The nine taxa that appear to be restricted to the eastern Mojave ranges are:

- Pinus monophylla* (two-needle race)—NY
- Erigeron* sp. nov.—P
- Astragalus cimae cimae*—MH, NY, I, C
- Lotus argyraeus multicaulis*—NY
- Eriogonum ericifolium thornei*—NY
- E.* sp. aff. *E. heermanni*—KR
- Potentilla patellifera*—KR
- Penstemon stephensii*—P, MH, KR.

Almost as restricted as these endemics are those taxa that occur elsewhere only in the Death Valley area, in the adjacent ranges of southern Nevada, as the Sheep or Spring Mountains, and possibly also the northwestern corner of Arizona. Among the taxa so restricted are:

<i>Selaginella leucobryoides</i>	<i>Selinocarpus nevadensis</i>
<i>Cryptantha tumulosa</i>	<i>Camissonia munzii</i>
<i>Lesquerella kingii latifolia</i>	<i>Arctomecon merriamii</i>
<i>Coryphantha vivipara rosea</i>	<i>Ivesia jaegeri</i>
<i>Arenaria congesta charlestonensis</i>	<i>Galium hildendiae kingstonense</i>
<i>Forsellesia pungens</i>	<i>Penstemon calcareus</i>
<i>Phacelia geraniifolia</i>	<i>P. fruticiformis amargosae</i>
<i>P. pulchella gooddingii</i>	<i>P. thompsoniae.</i>
<i>Mentzelia polita</i>	

Table 2. Life-forms of plants of the eastern Mojave ranges compared with those from other desert and Mediterranean climatic areas.

	Number of species	Percentage distribution of taxa among life-forms											
		P	M	N	Li	Ch	H	G	Th	E	Pa	SS	HH
Raunkiaer's Normal Spectrum (1934)	400	6	17	20	0	9	27	3	13	3	0	1	1
Eastern Mojave Ranges (native taxa)	753	0.4	5	13	0	14	19	5	39	0	1	3	0
Eastern Mojave Ranges (total flora)	819	0.4	5	12	0	13	19	4	42	0	1	3	0
Death Valley, Calif. (Raunkiaer 1934)	294	0	2	21	0	7	18	2	42	0	0	3	5
Libyan Desert (Raunkiaer 1934)	194	0	3	9	0	21	20	4	42	0	0	0	2
Tripoli, Libya (Raunkiaer 1934)	369	0.3	0	6	0	13	19	9	51	0	0	0	2
Aden, South Yemen (Raunkiaer 1934)	176	0	7	26	0	27	19	3	17	0	0	1	0
Santa Catalina I., Calif. (native taxa, Thorne 1967)	391	2	7	9	1	5	27	2	41	0	1	2	3
Santa Catalina I., Calif. (total flora, Thorne 1967)	557	1	6	8	1	3	27	2	48	0	1	1	2
Samos I., Greece (Raunkiaer 1934)	400	1	4	4	0	13	32	11	33	0	0	0	2

## BIOLOGICAL SPECTRUM: LIFE-FORMS

In 1967 Thorne compared the percentage distribution of life-forms, as originally proposed by Raunkiaer (1934), among the taxa listed by him for Santa Catalina Island, off the southwestern coast of California, with that found in several other floras of areas also subject to a Mediterranean type of climate. In Table 2 we have compared the percentage distribution of life-forms of the higher ranges and Kelso Dunes of the eastern Mojave Desert in California with that found in several other desert floras and adjacent areas subject to Mediterranean types of climate, as listed by Raunkiaer (1934) and Thorne (1967). The dominance of therophytes (annuals) and hemicryptophytes in both desert and Mediterranean-climatic areas is rather obvious. In the table the abbreviations represent the various life forms as follows:

P—Mesophanerophytes. Trees, 8–25 m high.

M—Microphanerophytes. Shrubs or small trees, 2–8 m high.

N—Nanophanerophytes. Small shrubs, 0.5–2 m high.



- Li—Climbing phanerophytes. Lianas with persistent stems.  
Ch—Chamaephytes. Vegetative buds not over 0.5 m above ground.  
H—Hemicryptophytes. Vegetative buds at surface of soil.  
G—Geophytes. Vegetative buds below surface of soil.  
Th—Therophytes. Annuals.  
E—Epiphytes. Borne upon trunks or branches of woody plants.  
Pa—Parasites. Depending on other plants for much or all sustenance;  
not including hemiparasites.  
SS—Stem succulents.  
HH—Hydrophytes. Aquatic plants, submersed or floating.

### CATALOGUE OF VASCULAR PLANTS

The following annotated check list includes all vascular plant taxa known to occur in the Kelso Dunes and Granite, Providence, Mid Hills, New York, Ivanpah, Clark, Mesquite, and Kingston ranges of the eastern Mojave Desert of California. The majority of the specimens have been collected by the authors in these ranges since 1973. The authors however, also have studied specimens collected by others and deposited in the herbaria at Rancho Santa Ana Botanic Garden-Pomona College (RSA-POM), California State University, Los Angeles (CSLA), California Academy of Science-Dudley Herbarium of Stanford University (CAS-DS), University of California, Los Angeles (LA), University of California, Berkeley-Jepson Herbarium (UC-JEPS), Los Angeles Museum of Natural History (LAM), and the Oakland Museum (OM). All available specimens cited have been examined by the authors and in some instances critical or difficult taxa have been submitted to authorities for confirmation as noted in the acknowledgments. A set of specimens collected by Castagnoli, de Nevers, and Stone of the University of California, Santa Cruz, during their intensive resource survey of the Kingston Range in 1980 are to be deposited at RSA. Because only the taxa new to the eastern ranges have been received, most of the new stations listed in their "Botanic Survey of the Kingston Range" have been included here as reports. Specimens collected in surveys of the Granite Mountains in 1970 by participants in a plant systematics course at the University of California, Los Angeles, taught by Prof. H. J. Thompson, and in 1978 by Hart, Stein, and Warrick of the University of California, Santa Cruz's Environmental Field Program, have already been incorporated into the RSA collections as have most of the specimens collected by the authors. Many duplicates of our collections are also available in the herbarium of California State University, Los Angeles, and others have been distributed to the

Dudley Herbarium of Stanford University at California Academy of Sciences, New York Botanical Garden, University of California, Berkeley and many other herbaria.

In the catalogue families are arranged alphabetically within subphyla, classes, or subclasses, as are genera within families and species within genera. Asterisks indicate naturalized species. Subspecific names are used when available and appropriate. A few new subspecific combinations are made by Thorne. Minor varieties, considered here as genetic variants with little if any geographic or ecologic significance, are placed in parentheses or brackets, if mentioned at all. Common names are given, usually only for the first species in a genus, and only if genuine popular names and not merely repetitive or translations of the scientific name. Nomenclature of species largely follows that of *A Flora of Southern California* (Munz, 1974), and families that of Thorne (1981). Synonyms are omitted unless the binomials used differ from those of Munz (1974).

Habit of growth is given for each species. The frequency terms used are based upon the following scale of collections or observations in these ranges: Rare, 1–5 stations; infrequent, 6–11 stations; frequent, 12–19 stations; common, 20 or more stations. The terms “abundant” and “locally abundant” indicate large numbers of a taxon throughout the ranges in the habitats listed or in specific ranges mentioned. The statements of habitat in the ranges were obtained from our field observations and from collection labels. Canyons are regularly abbreviated as “cyns” and springs as “spgs.” The plant communities in which each taxon was found are designated by abbreviations, as listed below alphabetically, but arranged in the catalogue with azonal communities usually preceding zonal (elevationally restricted) communities, which were arranged approximately from lowest to highest elevation.

#### Plant Community Abbreviations

bbs	Blackbush scrub
cbs	Creosote bush scrub
dcs	Desert calcicolous scrub
dow	Desert oasis woodland
dps	Desert psammophytic scrub
drs	Desert wash scrub
gs	Gypsiculous scrub
jsbs	Juniper-sagebrush scrub
jt看	Joshua tree woodland
mds	Mixed desert scrub
pjow	Pinyon-juniper-oak woodland

pjw	Pinyon-juniper woodland
pw	Pinyon woodland
sbs	Sagebrush scrub
ssm	Streamside marsh
wfpw	White fir-pinyon woodland

Elevations are listed in meters based upon our observations or collection labels from the ranges surveyed with unusual extremes or reports from other botanists given in parentheses. Range and other regional abbreviations are listed in capitals for each species in the order listed below, essentially from southwest to northeast and on to the northwest.

#### Range and Other Regional Abbreviations

KD	Kelso Dunes
G	Granite Mountains
P	Providence Mountains
MH	Mid Hills
NY	New York Mountains
I	Ivanpah and Mescal Mountains
C	Clark Mountain Range
MM	Mesquite Mountains
KR	Kingston Range

For rarer taxa collection stations are usually given. Specimens collected by the authors are cited only in exceptional cases. Collections made by other botanists, especially early ones of taxa not found by the authors, are cited by collector's name and number and/or date. Only if the collection is housed in an herbarium other than RSA-POM or CSLA is the herbarium acronym listed. Occasionally for rare taxa adjacent stations beyond the limits of our area are also cited. Endemics and often type localities are indicated. Our map (Fig. 1) locates the ranges, Kelso Dunes, Kingston Wash, Shadow Valley, and other major physiographic features of the region surveyed. Flowering dates listed are chiefly based on our observations and collections made in the region surveyed, with extremes, or reports from others, placed in parentheses.

ANNOTATED CHECK LIST OF THE VASCULAR PLANTS OF THE HIGHER  
RANGES AND THE KELSO DUNES OF THE EASTERN MOJAVE DESERT  
IN CALIFORNIA

Lycopsida

Lycopodiaceae

Selaginellaceae—Spike-moss Family

*Selaginella leucobryoides* Maxon. Spike-moss. Rare perennial; dolomite and limestone crevices and shade of boulders; dcs; 850–1370 m; only P and KR. Type from the Bonanza King Mine area. Elsewhere it is known only from the Panamint and Spring Mtns.

Sphenopsida

Equisetaceae

Equisetaceae—Horsetail Family

*Equisetum laevigatum* A. Br. Scouring-rush. Rare perennial; springy ground in pjw; 1775 m; only NY (Keystone Spg).

Pteropsida

Filices

Aspidiaceae—Shield Fern Family

*Cystopteris fragilis* (L.) Bernh. Fragile Fern. Rare perennial; spg at lower edge of pjw; 1585 m; only KR (Granite Cyn, *Castagnoli 147*).

*Woodsia oregana* D. C. Eat. Infrequent perennial; rock crevices and shaded, moist places on granitic or limestone substrates on cliffs, ridges, or along stream beds or near spgs; pjw, wfpw; 1500–2000 m; P, NY, C.

*Woodsia plummerae* Lemmon. Rare perennial; “single ravine in Keystone Basin . . . at 1900 m in soil at the base of n-facing granitic cliffs and boulders often under the canopy of *Quercus chrysolepis*” (MacNeill, Brophy, and Smith 1978); only NY (*A. R. Smith 673* and *C. D. MacNeill s. n.*, UC). This is the only station known for California.

Polypodiaceae—Polypody Family

*Polypodium hesperium* Maxon. Polypody. Rare perennial; reported at 550 m nne of New York Peak (2130 m high) “in shaded granite fissures and crevices, 2n = 74 II” (MacNeill, Brophy, and Smith 1978); only NY.

Pteridaceae—Bracken Fern Family

*Adiantum capillus-veneris* L. Maidenhair Fern. Very rare perennial, not rediscovered; collected in 1926 and 1930 by Marcus E. Jones only at Cove Spg; 1300 m; G.

- Cheilanthes covillei* Maxon. Lip Fern. Infrequent perennial; rock crevices and bases of boulders, mostly on granitic substrates; mds, pjw; 1200–1700 (2225) m; G, P, MH, w end NY, reported KR.
- Cheilanthes feei* T. Moore. Frequent perennial; shaded rock crevices and under boulders, often on n-facing limestone or dolomite cliffs and cyn walls, rare on granite (MacNeill, Brophy, and Smith 1978); dcs within pjw and wfpw; 1500–2000 m; P, NY, C, reported KR.
- Cheilanthes viscida* Davenp. Infrequent perennial; sheltered crevices, cave entrances, under boulders, and on rock ledges in granitic soil; mds; 950–1250 m; only G and reported KR (cyns s of Porcupine Cyn).
- Cheilanthes wootonii* Maxon. Infrequent perennial; under boulders and in crevices primarily on granitic slopes; pjw; 1200–1900 m; only NY and P (near Bonanza King Mine).
- Notholaena californica* D. C. Eat. Cloak Fern. Rare perennial; base of granite boulder in shade; 1300 m; only G (between Cove and Granite Sprs).
- Notholaena cochisensis* Goodd. Infrequent perennial; limestone crevices in full sun; dcs; 850–1600 m; P, I, C.
- Notholaena jonesii* Maxon. Infrequent perennial; crevices of limestone or dolomite cliffs and slopes; dcs in pjw; 950–1750 (1890) m; P, NY, C, reported KR.
- Notholaena limiteana* Maxon subsp. *limiteana*. Rare perennial; crevices of Bird Spring Formation on n slope below minor limestone peak; dcs in pjw; 1800 m; NY (Keystone Basin, *C. D. MacNeill s. n.*, UC). This is the only recorded station in California (MacNeill, Brophy, and Smith 1978).
- Notholaena parryi* D. C. Eat. Frequent perennial; under boulders and in crevices of both granitic and calcareous rock; drs, bbs; 750–1550 m; P, C, KR.
- Pellaea mucronata* (D. C. Eat.) D. C. Eat. var. *californica* (Lemmon) Munz & Jtn. Bird's Foot Fern. Rare perennial; among rocks on hot, exposed s slope; pjw; 2315 m; only NY (*J. & L. Roos 4431*, June 21, 1949).
- Pellaea mucronata* (D. C. Eat.) D. C. Eat. var. *mucronata*. Infrequent perennial; rocky places; pjw; 850–1750 m; G, P, MH, NY (e to Fourth of July Cyn), reported KR.
- Pellaea truncata* Goodd. [*P. longimucronata* of Calif. and Ariz. references]. Infrequent perennial; rocky cyn slopes, mostly at the base of boulders and in crevices of granitic rocks, occasionally on volcanics and limestones (MacNeill, Brophy, and Smith 1978); pjw; 1350–2150 m; only P and NY.
- Pityrogramma triangularis* (Kaulf.) Maxon var. *maxonii* Weath. Goldback Fern. Infrequent perennial; apparently restricted to shaded crevices and sandy soil under granitic boulders; mds; 1050–1350 m; only G and KR.

## Coniferae

## Cupressaceae—Cypress Family

- Juniperus californica* Carr. California Juniper. Dominant small tree at lower elevations; pjw; 975–1525 m; G (only eastern slopes toward Granite Pass).
- Juniperus osteosperma* (Torr.) Little. Utah Juniper. A common and dominant small tree of pjw; also in jsbs and wfpw; 1200–2350 m; in ranges e and n of G, and at higher elevations, up to 2065 m, in G; more abundant than pinyons at lower levels of pjw.

## Pinaceae—Pine Family

- Abies concolor* (Gord. & Glend.) Lindl. subsp. *concolor*. Rocky Mtn White Fir. Rare tree but dominant in wfpw at higher elevations of n-facing limestone or granitic slopes and cyn bottoms; 1850–2250 m; C and KR, rare in NY.
- Pinus monophylla* Torr. & Frém. (Two-needle variety). Two-needle Pinyon. Infrequent small tree but dominant at higher elevations; pjw, wfpw; 1250–2250 m; NY; scattered trees elsewhere, as in Cedar Cyn, MH and Big Horn Basin, G; commonly intergrading in needle number in G with the more common one-needle variety. It is treated by many California authors as *P. edulis* Engelm.
- Pinus monophylla* Torr. & Frém. (One-needle variety). One-needle Pinyon. Common small tree; dominant in pw, pjw, and wfpw; rocky slopes and in cyns; 1200–2300 m; all ranges except at higher elevations in NY where replaced by the two-needle variety; occasionally found as low as 1050 m, and some trees, as in G, MH, and NY, have both single and paired needles.

## Gnetae

## Ephedraceae—Mormon-tea Family

- Ephedra aspera* Engelm. ex S. Wats. Mormon-tea. Infrequent shrub; rocky slopes and cyns, sandy flats; cbs, drs; 900–1450 m; only G and P; Apr–May.
- Ephedra californica* S. Wats. Infrequent shrub; gravelly-sandy flats, washes, and bajadas; dws, cbs; at lower elevations, 650–1200 m; only in G, where locally abundant and often quite large, even arborescent, and reported KR (Kingston Wash and Coyote Holes); Apr–May.
- Ephedra funerea* Cov. & Mort. Infrequent shrub; gravelly-rocky substrates; bajadas and wash edges; cbs, drs, gs; at low elevations (700–)1000–1100 m; P, C, KR; Apr–May.
- Ephedra nevadensis* S. Wats. Frequent shrub; sandy-gravelly to rocky soils;

flats, bajadas, washes, cyn bottoms, and slopes; dws, cbs, mds, jtw, bbs; 1100–1675 m; G, P, NY, I, C, KR; Apr–May.

*Ephedra viridis* Cov. Squaw-tea. Common shrub; rocky cyn slopes, ledges, and peaks, and sandy-gravelly to rocky washes on granitic or calcareous substrates; jtw, pjw, wfpw; at higher elevations, 1200–2400 m; all ranges; Apr–July.

### Angiospermae

#### Dicotyledoneae

#### Aceraceae—Maple Family

*Acer glabrum* Torr. var. *diffusum* (Greene) Smiley. Maple. Rare large shrub or small tree; shaded, steep, n-facing talus slopes and cyns on limestone of Clark Mtn or granitics of Kingston Peak; pjw, wfpw; 1730–2300 m; only C and KR; May–June.

#### Aizoaceae

\**Mollugo cerviana* (L.) Ser. Indian-chickweed. Rare weedy summer annual; sandy cyn bottoms and washes; dws; 1150–1600 m; only G and I; Sept–Oct.

#### Amaranthaceae—Amaranth Family

\**Amaranthus albus* L. Pigweed. Rare tropical American weedy annual; disturbed ground near spgs; 1100–1430 m; only KR (near Crystal and Horse Thief Spgs); May–Oct.

*Amaranthus blitoides* S. Wats. Rare weedy prostrate annual; sandy or disturbed places; cbs, pjw; 650–1650 m; KD, P, NY; May–Sept.

*Amaranthus fimbriatus* (Torr.) Benth. Fringed Amaranth. Frequent summer annual; sandy or gravelly washes, flats, and bajadas; dws, cbs, bbs, jsbs; 900–1200 m; all ranges; Aug–Oct.

*Amaranthus palmeri* S. Wats. Rare weedy, dioecious annual; sandy wash; dws; 1160 m; only P (below Bonanza King Mine); Oct.

*Amaranthus pringlei* S. Wats. Infrequent summer annual; sandy, gravelly, or rocky washes and slopes; jtw, bbs, pjw; 1450–1700 m; MH, NY, I, C; Aug–Oct.

*Tidestromia oblongifolia* (S. Wats.) Standl. Arizona Honey-sweet. Rare perennial; carbonate-derived soils on open flats and steep, limestone slopes; cbs, dcs, gs; 750–1200 m; P, C, MM; June.

## Anacardiaceae—Sumac Family

*Rhus trilobata* Nutt. ex T. & G. var. *anisophylla* (Greene) Jeps. Squaw Bush. Very common shrub; rocky slopes, flats, washes, cyns, and about spgs and large boulders; cbs-pjw; 1050–2150 m; all ranges; Mar–May.

## Apocynaceae [incl. Asclepiadaceae]—Dogbane Family

*Amsonia brevifolia* Gray [incl. var. *tomentosa* (Torr. & Frém.) Jeps.]. Frequent perennial; sandy, gravelly, or rocky washes, flats, and fans of bajadas; dws, cbs; at lower elevations, 800–1220 m; G, P, NY, I, C, KR; Mar–May. The tomentose variety is usually found with the glabrous variety.

*Asclepias asperula* (Dcne.) Woodson. Milkweed. Frequent perennial; gravelly or rocky cyn bottoms and slopes; pjw; 900–1900 m; P, NY, C; May–June.

*Asclepias erosa* Torr. Infrequent conspicuous perennial; sandy or gravelly washes and rocky bajadas; cbs, jtw; 900–1500 m; all ranges; May–Sept.

*Asclepias nyctaginifolia* A. Gray. Rare perennial; sandy-gravelly soil of bajadas; cbs, jtw; 1000–1460 m; only NY (near Barnwell, *T. Stith & K. Brandegee*, May, 1911, JEPS) and C (Shadow Valley); June. Reported by Munz (1974) from P, but no specimen has been seen by us.

*Cynanchum utahense* (Engelm.) Woodson. Rare twining perennial; climbing over *Ambrosia* shrubs in dry, stony wash and along roadside; cbs; 900 m; only I (at se base of range, *Everett & Balls 23889*, Aug. 19, 1959); Aug.

*Sarcostemma cynanchoides* Dcne. subsp. *hartwegii* (Vail) R. Holm. Climbing Milkweed. Rare twining perennial; on *Prunus fasciculata* in sandy wash; dws; 1370 m; only G (Willow Spg Cyn, *B. A. Stein 67*, May 22, 1978); Apr–July.

*Sarcostemma hirtellum* (A. Gray) R. Holm. Rare twining perennial; gravelly banks; cbs; 750–850(–950) m; only G (Bull Cyn Wash) and reported KR (near Porcupine Wash); Mar–May.

## Araliaceae [incl. Apiaceae]—Ginseng Family

*Cymopterus gilmanii* Mort. Rare perennial; gravelly carbonate soil, probably gypsiferous clay, and dolomitic ridges; dcs, gs; 975–1220 m; only C, reported KR (w of ne Camp); Mar–May.

*Cymopterus multinervatus* (Coult. & Rose) Tides. Very rare perennial, not recently collected; gravelly hills jtw; 1370 m; only NY (s of Barnwell, *Munz 13712*); Apr–May.

*Cymopterus panamintensis* Coult. & Rose var. *acutifolius* (C. & R.) Munz.



Rare perennial; sunny cyn walls; mds, pjw; 1220–1675 m; only G (Budweiser Wash) and KR (large cyn sw of Horse Thief Spgs, *C. B. Wolf* 7647, DS); May–Apr.

*Cymopterus purpurascens* (A. Gray) Jones. Rare perennial; sandy clay or gravelly plains, rocky slopes, and limestone ridges; dcs, jtw; 1550–1700 m; MH, NY, C (*L. Constance* 3446, Apr. 30, 1952, UC); Mar–Apr.

*Daucus pusillus* Michx. Rattlesnake Weed. Rare annual; rocky, limestone cyn slopes; dcs; 1200–1500 m; only P; Apr–May.

*Lomatium nevadense* (S. Wats.) Coult. & Rose var. *parishii* (C. & R.) Jeps. [incl. var. *pseudorientale* (Jones) Munz]. Hog-fennel. Frequent perennial; clayey to gravelly or rocky slopes; bbs, drs, jtw, pjw; 1050–1800 m; P, MH, C, KR; Apr–May.

*Lomatium parryi* (S. Wats.) MacBr. Frequent perennial; bouldery arroyos, rocky cyn slopes, and shaded calcareous or granitic cliffs; pjw, wfpw; 1100–2300 m; all ranges; May–June.

*Yabea microcarpa* (H. & A.) Koso-Pol. [*Caucalis microcarpa* H. & A.]. Rare weedy annual; moist soil of disturbed mine sites and tenajas; 1200–1400(–1600) m; only P and KR; Apr–May.

#### Asteraceae—Sunflower Family

*Acamptopappus shockleyi* A. Gray. Goldenhead. Infrequent subshrub; rocky or gravelly bajadas and mesas; bbs, gs, jtw; 1050–1500 m; only C and KR; May.

*Acamptopappus sphaerocephalus* (Harv. & Gray) A. Gray. Infrequent shrub; open, sandy to rocky bajadas, washes, flats, and limestone ridges; cbs, dcs, jtw; 950–1750 m; G, P, MH, C; May–July.

\**Ambrosia acanthicarpa* Hook. Sandbur. Rare weedy annual; 1160–1525 m; only MH (granitic arroyo near old cabins in Butcher Knife Cyn) and KR (dolomitic cyn at Crystal Spgs); Aug–Nov.

*Ambrosia dumosa* (A. Gray) Payne. Bur-sage, Burro-bush. Common shrub, often abundant; dunes, sandy flats, gravelly bajadas, and gentle, rocky slopes; dps, cbs, jtw; 650–1200(–1700) m; KD, G, P, MH, C, KR; Apr–May.

*Ambrosia eriocentra* (A. Gray) Payne. Woolly-fruited Burbush. Abundant rhizomatous shrub; sandy-gravelly washes and rocky cyn bottoms; dws, cbs, jtw, bbs; 800–1550(–1700) m; all ranges; Apr–May.

*Ambrosia* sp. An unidentified specimen (*Henrickson 10371*) collected along an arroyo near Butcher Knife Spg, MH, 1585 m; may be a hybrid between *A. eriocentra* and *A. acanthicarpa*.

*Amphipappus fremontii* T. & G. subsp. *fremontii*. Chaff Bush. Frequent subshrub of upper bajadas and lower mtn slopes; cbs; 850–1220 m; only KR (dolomite at Smith Mine, *de Nevers 81*); Apr–May.

- Amphipappus fremontii* T. & G. subsp. *spinosus* (A. Nels.) Keck. Rare low shrub; rocky slopes; cbs; 750–1150 m; only G (n and w sides) and P; Apr–May. Also near Goffs.
- Anisocoma acaulis* T. & G. Scale Bud. Infrequent annual; sandy-gravelly washes and flats and gentle bajada slopes; cbs, jtw; 750–1550 m; KD, G, P, MH, NY, C; Apr–May.
- \**Artemisia biennis* Willd. Rare weedy annual from Northwest; jtw; 1600 m; NY (along the New York Mtn Rd just E of the mouth of Caruthers Cyn); Oct.
- Artemisia bigelovii* A. Gray in Torr. Sagebrush. Infrequent low shrub; rocky limestone slopes and cyns; dcs, pjw; 1500–1850 m; P, NY, I, C; Aug–Oct.
- Artemisia dracuncululus* L. Dragon Sagewort. Frequent rhizomatous perennial; sandy or gravelly washes and cyn bottoms; dow, jtw, bbs, pjw; 1150–1700 m; G, NY, C, KR; Aug–Oct.
- Artemisia ludoviciana* Nutt. ssp. *albula* (Woot.) Keck. Western Mugwort, Pinyon Wormwood. Common rhizomatous perennial; steep, rocky slopes; drs, pjw; 800–2300 m; G, P, NY, C, KR; July–Sept.
- Artemisia ludoviciana* Nutt. ssp. *incompta* (Nutt.) Keck. Infrequent rhizomatous perennial with leaves larger than subsp. *albula*, and glabrescent above; rocky slopes or about spgs; dow; 1450 m; only G (Cottonwood Cyn), and KR (Horse Thief Sprs, reported at Sheep Tanks); Aug–Oct.
- Artemisia nova* A. Nels. Dwarf or Black Sagebrush. Common low shrub; rocky slopes and bottoms of cyns, especially limestone or dolomite; dcs, bbs, pjw; 1300–2200 m; P, NY, C, KR; Nov.
- Artemisia spinescens* D. C. Eat. Bud Sagebrush. Rare, low, spiny shrub; cbs; 1100–1280 m; only at Cima (*K. Brandegee*, many years ago) and C (Shadow Valley near Valley Wells).
- Artemisia tridentata* Nutt. subsp. *tridentata*. Great Basin Sagebrush. Infrequent, although locally abundant, evergreen shrub; sandy, gravelly, or bouldery slopes or benches, mostly of granitic origin; sbs, jsbs, pjw; (1150–)1350–2150(–2230) m; G, MH, western NY, KR, dominant with *Juniperus osteosperma* (jsbs) in Pinto, Round, and Gold Valleys between MH and NY; Aug–Oct.
- Atrichoseris platyphylla* A. Gray. Tobacco-weed. Rare annual with basal rosette of leaves; rocky benches; cbs; (670–)750–850 m; only G (along lower Bull Cyn Wash, just s of the Kelso Dunes) and reported KR (along Kingston Wash); Mar.
- Baccharis brachyphylla* A. Gray. Rare suffrutescent perennial; among granite boulders; mds; 1220 m; only G (in Willow Spg Cyn) and lower P (“Kelso,” 900 m, *M. E. Jones*, May 2, 1906); Aug–Nov.
- Baccharis glutinosa* Pers. [incl. *B. viminea* DC.]. Mule Fat. Rare shrub;

- sandy soil; dow; 1230–1250 m; only G (Willow Spg Basin and at Dripping Spg Pond); blooming most of year.
- Baccharis sergiloides* A. Gray. Squaw Waterweed. Common shrub, locally abundant; about spgs and in cyn bottoms and washes, wet with seepage or stream flow; dow, ssm; 930–1530 m; all ranges; July–Sept.
- Bahia dissecta* (A. Gray) Britt. Rare biennial; pow; 2075 m; NY (only above Fourth of July Cyn on crest of range); Aug–Sept.
- Bahia neomexicana* (A. Gray) A. Gray. [*Schkuhria multiflora* H. & A. in Hook., acc. to Heiser, 1945]. Rare annual; sandy washes; dws; 1550–1620 m; only C (Colosseum Mine and below corral at Green's Well); Sept–Oct.
- Baileya multiradiata* Harv. & Gray. Desert-marigold, Gold Dollars. Common biennial or perennial, locally abundant; gravelly bajadas and rocky mesas and slopes; dps–pjw; 1100–1550 m; P, NY, I, C, KR; Apr–Aug.
- Baileya pauciradiata* Harv. & Gray. Lax Flower. Rare annual; dps; 670–730 m; only KD (where locally abundant) and P (“Kelso,” 915 m, *M. E. Jones*, May 2, 1906, CAS); June, Oct.
- Baileya pleniradiata* Harv. & Gray. Infrequent annual, locally abundant on KD and other sandy areas; dps–pjw; 700–1050 m; KD, G, P, MH, NY, C; Mar–June, Oct.
- Bebbia juncea* (Benth.) Greene. Sweet Bush. Frequent half-shrub, very fragrant, locally abundant; sandy washes, gravelly bajadas, and rocky slopes; dps, cbs, jtw; 730–1225 m; KD, G, P, KR; Apr–June.
- Brickellia arguta* Rob. Brickelbush. Frequent shrub; steep rocky slopes; drs, jtw, bbs; (750–)900–1400 m; G, P, C, KR; Apr–May.
- Brickellia californica* (T. & G.) A. Gray. Frequent suffrutescent perennial; rocky slopes and gravelly arroyos; drs, jtw, bbs, pjw; 1250–2000 m; G, MH, NY, I, C, KR; Aug–Oct.
- Brickellia desertorum* Cov. Infrequent shrub; rocky granitic or calcareous slopes; drs, pjw; 1000–1770 m; G, NY, KR; Aug–Oct.
- Brickellia incana* A. Gray. Frequent white-tomentose shrub; sandy-gravelly washes and rocky slopes; cbs, bbs, pjw; 730–1600 m; KD, G, P, NY, C, KR; May–Oct.
- Brickellia knappiana* E. Drew. Rare shrub; 915–1315 m; only KR (n slope hill “4439,” *de Nevers* 425, ne Silver Rule Cyn, Crystal Spr, Sheep Tanks Cyn); Sept–Oct. Possibly a hybrid between *B. californica* and *B. multiflora*, as suggested by Castagnoli, de Nevers, and Stone (1981).
- Brickellia microphylla* (Nutt.) A. Gray. Rare shrublet; rocky slopes; drs, pjw; 1150–1850 m; only C and KR; Aug–Oct.
- Brickellia multiflora* Kell. Rare tall shrub; washes and arroyos; sandy, gravelly or rocky, mostly calcareous soils; dws, pjw; 975–1850 m; P, C, KR; Sept–Oct.
- Brickellia oblongifolia* Nutt. var. *linifolia* (D. C. Eat.) Rob. Common suf-

- frutescent perennial; gravelly or rocky slopes and washes; bbs, pjw, wfpw; (900-)1250-2400 m; all ranges; May-June.
- Brickellia watsonii* Rob. Rare low shrublet; rocky, calcareous slopes; dcs, pjw; 1050-2100 m; only C (s slope of Clark Mtn) and KR (near Crystal Spg, *de Nevers* 432, and ca. 6.5 km se Horse Thief Spgs, *de Nevers* 266 and 455); Sept-Oct.
- Calycoseris parryi* A. Gray. Yellow Tack-stem. Frequent annual; sandy or gravelly flats and rocky slopes; cbs-pjw; 650-1500 m; KD, G, P, I, C, KR; Apr-June.
- \**Centaurea melitensis* L. Tocalote. Rare European weedy annual; disturbed ground at sprs; dow; 945-1500 m; only C (Pachalka Spr) and KR (Crystal Spr); May-June.
- Chaenactis carphoclinia* A. Gray [incl. var. *attenuata* (A. Gray) Jones]. Pebble Pincushion. Infrequent, though locally abundant, annual; sandy-gravelly washes and rocky bajada slopes; dws, cbs; 670-1100 m; KD, G, P, NY, C, KR; Apr-May.
- Chaenactis fremontii* A. Gray. Frequent annual; gravelly-sandy washes and rocky bajadas and cyn slopes; cbs, dws, pw; 700-950(-1350) m; KD, G, P, C, KR; Apr-May.
- Chaenactis macrantha* D. C. Eat. Mojave Pincushion. Frequent annual; sandy, gravelly, or clayey flats and slopes and rocky mesas, ridges, or calcareous slopes; dcs, jtw, bbs, pjw; 1050-1550 m; G, NY, C, KR; Apr-June.
- Chaenactis stevioides* H. & A. [var. *brachypappa* (A. Gray) Hall]. Frequent annual; sandy-gravelly washes and rocky, shaly or limestone slopes; cbs, dws, dcs, bbs; 1050-1550 m; G, P, MH, NY, C, KR; Apr-May.
- Chaenactis stevioides* H. & A. (var. *steviioides*). Infrequent annual; dunes, gravelly-sandy washes, and rocky bajadas; dps, dws, cbs; 730-1200 m; KD, G, P, NY, MM; Apr-May.
- Chrysothamnus depressus* Nutt. Rabbit Brush. Frequent shrub; rocky slopes and crests; pjw; 1550-2200 m; G, P, MH, NY, C; Aug-Oct.
- Chrysothamnus nauseosus* (Pall.) Britt. subsp. *hololeucus* (A. Gray) Hall & Clem. Frequent shrub; rocky slopes, sandy to rocky washes and cyn floors on calcareous, shaly, or granitic substrates; sbs, pjw; 1500-2050(-2290) m; MH, NY, C, KR; Aug-Nov.
- Chrysothamnus nauseosus* (Pall.) Britt. subsp. *leiospermus* (A. Gray) Hall & Clem. Infrequent small shrub, locally common; rocky, limestone or dolomite slopes and cliffs and cyn bottoms; bbs, pjw; 1650-2300 m; only C, reported KR; July-Oct.
- Chrysothamnus paniculatus* (A. Gray) Hall. Frequent tall shrub; gravelly to rocky arroyo bottoms and sandy-gravelly washes; dws, cbs, jtw, pjw; 750-1550 m; all ranges; Sept-Nov.

- Chrysothamnus teretifolius* (Dur. & Hilg.) Hall. Infrequent shrub; rocky volcanic, dolomitic, or granitic slopes and ridges; mds, jtw; pjw; 1050–2050 m; only G and KR, where locally abundant; Sept–Nov.
- Chrysothamnus viscidiflorus* (Hook.) Nutt. subsp. *viscidiflorus*. [incl. var. *stenophyllus* (A. Gray) Anders.]. Infrequent shrub; rocky, usually n-facing slopes; sbs, pjw, wfpw; (1000–)1350–2300 m; only NY and KR; Oct.
- Cirsium neomexicanum* A. Gray. Thistle. Common tall perennial; about spgs, in sandy-gravelly washes and on rocky slopes; dws, drs, jtw, pjw; 975–2150 m; all ranges; May–June.
- Cirsium nidulum* (Jones) Petr. Rare perennial; rocky slopes and gravelly cyn bottoms; pjw; 1550–2300 m; only NY and C; June–Sept.
- \**Conyza canadensis* (L.) Cronq. Horseweed. Rare annual weed in disturbed ground; 915–1525 m; only KR (Crystal Spg, Horse Thief Spgs, *Castagnoli 169*, and near Smith Mine); May–Sept.
- Dicoria canescens* T. & G. subsp. *canescens*. Rare annual though locally abundant; dps; 670–850 m; only KD and reported KR (dunes at Coyote Holes); Oct.
- Dyssodia cooperi* A. Gray. Common ill-scented perennial; gravelly-sandy or rocky washes, slopes, mesas, and gently sloping bajadas; dws, cbs, jtw; 900–1650 m; all ranges; May–June.
- Dyssodia pentachaeta* (DC.) Rob. subsp. *pentachaeta* var. *belenidium* (DC.) Strother. Frequent low, diffusely-branched perennial; rocky slopes, mesas, and ridges, and gravelly arroyos and bajadas, especially on limestone or dolomite; dcs, cbs, jtw, bbs; 900–1550(–1700) m; P, MH, I, C, KR; Apr–June, Sept–Oct.
- Dyssodia porophylloides* A. Gray. Rare perennial; rocky slopes; mds; 1100–1250 m; only G (Willow Spgs, Budweiser Cyn, and Cottonwood Basin areas) and P (ridge below first peak above Fountain Cyn, *Mary Beal 948*, JEPS); Apr–Oct.
- Encelia farinosa* A. Gray ex Torr. Brittle-bush, Incienso. Infrequent shrub, though locally abundant; rocky, often s-facing slopes; drs, cbs; 800–1200 m; G, north side of P, reported w KR; Apr–May.
- Encelia frutescens* A. Gray ex Torr. Rare shrub; sandy-gravelly washes and banks; cbs; 800–1150; n bajadas of G, P, NY; Mar–May.
- Encelia actoni* Elmer. Rare low, rounded shrub; rocky slopes; drs; reported only from higher elevations in P (C. Clark, per. comm.); Apr–May.
- Encelia virginensis* A. Nels. Common shrub; sandy to rocky banks, arroyo benches, open flats, slopes, ridges, and mesas; dcs, cbs—pjw; 1050–1450(–1525) m; all ranges; Apr–June.
- Enceliopsis nudicaulis* (A. Gray) A. Nels. Naked-stemmed Sunray. Rare perennial; clayey gypsiculous soil of slopes and ridges; gs; 875–1225 m; only ne C; Apr–May. Some of our material is almost indistinguishable

- from the gypsicolous *E. argophylla* (D. C. Eat.) A. Nels. of Arizona and Nevada. The two taxa may not be distinct.
- Erigeron aphanactis* (A. Gray) Greene. Fleabane. A discoid perennial reported from P by Munz (1974) but no specimens seen by us.
- Erigeron breweri* A. Gray var. *porphyreticus* (Jones) Cronq. Rare perennial; rocky granitic slopes and ridges; sbs, pjw; 1850–2150 m; only KR; May–June.
- Erigeron divergens* T. & G. Frequent annual or biennial; rocky slopes, flats, and stream beds in cyn bottoms; drs, ssm, jtw, pjw; 900–1850 m; G, P, MH, NY, I, KR; May–June, Oct–Nov.
- Erigeron foliosus* Nutt. var. *covillei* (Greene) Compton. Infrequent perennial; sandy-gravelly arroyos, washes, and open granitic slopes; dws, cbs, pjw; 1250–2000 m; G, MH, NY, I, KR; May–July.
- Erigeron pumilus* Nutt. subsp. *concinoides* Cronq. Tidy Fleabane. Very common perennial; sandy-gravelly or rocky flats, slopes, ridges, mesa tops, and arroyos, often on calcareous substrates; cbs, drs, jtw, pjw; 900–1950 m; G, P, NY, I, C, KR; Apr–June.
- Erigeron uncialis* Blake. Rare perennial; shaded crevices of n-facing limestone cliffs; wfpw; 1920–2300 m; only C; May–July.
- Erigeron utahensis* A. Gray. Very rare suffruticose perennial, not recently collected; limestone slopes; dcs; 1525 m; only P (near the Bonanza King Mine, Wolf 9670, May 28, 1940).
- Erigeron* sp. nov. (?). Limestone cliffs and ridges; dcs; 1400–1770 m; P (near the Bonanza King Mine, Thorne 50692 and Henrickson 10256b). These specimens approach *Erigeron breweri* and *E. foliosus* but differ from them substantially. They may represent a new species.
- Eriophyllum ambiguum* (A. Gray) A. Gray var. *paleaceum* (T. S. Brandegee) Ferris. Woolly-daisy. Infrequent annual, locally abundant; rocky slopes and cliffs and gravelly flats and washes; drs, jtw, bbs; (915–)1050–1550 m; only KR; May–June.
- Eriophyllum pringlei* A. Gray. Infrequent small annual; sandy washes of bajadas; dws, cbs, jtw, bbs; (760–)1000–1600 m; G, MH, NY, C, reported KR; Apr–June.
- Eriophyllum wallacei* A. Gray. Woolly-daisy. Common, often locally abundant, small annual; sandy-gravelly to bouldery cyn bottoms, and washes, dunes, bajadas, and flats; dws, cbs, jtw; 670–1670 m; all ranges; Mar–June.
- Eupatorium herbaceum* A. Gray. [*Ageratina herbacea* King & Robbins]. Infrequent perennial from woody caudex; sandy, gravelly, or rocky slopes and bottoms of cyns and arroyo margins, on granitic or calcareous substrates; pjw, pjow; 1550–1950 m; G, MH, NY, C, reported KR; Sept–Oct.

- Filago californica* Nutt. Infrequent erect annual; sandy, bouldery flats and rocky slopes; cbs, drs; (600–)750–1525 m; G, P, NY, KR; Mar–May.
- Geraea canescens* T. & G. Desert-sunflower. Rare annual; sandy-gravelly flats and washes and gentle bajadas; cbs, dws; 670–1200 m; KD, G, P (especially Granite Pass area), reported KR (Kingston Wash); Mar–May.
- Glyptopleura marginata* D. C. Eat. Infrequent annual; sandy flats of bajadas; dws, cbs, jtw; 670–1200 m; G, P, NY, I, KR; Apr–June.
- Gnaphalium palustre* Nutt. Cudweed. Rare annual; one plant collected along a stream; ssm; 1280 m; only G (Bull Cyn); May–Oct.
- Gnaphalium wrightii* A. Gray. Rare perennial; along intermittent streams, near spgs, or in washes; ssm; 1150–1850 m; only NY and KR; Oct–Nov, Apr–May.
- \**Grindelia aphanactis* Rydb. Rare biennial; collected once along sandy roadside; 1525 m; C (Mountain Pass, *J. C. Roos 4983*, Sept. 3, 1950).
- Gutierrezia microcephala* (DC.) A. Gray. Matchweed, Broomweed. Common subshrub; bouldery, sandy, or rocky limestone slopes, cyns, and sandy-gravelly bajadas; cbs, jtw, bbs, pjw; 900–2000 m; all ranges; Sept–Oct.
- Gutierrezia sarothrae* (Pursh) Britt. & Rusby. Frequent subshrub; rocky limestone or granitic slopes, cyns, and ridges; drs, jtw, pjw; (900–)1250–2320 m; all ranges; Aug–Oct.
- Haplopappus brickellioides* Blake. [*Hazardia brickellioides* (Blake) Clark]. Infrequent perennial; dolomitic slopes and benches; dcs; 850–1160 m; only KR; Sept.
- Haplopappus cooperi* (A. Gray) Hall subsp. *cooperi*. Goldenbush. Common small shrub; rocky slopes and sandy-gravelly washes of bajadas; cbs, jtw, bbs; 1050–1650 m; all ranges; Apr–June.
- Haplopappus cuneatus* A. Gray. [*Ericameria cuneatus* McClatchie]. Rock Goldenbush. Common low shrub; crevices of boulders or outcrops of granitic, volcanic, or conglomerate rock, less common on calcareous substrates; mds, pjw; (915–)1200–2200 m; G, MH, NY, I, C, KR; Aug–Nov.
- Haplopappus laricifolius* A. Gray. Turpentine Bush. Infrequent shrub; among granitic boulders, on cyn bottoms, sandy or clayey-gravelly washes, and on rocky limestone slopes; drs, pjw; 1250–2000 m; G, MH, I, C; Sept–Oct.
- Haplopappus linearifolius* DC. Very common shrub; rocky slopes and mesa tops, on granitic, volcanic, or limestone substrates, often among granitic boulders, and on gravelly-rocky arroyo benches and washes; dws, cbs–pjw; 850–2000(–2200) m; all ranges; Mar–June.
- Haplopappus nanus* (Nutt.) D. C. Eat. Rare low shrub; crevices of granitic rocks; 1615 m; mds; only I (*Prigge 2260a*, Oct. 14, 1977) a considerable range extension southward and downward in elevation; Aug–Oct.

- Haplopappus ravenii* Jackson. [*H. gracilis* of California authors]. Infrequent annual; sandy-gravelly flats and washes on gently sloping bajadas; jsbs, jtw, bbs; 1250–1550 m; P, MH, NY, C; May–July.
- Hecastocleis shockleyi* A. Gray. Rare low, rounded subshrub; dcs; 1030–1350 m; only KR (on dolomite of cyn draining n from “4439,” *de Nevers* 362 and 428); July.
- Hymenoclea salsola* T. & G. var. *salsola*. Burrobush, Hopsage, Cheesebush. Abundant shrub at lower elevations; sandy-gravelly washes, sandy-rocky flats and mesas, gently sloping bajadas and valley floors; one of the dominant shrubs of dws, also in cbs, jtw, bbs; 900–1550 m; all ranges; Apr–May.
- Hymenopappus filifolius* Hook var. *eriopodus* (A. Nels.) Turner. Infrequent perennial; rocky cyn slopes and bottoms and limestone ridges; pjw, wfpw; 1550–2150 m; only NY and C; May–July, Oct.
- Hymenoxys acaulis* (Pursh) Parker var. *arizonica* (Greene) Parker. Infrequent perennial, locally abundant; clayey-gravelly-rocky flats, slopes, and ridges, usually on limestone; pjw, wfpw; 1450–2300 m; only NY (Barnwell-Keystone Cyn area) and C (s-facing slope of Clark Mtn and Juniper Claims area); Apr–June.
- Hymenoxys cooperi* (A. Gray) Ckll. subsp. *cooperi*. Frequent perennial; rocky or gravelly cyn slopes, flats, ridges, cliffs, and talus, usually on limestone; pjw, wfpw; 1350–2300 m; P, MH, NY, C; May–July, Oct.
- \**Lactuca serriola* L. Wild Lettuce. Rare weedy annual; disturbed places, as near mine buildings; 1525 m; C (Colosseum Mine, collected in 1940 where it presumably did not become established).
- Layia glandulosa* (Hook.) H. & A. subsp. *glandulosa*. White Tidy-tips. Frequent annual; clayey, sandy, or gravelly soils of flats, benches, gentle slopes, cyn floors, and washes; cbs, dws–pjw; 750–1700 m; all ranges; Mar–May.
- Lepidospartum latisquamum* S. Wats. Nevada Broom-shrub. Rare shrub; rocky limestone cyn bottoms; pjw; 1700–1900 m; only C; Sept–Oct.
- Lessingia lemmonii* A. Gray subsp. *lemmonii*. Rare annual, though locally common in sandy washes and open flats; jsbs, dws, jtw, pjw; 1450–1700 m; only MH, May–June.
- Leucelene ericoides* (Torr.) Greene. Rose-heath, White-aster. Frequent small perennial, often locally abundant; sandy-gravelly or rocky slopes and flats; jtw, bbs, pjw; 1100–2150 m; MH, NY, I, C; Apr–Aug.
- Machaeranthera canescens* (Pursh) A. Gray subsp. *canescens*. Desert-aster. Frequent tap-rooted biennial; sandy to rocky flats, slopes, and washes; jsbs, jtw, pjw; 1200–1850 m; P, MH, NY, I, C, KR; May–Oct.
- Machaeranthera leucanthemifolia* (Greene) Greene. Rare perennial; dps; 670–760 m; only KD; May–June.



- Machaeranthera tanacetifolia* (H.B.K.) Nees. Rare annual; pjw; 1675 m; only NY (in lower Fourth of July Cyn near old mine mill, *Henrickson 12712*, Aug. 30, 1973); apparently a first report for California.
- Malacothrix coulteri* A. Gray. Snake's-head. Infrequent annual; sandy-gravelly bajadas and rocky slopes; cbs, bbs; 900–1200(–1375) m; G, P, NY (Barnwell, *K. Brandegee*, May 1911, UC), reported KR; Mar–May.
- Malacothrix glabrata* A. Gray. Desert-dandelion. Frequent annual; gravelly-sandy to rocky dunes, washes, cyn bottoms, flats, slopes, and bajadas; dps, cbs; 670–1550 m; KD, all ranges; Apr–May.
- Malacothrix sonchoides* (Nutt.) T. & G. Rare annual; only KR (Kingston Wash, 825 m, *Stone 51*); Apr–June. Also known from Mesquite Valley (*Wolf 10636*, May 15, 1941).
- Malacothrix stebbensii* Davis & Raven. Rare annual; decomposed granitic soil in sandy washes; dws, cbs; 1200–1300 m; only G (at mouth of Willow Spgs Cyn) and KR (Horse Thief Spgs); Apr–May.
- Microseris linearifolia* (DC.) Sch.-Bip. Silver Puffs. Common annual; sandy-gravelly washes, cyn bottoms, flats, granitic slopes among boulders, and old burns; cbs, jtw, bbs, pjw; 670–2250 m; all ranges; Mar–May.
- Monoptilon bellidiforme* T. & G. ex A. Gray. Desert Star. Rare annual; washes; dws, cbs; 1130 m; only G (Willow Spg Basin and Sheep Corral); Apr–May.
- Monoptilon bellioides* (A. Gray) Hall. Infrequent annual; sandy or clayey loam-rocky flats, dunes, washes, and gravelly bajadas; dws, dps, cbs, bbs; 750–1050 m; KD, G, P, C, KR; Mar–May.
- Nicolletia occidentalis* A. Gray. Hole-in-the-sand Plant. Rare perennial; bottom of sandy wash; dws; 1130 m; only G (Willow Spgs Wash); Apr–June.
- Palafoxia arida* B. L. Turner var. *arida*. [*Palafoxia linearis* (Cav.) Lag.]. Spanish-needles. Infrequent annual, sometimes rather woody; locally abundant on dunes and in sandy washes of lower bajadas; dps, cbs, dws; (670–)730–1250 m; KD, G, P, reported KR; Apr–May.
- Pectis papposa* Harv. & Gray ex A. Gray. Cinch Weed. Infrequent, aromatic summer annual, sometimes locally very abundant; gravelly-sandy or stony washes, flats, and bajadas; cbs, jtw, bbs; 750–1650 m; KD, G, P, NY, I, C, KR; Aug–Oct.
- Perityle emoryi* Torr. in Emory. Rock-daisy. Rare brittle winter annual, locally common; crevices on rocky slopes; mds; 750–1400 m; only G and P; Mar–May.
- Perityle megalcephala* (S. Wats.) Macbr. var. *oligophylla* Powell. Rare subshrub; gravelly limestone arroyos and limestone slopes; cbs, dws, dcs, bbs; 1050–1500 m; only C (Stateline Pass area and Shire Gypsum Deposits area) and KR (ne portion of range, *de Nevers 419*); June–Sept.
- Petradoria pumila* (Nutt.) Greene. Rock-goldenrod. Frequent suffrutescent

- shrub; steep, rocky-gravelly limestone slopes and ridges; dcs in pjw; 1050–2350 m; P, NY, C; July–Oct.
- Peucephyllum schottii* (A. Gray) A. Gray. Pigmy-cedar. Infrequent shrub; steep, s-facing, limestone slopes and ridges; dcs; 975–1225 m; P, C, KR; Dec–June.
- Pleurocoronis pluriseta* (A. Gray) King & Robbins. Arrow-leaf. Infrequent subshrub; crevices of rocky slopes and cliffs; cbs, mds; (915–)1000–1275 m; G, P, reported KR; Apr–May.
- Pluchea sericea* (Nutt.) Cov. Arrowweed. Rare slender shrub; seepage slope; 670 m; only KR (Coyote Holes, *de Nevers 203b*); June–July.
- Porophyllum gracile* Benth. Odora. Frequent suffrutescent perennial at lower elevations; rocky or gravelly-sandy slopes, flats, mesas, and arroyos; dws, cbs, bbs, drs; 800–1600; G, P, I, C, KR; Apr–Oct.
- Prenanthes exiguua* (A. Gray) Rydb. [*Lygodesmia exiguua* A. Gray]. Infrequent annual; rocky slopes and ridges and gravelly-silty flats; cbs, bbs; (850–)900–1550 m; G, NY, P, I, C, KR; Apr–May.
- Psathyrotes annua* (Nutt.) A. Gray. Rare annual; rocky limestone slopes; dcs, gs; (790–)1065–1100 m; only C (near Stateline Pass and Shire Gypsum Deposits area) and reported KR (Kingston Wash); Apr–Oct.
- Psathyrotes ramosissima* (Torr.) A. Gray. Rare annual or perennial; silty to gravelly-rocky alluvial fans and flats; cbs; 750–900 m; P (bajada on nw side of range) and reported KR; Apr–Oct.
- Psilostrophe cooperi* (A. Gray) Greene. Paperflower. Common suffrutescent perennial; rocky slopes and mesas, cyn bottoms, gravelly arroyo benches and washes, and sandy flats; dcs, jtw, bbs, pjw; (880–)900–1950 m; all ranges; Apr–Dec.
- Rafinesquia californica* Nutt. California-chicory. Infrequent annual; gravelly washes, igneous mesa tops, and rocky, limestone slopes; dws, drs, jtw, pjw; 900–1500 m; G, P, MH, KR; Apr–June.
- Rafinesquia neomexicana* A. Gray. Desert-chicory. Frequent annual; sandy, gravelly flats, dunes, arroyos, and rocky slopes; dps, cbs, drs, jtw; 750–1370 m; KD, all ranges; Apr–May.
- Sanvitalia abertii* A. Gray. Rare summer annual; rocky, gravelly limestone slopes and washes; dws, dcs, jtw; 1570–1670 m; only NY and C; Aug–Oct.
- Senecio douglasii* DC. var. *monoensis* (Greene) Jeps. Groundsel. Common shrub; rocky to gravelly slopes, cyn bottoms, and arroyos, and sandy washes; dws, cbs, jtw, pjw; 750–1700 m; all ranges; Apr–Oct.
- Senecio mohavensis* A. Gray. Ragwort. Rare annual; granitic arroyo; pjw; 1585 m; only MH (Butcher Knife Cyn); Oct.
- Senecio multilobatus* T. & G. Ragwort. Common perennial, though rare in G; gravelly or rocky slopes, ridges, and open flats, and in cyns and ar-

- royos on both granitic and limestone substrates; drs, jtw, pjw, wfpw; 900–2300 m; all ranges; Apr–July.
- Solidago confinis* A. Gray. Goldenrod. Infrequent perennial; moist, sandy to rocky ground near spgs and along stream beds; dow, ssm in pjw; 1000–1850 m; G, NY, reported KR; June–Oct.
- \**Sonchus asper* (L.) Hill. Sow-thistle. Infrequent weedy annual; along intermittent streams in wet sand or gravel or about ponds and spgs; ssm; 1050–1500 m; G, P, NY, reported KR; Apr–Oct.
- \**Sonchus oleraceus* L. Rare weedy annual; disturbed area at spgs; dow; 1500 m; only C (Pachalka Spg); Apr–June.
- Stephanomeria exigua* Nutt. [incl. var. *pentachaeta* (D. C. Eat.) Hall]. Wire-lettuce. Frequent annual; sandy to gravelly dunes, washes, arroyo banks, open flats, and gently sloping bajadas; dps, cbs–bbs; 670–1675 m; KD, G, P, MH, NY, C, reported KR; Apr–Sept.
- Stephanomeria parryi* A. Gray. Infrequent weak perennial; sandy to rocky slopes and flats; cbs, jsbs, drs; (900–)1200–1675 m; G, MH, KR; May–June.
- Stephanomeria pauciflora* (Torr.) A. Nels. Frequent perennial; dunes, sandy-gravelly arroyos and washes, and rocky slopes; dps–pjw; 730–1600 m; KD, G, P, MH, NY, C, KR; Oct.
- Stylocline micropoides* A. Gray. Desert Nest-straw. Infrequent small annual; sandy-gravelly washes, rocky slopes and ridges, and igneous mesa tops; cbs, jtw, pjw; 760–1500 m; KD, G, P, MH, NY, C, KR; Apr–May.
- Syntrichopappus fremontii* A. Gray. Frequent annual; sandy-gravelly alluvium, rocky slopes and mesas, and gravelly washes; cbs, drs, jtw, pjw; 975–1525–(2075); G, P, MH, NY, C, KR; Apr–June.
- \**Taraxacum officinale* Wiggers. Dandelion. Rare weedy perennial; granitic sand, wet with seepage; 1615 m; only MH (Butcher Knife Cyn); most of year.
- Tetradymia argyraea* Munz & Roos. Striped Horsebush. Common low, spiny shrub; rocky and gravelly slopes and ridges; jtw, jsbs, bbs, pjw; 1200–2200 m; all ranges (except NY); June–Sept.
- Tetradymia axillaris* A. Nels. Rare shrub; dolomite hill; dcs; 1160 m; only KR (hill “3944” at n end of range, *Stone 94*); Apr–May.
- Tetradymia canescens* DC. Spineless Horsebush. Rare dense shrub; rocky, s-facing, limestone slopes; pjw; 2075–2300 m; only C; July–Sept.
- Tetradymia spinosa* H. & A. var. *longispina* Jones. Infrequent shrub; upper bajadas on dolomite or granite; jtw, bbs; 1220–1525 m; only KR (*Loco Heifer Cyn, Castagnoli 123*); Apr–May.
- Tetradymia stenolepis* Greene. Infrequent spiny shrub; rocky slopes of bajadas; cbs, jtw, bbs; 975–1475 m; G, P, NY, C; June–Aug.
- Trichoptilium incisum* (A. Gray) A. Gray. Yellow Head. Rare annual; rocky slopes of bajadas; cbs; 700–825 m; only G; Oct–Nov.

*Trixis californica* Kell. Pichaga. Rare perennial; only on rocky slopes and cyn bottoms; mds; 760–1225 m; G (only w end, S. F. Warrick, May 16, 1978); Mar–May.

*Viguiera deltoidea* A. Gray var. *parishii* (Greene) Vasey & Rose. Goldeneye. Common subshrub; rocky cyn slopes and bottoms and sandy-gravelly washes of bajadas; dws, cbs, bbs, pjw; 915–1500 m; all ranges; Apr–July, Sept–Oct.

*Viguiera multiflora* (Nutt.) Blake var. *nevadensis* (A. Nels.) Blake. Frequent suffrutescent perennial; gravelly-sandy to rocky, limestone slopes and cyn bottoms, talus, and washes; dcs, bbs, pjw; (1200–)1275–2000 m; NY, C, KR; May–June, Sept–Oct.

\**Xanthium strumarium* L. [incl. var. *canadense* (Mill.) T. & G.]. Cocklebur. Rare annual weed; on disturbed ground; 1400 m; only KR (Horse Thief Spgs, *Stone* 295c); July–Aug.

*Xylorhiza tortifolia* (Torr. & Gray ex A. Gray) Greene. [*Machaeranthera tortifolia* Cronq. & Keck, *Aster abatus* Blake]. Desert-aster. Frequent, showy, suffruticose perennial; rocky slopes and flats; cbs, drs, jtw, bbs; 670–1430 m; all ranges; Apr–June.

#### Berberidaceae—Barberry Family

*Mahonia haematocarpa* (Woot.) Fedde. [*Berberis haematocarpa* Woot.]. Desert Barberry. Infrequent large, spiny shrub; locally abundant on sandy cyn bottoms and washes; pjw, pjow; 1450–1800 m; only MH and NY, and collected once in G (on rocky cliff face, summit of Willow Spgs Cyn, 1525 m, *Wolf* 10148, Apr. 29, 1941); May–June.

#### Bignoniaceae—Bignonia Family

*Chilopsis linearis* (Cav.) Sweet. Desert-Willow. Common and locally abundant large shrub or small tree throughout lower elevations; dunes, sandy to rocky washes, cyn bottoms, and slopes; dws, dps, cbs, jtw; 700–1600 m; KD, G, P, NY, C, KR; May–July.

#### Boraginaceae—Borage Family

*Amsinckia tessellata* A. Gray. Fiddleneck. Common annual; sandy-gravelly to rocky washes, flats, slopes, and bajadas; cbs, jtw, bbs, pjw; 900–1700 m; all ranges; Mar–June.

*Cryptantha angustifolia* (Torr.) Greene. Frequent annual, locally common; dunes and gravelly-sandy bajadas, flats, mesas, washes, and cyn bottoms; dws, cbs, dps; 670–1400 m; KD, G, P, I, reported KR; Mar–May.

*Cryptantha barbiger* (A. Gray) Greene. Common annual; rocky to sandy-gravelly bajadas, flats, washes, cyn bottoms, and slopes; cbs–pjw; 670–1625 m; all ranges; Mar–June.

- Cryptantha circumscissa* (H. & A.) Jtn. Common annual; sandy to rocky washes, open flats, slopes, and dunes, especially at lower elevations; dws-pjw; 670–1770 m; KD, all ranges; Mar–June.
- Cryptantha confertifolia* (Greene) Pays. Rare perennial; rocky, n-facing limestone slopes; dcs, gs, pjw; 1200–2150 m; only C and KR; Apr–May.
- Cryptantha decipiens* (Jones) Heller. Infrequent annual; gravelly-sandy washes and flats and rocky slopes at low elevations; dws, drs, cbs; 750–1375 m; G, P, MH, reported KR; Mar–May.
- Cryptantha dumetorum* (Greene ex Gray) Greene. Infrequent sprawling annual; sandy-gravelly places among boulders, at bases of cliffs, and on open flats and valleys at low elevations; cbs; 750–1220(–1300) m; G, P, MH, C, KR; Apr–May.
- Cryptantha flavoculata* (A. Nels.) Pays. Infrequent perennial; rocky limestone slopes, talus, and ridges at higher elevations; dcs, pjw; 1700–2350 m; NY, C, reported KR; Apr–June.
- Cryptantha gracilis* Osterh. Very common annual throughout; rocky slopes, cyn bottoms, arroyo margins, and sandy-gravelly washes and flats; dws, cbs-wfpw; 900–2325 m; all ranges; Apr–June.
- Cryptantha maritima* (Greene) Greene. [incl. var. *pilosa* Jtn.]. Infrequent annual; mostly limestone slopes and flats; dcs, gs; 900–1225 m; G, P, C, KR; Mar–May.
- Cryptantha micrantha* (Torr.) Jtn. subsp. *micrantha*. Infrequent annual; dunes and sandy washes and flats of bajadas; dps, cbs; 600–1300 m; KD, G, P, MH, reported KR; Mar–June.
- Cryptantha nevadensis* Nels. & Kenn. var. *nevadensis*. Infrequent annual; rocky slopes and gravelly-sandy washes and flats of bajadas; cbs, dws, jtw, bbs; 700–1250 m; G, P, MH, NY, C, KR; Mar–May. [The var. *rigida* Jtn. was collected along the Excelsior Talc Mine Rd, KM, 1060–1150 m, Abrams 14051, 14061].
- Cryptantha pterocarya* (Torr.) Greene. [incl. var. *cycloptera* (Greene) Macbr.]. Very common annual; dunes, sandy washes and flats, rocky slopes, arroyo margins, and cyn bottoms; dps, dws, cbs, bbs, dcs; 730–1700 m; KD, all ranges; Mar–June.
- Cryptantha racemosa* (S. Wats.) Greene. Rare perennial; rocky cyn and arroyo slopes on granitic or limestone substrates; drs; 1000–1200(–1675) m; G, P, C, reported KR; Mar–May.
- Cryptantha recurvata* Cov. Rare annual; rocky, limestone slopes; dcs, gs; 1050–1225 m; only P and C; Mar–May.
- Cryptantha tumulosa* (Pays.) Pays. Infrequent perennial, though locally abundant; rocky, granitic or limestone slopes and ridges, and cyn bottoms and washes on gravelly or sandy alluvium of granitic or limestone origin; dcs, jtw, pjw; 1400–2000 m; P, MH, NY, I, C; May–June.

- Cryptantha utahensis* (A. Gray) Greene. Frequent annual; sandy-gravelly arroyos and washes and rocky slopes, often on talus at base of limestone cliffs; dws, drs; 975–1925 m; G, P, C, KR; Apr–June.
- Cryptantha virginensis* (Jones) Pays. Infrequent biennial or short-lived perennial; rocky limestone and gravelly, rocky mesas with clayey soil, perhaps gypsiferous; dcs, gs, bbs, pjw; 915–1830 m; I, C, KR; Apr–May. It is difficult to distinguish this species in C from *C. tumulosa*.
- Heliotropium convolvulaceum* (Nutt.) A. Gray var. *californicum* Greene. Heliotrope. Rare hispid annual; sandy places at low elevations; dps; 670–730 m; KD (along power line rd), G (valley near Old Dad Mtns), reported KR (dunes at Coyote Holes); Apr–May, Sept–Oct.
- Heliotropium curassavicum* L. subsp. *oculatum* (Heller) Thorne. Infrequent colonial perennial; disturbed alkaline soil about spgs; dow; (975–)1500 m; only C (Pachalka Spg) and KR (Smith Mine area and Crystal Spg); May–July.
- Lappula redowskii* (Hornem.) Greene. [incl. var. *desertorum* (Greene) Jtn.]. Stickseed. Rare annual; mostly rocky, limestone slopes; dcs, jtw; 1200–1675 m; MH, NY, I, C; Apr–May.
- Lithospermum incisum* Lehm. Puccoon. Rare perennial; sandy or rocky slopes; pjw; 1700 m; only NY (Keytone Cyn); May.
- Pectocarya heterocarpa* (Jtn.) Jtn. Frequent annual; dunes, sandy-gravelly to rocky cyn bottoms and washes, mesas, flats, or gentle bajada slopes; dps to lower pjw; 670–1300 m; KD, G, P, MH, NY, I, C; Mar–May.
- Pectocarya platycarpa* (M. & J.) M. & J. Frequent annual; dunes, sandy-gravelly washes, bajadas, and flats, and rocky cyn bottoms; dws, cbs; 670–1130(–1200) m; KD, G, P, MH, C, reported KR; Mar–May.
- Pectocarya recurvata* Jtn. Rare annual; sandy or rocky, limestone slopes; mds, cbs; 975–1200 m; G (Coyote Spg) and KR (2.5 km s of Excelsior Talc Mine); Apr–May.
- Pectocarya setosa* A. Gray. Frequent annual; sandy to rocky washes, flats, bajadas, mesa tops, and clayey limestone or granitic slopes; dws–pjw; 760–1675 m; G, P, MH, NY, C, KR; Mar–May.
- Plagiobothrys arizonicus* (A. Gray) Greene ex A. Gray. Popcorn Flower. Frequent annual; sandy to rocky slopes, open flats, and washes; dws, cbs, jtw, pjw; 670–1500 m; KD, G, P, MH, NY, I, KR; Mar–June.
- Plagiobothrys jonesii* A. Gray. Rare annual; alluvial fans and rocky, limestone slopes; cbs, dcs, gs; 950–1500 m; P, C, reported KR; Mar–May.
- Tequilia canescens* (DC.) Richards. [*Coldenia canescens* DC.]. Infrequent matted perennial; rocky or gravelly-clayey slopes and bajadas; cbs, bbs, jtw; 1200–1500 m; P, NY, C; Apr–June.
- Tequilia plicata* (Torr.) Richards. [*Coldenia plicata* Cov.]. Infrequent matted perennial, locally abundant at low elevations; dunes, sandy washes

and bajadas; dps, cbs; 670–760(–825) m; KD, G, P, C, reported KR; Apr–June.

### Brassicaceae—Mustard Family

*Arabis glaucovalvula* Jones. Rock Cress. Rare perennial; gravelly-sandy bajadas and gravelly to rocky flats and cyn slopes; cbs, drs, jtw; 1150–1300 m; G, NY, KR; Mar–Apr.

*Arabis perennans* S. Wats. Very common perennial throughout rocky slopes, cliffs, talus, arroyo margins and terraces, and sandy-gravelly bottoms of cyns and arroyos; dws–pjw; 915–2000(–2200) m; all ranges; Apr–May.

*Arabis pulchra* Jones var. *gracilis* Jones. Rock-cress. Infrequent perennial; rocky slopes and arroyo margins on granitic and limestone substrates, gravelly talus, and open flats; cbs, drs, jtw, bbs; 850–1850 m; all ranges; Mar–May.

\**Brassica geniculata* (Desf.) J. Ball. Mustard. Rare weedy biennial or short-lived perennial; disturbed places; 1600–1675 m; G, MH, NY; Apr–June.

\**Brassica nigra* (L.) Koch. Black Mustard. Rare weedy annual; only disturbed alkaline areas; 1500 m; C (around Pachalka Spg); Mar–Aug.

*Caulanthus cooperi* (S. Wats.) Pays. Frequent annual; rocky cyn slopes and bottoms, sandy-gravelly washes, and clayey to gravelly mesas, flats, and bajadas, often among shrubs; cbs, drs, jtw, bbs, pjw; (730–)900–1600 m; all ranges except NY; Mar–May.

*Caulanthus crassicaulis* (Torr.) S. Wats. Wild-cabbage. Infrequent perennial; rocky, limestone slopes, cliffs, ridges, and flats; dcs, pjw, wfpw; 900–2150 m; only C and KR; Apr–June.

*Caulanthus lasiophyllum* (Hook. & Arn.) Pays. [*Thelypodium lasiophyllum* Greene and var. *utahense* (Rydb.) Jeps.]. California-mustard. Frequent annual; sandy or gravelly bajada flats, washes, and slopes and rocky hill-sides; cbs, jtw; 730–1225 m; G, P, MH, C, KR; Mar–May.

*Caulanthus major* (Jones) Pays. Rare glabrous perennial; rocky slopes and rocky limestone bajada; dcs in pjw; 1000–1770 m; only NY (Keystone Cyn) and C (se of Stateline Pass); May–June.

*Descurainia pinnata* (Walt.) Britt. subsp. *glabra* (Woot. & Standl.) Detl. Tansy-mustard. Frequent annual, often locally abundant; rocky slopes, sandy-gravelly washes, and open slopes of bajadas; dws, cbs, jtw, pjw; 700–1675 m; G, P, MH, NY, C, KR; Mar–May.

*Descurainia pinnata* (Walt.) Britt. subsp. *halictorum* (Ckll.) Detl. Infrequent annual; sandy to rocky flats and slopes; cbs, drs, jtw; 900–1525 m; G, P, KR; Apr–May.

\**Descurainia sophia* (L.) Webb. Tansy-mustard. Rare weedy annual; disturbed roadsides or spgs on sandy or gravelly soil; 750–1500 m; G, C, reported KR; Apr–May.

- Dithyrea californica* Harv. Spectacle-pod. Infrequent annual; dunes and sandy-gravelly flats and washes of bajadas at low elevations; dps, dws, cbs; 670–1200 m; KD (where locally abundant) and reported KR (Coyote Holes); Apr–May.
- Draba cuneifolia* Nutt. ex T. & G. var. *cuneifolia*. Frequent annual; limestone crevices and talus, gravelly or sandy slopes, ridges, and cyn bottoms; dcs, pjw; 1250–1900 m; P, MH, NY, C; Mar–Apr.
- Draba cuneifolia* Nutt. ex T. & G. var. *integrifolia* S. Wats. Infrequent annual at lower elevation; dunes, sandy to rocky washes and cyn bottoms and slopes, especially in limestone crevices and under large granitic boulders; dps, dws, cbs, drs; 760–1300 m; KD, G, P, w C, KR; Mar–Apr.
- Halimolobos diffusa* (A. Gray) O. E. Schulz var. *jaegeri* (Munz) Roll. Infrequent perennial at highest elevations; rocky slopes, cliffs, and peaks in crevices and talus and among boulders, granitic, volcanic, or carbonate soil; drs, pjw, wfpw; 1350–2350 m; P, MH, C, KR; May–Sept.
- Hutchinsia procumbens* (L.) Desv. Rare annual; wet, sandy border of a cyn stream; ssm; 1220 m; only P (at w end, *R. Hoffman s. n.*, May 18, 1930).
- Lepidium fremontii* S. Wats. Peppergrass. Common suffrutescent perennial; rocky slopes and benches; gravelly arroyos, and sandy washes and open flats; dws, cbs, drs, gs, jtw, bbs; 915–1525 m; G, P, MH, C, KR; Apr–May.
- Lepidium lasiocarpum* Nutt. [incl. var. *georginum* (Rydb.) C. L. Hitchc.]. Common annual throughout, often locally abundant; rocky slopes, sandy-gravelly arroyos and flats, sandy cyn bottoms and washes; dws–pjw; 760–1675 m; all ranges; Mar–May.
- Lepidium montanum* Nutt. subsp. *cinereum* (C. L. Hitchc.) C. L. Hitchc. Infrequent perennial; sandy granitic slopes, cyn floors, and washes, and rocky limestone slopes and mine talus; jtw, pjw; 1300–1900 m; MH (Cottonwood Cyn) and NY; Mar–July.
- \**Lepidium virginicum* L. var. *pubescens* (Greene) C. L. Hitchc. Rare annual weed; reported only KR (where found along road by Abrams).
- Lesquerella kingii* S. Wats. subsp. *latifolia* (A. Nels.) Rollins & Shaw. Bladder Pod. Infrequent perennial; rocky slopes, talus, and sandy-gravelly cyn bottoms, especially on limestone; pjw; 1575–1950 m; P, NY, C; Mar–June.
- Lesquerella palmeri* S. Wats. Rare annual; sandy flats and roadsides; cbs; 750–1225 m; only P (near Bonanza King Mine); Mar–May.
- \**Nasturtium officinale* R. Br. [*Rorippa nasturtium-aquaticum* (L.) Schinz & Thell.] Water Cress. Rare naturalized perennial; wet ground about spgs; dow; 1400–1500 m; only C (Pachalka Spg) and KR (Horse Thief Spgs); Mar–Nov.
- Physaria chambersii* Roll. Double Bladder Pod. Infrequent perennial; locally abundant on rocky, limestone slopes, ridges, and cyn bottoms; dcs, pjw; 1525–2000 m; only C; May.



- \**Sisymbrium irio* L. Rare weedy annual; disturbed ground near corrals or mines; (970–)1220–1600 m; G, P, C, reported KR; Mar–May.
- \**Sisymbrium orientale* L. Rare weedy, European annual; disturbed ground; 975 m; only KR (Smith Mine, *Castagnoli 19* and *112*); Mar–Apr.
- Stanleya pinnata* (Pursh) Britt. subsp. *pinnata*. Prince's Plume. Common tall perennial; limestone cliffs, rocky slopes, cyn bottoms, arroyo margins, gravelly washes, about spgs, and on sandy flats; dws, dow, cbs–wfpw; 750–1650 m; all ranges Apr–July.
- Streptanthella longirostris* (S. Wats.) Rydb. Frequent annual; dunes, sandy washes and flats, and clayey to gravelly bajadas; cbs, jtw, bbs, wfpw; 670–1925 m; KD, P, MH, NY, I, C, KR; Mar–May.
- Streptanthus cordatus* Nutt. Rare glabrous perennial; granitic sandy slopes and flats, often among boulders; pjw; 1675–1800 m; only MH (Butcher Knife Cyn) and NY (Fourth of July and Caruthers Cyns and Vanderbilt area); Mar–June.
- Thysanocarpus curvipes* Hook. var. *eradiatus* Jeps. Lace-pod. Infrequent annual; sandy-gravelly open slopes of cyns and bajadas, often among giant boulders; cbs, drs, pjw; 900–1950 m; G, P, MH, NY, C, reported KR; Apr–May.
- Thysanocarpus laciniatus* Nutt. ex T. & G. var. *laciniatus*. Rare annual; pjw; 2150 m; only NY (e slope of New York Peak, with the preceding species); May.

#### Buddlejaceae—Buddleja Family

- Buddleja utahensis* Cov. Infrequent shrub though locally abundant; crevices of calcareous outcrops and gravelly slopes; dcs; (915–)975–1275(–1585) m; C, MM, KR; May–June (Oct).

#### Cactaceae—Cactus Family

- Coryphantha vivipara* (Nutt.) Britt. & Rose var. *desertii* (Engelm.) Marshall. Pincushion Cactus. Frequent succulent-stemmed perennial; rocky calcareous slopes and gravelly bajadas; dcs, jtw, bbs, pjw; 975–1700 (–1830) m; I, C, KR; May–June (Sept).
- Coryphantha vivipara* (Nutt.) Britt. & Rose var. *rosea* (Clokey) L. Benson. Infrequent succulent-stemmed perennial; gravelly or rocky slopes; jsbs, pjow, pjw; 1525–1825 m; only MH and NY; May–June.
- Echinocactus polycephalus* Engelm. & Bigel. Cottontop Cactus. Infrequent succulent-stemmed perennial; gravelly or rocky bajadas and slopes; cbs, dcs, jtw, bbs; below 1375(–1525) m; G, MH, C, reported KR; Apr–May, (Sept).
- Echinocereus engelmannii* (Parry) Lem. var. *chrysocentrus* (Engelm. & Bi-

- gel.) Engelm. ex Rumpler. Hedgehog Cactus. Common succulent-stemmed perennial; gravelly to rocky substrates of bajadas, arroyos, and slopes; cbs, drs, jtw, bbs, jsbs; (900–)975–1525(–1830) m; G, P, MH, NY, I, C, KR; May.
- Echinocereus triglochidiatus* Engelm. var. *melanacanthus* (Engelm.) L. Benson. Mound Cactus. Rare succulent-stemmed perennial; rocky-sandy slopes; jtw; 1525 m; only NY and C; May. This variety has a more eastern distribution than var. *mohavensis* and grades into that variety through their zone of contact in the NE Mojave Desert (Benson 1969).
- Echinocereus triglochidiatus* Engelm. var. *mohavensis* (Engelm. & Bigelow) L. Benson. Mojave Mound Cactus. Frequent stem-succulent; rocky slopes and cyn bottoms, often on bedrock; drs, bbs–pjw; (1060–)1375–2230 m; G, P, MH, NY, I, C, KR; Apr–June.
- Ferocactus acanthodes* (Lem.) Britt. & Rose var. *acanthodes*. Barrel Cactus. Rare stem-succulent; stony slopes; pjw; 1525 m; only MH (Cedar Cyn, Munz & Everett 17454).
- Ferocactus acanthodes* (Lem.) Britt. & Rose var. *lecontei* (Engelm.) Lindsay. Frequent but rarely collected barrel cactus; gravelly-rocky bajadas and slopes; cbs, jtw, bbs; below 1525(–1670) m; G, P, NY, I, C, KR, probably in all ranges; Apr–May.
- Mammillaria tetrancistra* Engelm. Nipple Cactus, Fishhook Cactus. Infrequent stem succulent; gravelly bajadas and rocky slopes; drs, bbs; below 1220(–1370) m; G, C, MM, KR; Mar–Apr.
- Opuntia acanthocarpa* Engelm. & Bigel. var. *coloradensis* L. Benson. Buckhorn Cholla. Common succulent-stemmed shrub; gravelly to rocky bajadas, cyn bottoms, and slopes; cbs–pjw; below 1525(–1825) m; G, P, MH, NY, I, C, KR; May–June.
- Opuntia basilaris* Engelm. & Bigel. var. *basilaris*. Beavertail. Common prickly-pear; sandy to gravelly flats and bajadas and gravelly to rocky slopes; cbs, jtw, bbs; below 1525 m; all ranges; Apr–July.
- Opuntia basilaris* Engelm. & Bigel. var. *brachyclada* (Griffiths) Munz. Rare prickly-pear; sandy bajada; cbs; 915 m; only P (vicinity of Bonanza King Mine, Munz, Johnston, & Harwood 4296).
- Opuntia chlorotica* Engelm. & Bigel. Pancake-pear. Infrequent erect prickly-pear; rocky slopes; jtw, bbs, pjw; 900–1500(–1830) m; G, P, MH, NY, I, C, KR; May–June.
- Opuntia echinocarpa* Engelm. & Bigel. var. *echinocarpa*. Silver or Golden Cholla. Frequent stem-succulent shrub; sandy to gravelly flats and bajadas; cbs, jtw, bbs; below 1600(–1825) m; KD, G, NY, I, C, KR; Apr–May.
- Opuntia erinacea* Engelm. & Bigel. var. *erinacea*. Mojave prickly-pear. Infrequent prickly-pear; gravelly-rocky bajadas, cyn bottoms, and slopes;

cbs-wfpw; 1000–2075 m; G, MH, C, KR, and probably other ranges, though not easily distinguished in field from the var. *ursina* (Weber) Parish; May–June.

*Opuntia erinacea* Engelm. & Bigel. var. *ursina* (A. Weber) Parish. Grizzly Bear Cactus. Frequent prickly-pear; gravelly or rocky bajadas, arroyos, cyn bottoms, and slopes; dws, bbs-wfpw; 1200–1700(–2230) m; G, P, NY, I, C, KR; May–June.

*Opuntia littoralis* (Engelm.) Ckll. var. *martiniana* (L. Benson) L. Benson. Rare prickly-pear; pjw; 1375–1975 m; NY; reported by Benson (1969) but no specimens seen by us.

*Opuntia macrorhiza* Engelm. Plains Prickly-pear. Rare prickly-pear reported by Benson (1969) from C, but no specimens seen by us.

*Opuntia phaeacantha* Engelm. [incl. vars. *discata* (Griffiths) Benson & Walkington and *major* Engelm.]. Common sprawling prickly-pear; gravelly to rocky cyn bottoms and rocky slopes; jtw, bbs, pjw; 1100–1950 m; G, P, MH, NY, C, and probably MM and KR; Mar–June. Both var. *discata* and var. *major* occur in these ranges, but because of the paucity of collected material, no attempt has been made here to treat them separately.

*Opuntia polyacantha* Haw. var. *rufispina* (Engelm. & Bigel.) L. Benson. Plains Prickly-pear. Rare cactus reported by Benson (1969) from NY. Though no herbarium specimens of this species have been seen by us from these ranges, there is a specimen growing at the Rancho Santa Ana Botanic Garden from pjow; 1890 m; NY (Caruthers Cyn).

*Opuntia ramosissima* Engelm. Diamond Cholla, Pencil Cholla. Frequent thin-stemmed, erect succulent shrub; sandy flats and gravelly bajadas; cbs, jtw, bbs; below 1350 m; G, P, MH, NY, C, KR; Apr–June.

*Opuntia stanleyi* Engelm. var. *parishii* (Orcutt) L. Benson. Devil's Cholla. Infrequent prostrate stem succulent; sandy-gravelly flats, gravelly-rocky bajadas, and gentle limestone slopes; cbs, jtw, bbs; 850–1475 m; NY, I, C; May–June.

#### Campanulaceae—Bellflower Family

*Nemacladus glanduliferus* Jeps. var. *orientalis* McVaugh. Threadstem. Frequent annual; dunes, sandy washes, cyn bottoms, gravelly open flats, and rocky calcareous, possibly gypsiferous, slopes; dps-pjw; 730–1930 m; KD, G, P, NY, C, KR; Apr–June.

*Nemacladus rubescens* Greene. [incl. var. *rubescens* and var. *tenuis* McVaugh]. Infrequent annual; sandy or gravelly washes and open flats in dunes and on bajadas at low elevations; dws, cbs; 700–735(–915); KD, G, P, I, reported KR; Apr–May.

*Nemacladus sigmoideus* Robbins. Infrequent annual; dunes, sandy washes, cyn bottoms, and open flats, gravelly bajadas, and sandy-rocky slopes; dps, dws, cbs, jtw; 760–1200(–1370) m; KD, G, MH, NY, I, C, KR; Apr–May.

\*Cannabaceae—Hemp Family

\**Cannabis sativa* L. Hemp, Marijuana. Rare perennial, Euasian weed; many seedlings at Arrowweed Spring; 1205 m; P (probably sown there and doubtfully persisting).

Capparaceae—Caper Family

*Cleome isomeris* Greene. [*Isomeris arborea* Nutt.]. Bladderpod. Infrequent shrub; sandy-gravelly washes and arroyos; dws; below 1225 m; only G and P; Apr–Oct (probably most of the year).

*Cleome lutea* Hook. Spider Flower. Rare annual reported by Munz (1974) from Mountain Pass, C, but no specimen seen by us.

*Oxystylis lutea* Torr. & Frém. Rare annual, but locally frequent; sandy-clay alkaline soil in disturbed area around watering tank; cbs; 945 m; only KR (Smith Mine); May (Apr–Nov).

Caprifoliaceae—Honeysuckle Family

*Sambucus caerulea* Raf. Rare shrub; base of n-facing limestone cliff; wfpw; 2200 m; only C; June–Sept. This specimen was lost before being critically examined, but is probably this montane species.

*Sambucus mexicana* Presl. Mexican Elderberry. Rare tree or large shrub; dow; (1450–)1500 m; only C (Pachalka Spg) and reported KR (Contact and Tadpole Cyns); May.

*Symphoricarpos longiflorus* A. Gray. Waxberry. Frequent shrub of gravelly, rocky cyn bottoms, slopes, and talus, usually on limestone or dolomite; pw, pjw, wfpw; 1370–2320 m; P, MH, NY, C, KR; May–June.

Caryophyllaceae—Pink Family

*Achyronychia cooperi* T. & G. Frost-mat. Infrequent annual; low dunes, sandy flats, and fine gravelly washes and bajadas; dps, cbs; below 1100 (–1220) m; KD, G, reported KR (Coyote Holes); Mar–May, Oct.

*Arenaria congesta* Nutt. ex T. & G. var. *charlestonensis* Maguire. Sandwort. Rare perennial; “sandy places along ridge;” pjow; 2225 m; only NY (New York Peak, Roos 3557, June 21, 1949); June.

*Arenaria macradenia* S. Wats. var. *parishiorum* Rob. Desert Sandwort. Common perennial; rocky slopes and ridges, often in crevices, occasion-

ally in gravelly-rocky cyn bottoms; drs, jtw, bbs, pjw, pw; (850-)925-1925 m; all ranges; Apr-June, Oct.

*Scopulophila rixfordii* (Bdg.) M. & J. Rockwort. Rare perennial; crevices of limestone or dolomite slopes; dcs; (850-)1220(-1340) m; only C (Bear Poppy Saddle and near Stateline Pass) and reported KR (ne section); May-June.

*Silene antirrhina* L. Catchfly. Infrequent annual; gravelly or rocky cyn bottoms and rocky slopes; dws, drs, pjw; (1060-)1950-1775 m; G, P, NY, C, KR; Apr-June.

*Silene verecunda* S. Wats. subsp. *andersonii* (Clokey) Hitchc. & Maguire. Infrequent perennial; coarse sandy, gravelly, or rocky arroyos, benches, and slopes; pjow, pjw, wfpw; 1450-2000(-2200) m; G, P, MH, NY, C, KR; June-Oct.

#### Celastraceae—Staff Tree Family

*Mortonia utahensis* (Cov.) A. Nels. Infrequent shrub though locally abundant; rocky calcareous slopes and crevices, occasionally in rocky, calcareous washes and bajadas, locally dominant above Crystal Spgs; dcs, pjw; (915-)975-2025 m; C, MM, KR; Apr-May.

#### Chenopodiaceae—Goosefoot Family

*Atriplex canescens* (Pursh) Nutt. subsp. *canescens*. Fourwing Saltbush. Common shrub; sandy to gravelly washes and arroyos, rocky slopes, ridges, and ravines; dws-pjw; 800-1950 m; P, MH, NY, I, C, KR; May-July.

*Atriplex confertifolia* (Torr. & Frém.) S. Wats. Shadscale. Infrequent shrub; stony loam and gypsiferous soils of slopes and ridges; only gs; (880-)1050-1350 m; only C and reported KR (Smith Mine); Apr-May.

*Atriplex hymenelytra* (Torr.) S. Wats. Desert-holly. Rare silvery subshrub, reported locally abundant; low slopes and desert pavement; cbs; 670-1065 m; only KR (Smith Mine, *Castagnoli 43*, Northwest Camp, and Kingston Wash); Jan-Apr.

*Atriplex polycarpa* (Torr.) S. Wats. All Scale, Cattle-spinach. Rare shrub; sandy or subalkaline soils; cbs; 990 m; only G (Sheep Corral) and reported KR (Smith Mine and Kingston Wash); July-Oct.

\**Atriplex rosea* L. Redscale. Rare European annual weed; disturbed, alkaline soil around spgs; dow; (1415-)1500 m; only C (Pachalka Spg) and KR (Horse Thief Spgs); May.

*Ceratoides lanatum* (Pursh) Howell. [*Eurotia lanata* Moq.]. Winter Fat. Common shrub; sandy flats, gravelly bajadas, and rocky slopes and ridges; dws-pjw; (850-)1025-1675 m; G, P, MH, NY, I, C, KR; Apr-June.

- \**Chenopodium album* L. Pigweed, Lamb's Quarter. Rare European weedy annual; alkaline, clayey soil around spgs; dow; 1225–1500 m; only P (Arrowweed Spg) and C (Pachalka Spg); much of the year.
- Chenopodium fremontii* S. Wats. Frequent annual; sandy to gravelly disturbed areas and washes, talus slopes, and rocky ridges; dws, cbs, pjw, pjow; 750–2200 m; G, P, NY, C, KR; May–Sept.
- Chenopodium incanum* Heller. Infrequent annual; sandy or gravelly flats and arroyos, and disturbed areas; dws, cbs, jtw, bbs; 670–1650 m; KD, NY, C, KR; May–Sept.
- Chenopodium leptophyllum* Nutt. Rare annual along road; pjw; 1675 m; only NY (Fourth of July Cyn); Aug.
- \**Chenopodium murale* L. Rare weedy annual; margins of intermittent streams or spgs; ssm; (915–)975–1035(–1400) m; G (Coyote Spg), P (Cornfield Spg), and KR; May.
- Chenopodium strictum* Roth var. *glaucophyllum* (Aellen) H. A. Wahl. Disturbed soil; dow; 1415 m; only KR (Horse Thief Spgs, *de Nevers* 405); Aug–Oct.
- Cycloloma atriplicifolia* (Spreng.) Coult. Winged-pigweed. Rare annual; low sand dunes and sandy flats; dps, cbs; 730–760 m; only KD; Apr–May (–Sept).
- Grayia spinosa* (Hook.) Moq. Hop-sage. Frequent shrub; gravelly-clayey to rocky flats, bajadas, cyn bottoms, and slopes; cbs, jtw, bbs; (915–)1100–1600 m; G, P, MH, NY, I, C, KR; Apr–May. The genus *Grayia* seems doubtfully distinct from *Atriplex*.
- \**Hologeton glomeratus* (Bieb.) C. A. Mey. Rare naturalized weedy Eurasian annual; gravelly clay soil along roadside; jtw; 1130 m; only C (near Valley Wells in Shadow Valley, *Prigge* 1268, Sept. 17, 1973); summer.
- \**Salsola iberica* Sennen. & Pau. Russian-thistle, Tumbleweed. Probably common, but seldom collected, weedy Eurasian annual; disturbed places; cbs, jtw, bbs; (900–)1300–1700 m; at least NY, C, KR; July–Oct.
- \**Salsola paulsenii* Litv. Infrequent Eurasian weedy annual; low sand dunes and gravelly roadsides; dps, cbs, pjw; below 1670 m; KD, MH, NY, C, KR; May–June.
- Suaeda torreyana* S. Wats. [var. *ramosissima* (Standl.) Munz]. Rare suffrutescent perennial; in disturbed subalkaline soil about spgs and seeps; dow; 950–1500 m; only C (Pachalka Spg) and KR (Crystal Spg and Smith Mine); May–Sept.

#### Convolvulaceae—Morning Glory Family

- \**Convolvulus arvensis* L. Bindweed. Rare weedy sprawling perennial; disturbed ground; dow; 1500 m; only C (Pachalka Spg); May–June(–Oct).
- Cuscuta californica* H. & A. Dodder. Infrequently collected parasite; pri-

marily on *Eriogonum fasciculatum polifolium* and *Ambrosia dumosa*; cbs, jtw, bbs; 975–1600 m; G, P, MH, reported KR; May–Aug.

*Cuscuta denticulata* Engelm. Rarely collected parasite; mostly found on *Larrea divaricata tridentata*, *Hymenoclea salsola*, *Amphipappus fremontii*, and other desert shrubs; cbs; below 1200 m; Apr–Oct. Not collected within our ranges but known from a collection just outside our western boundary, there parasitic on *Larrea* (*Prigge* 2625, Apr. 22, 1978).

#### Crassulaceae—Stonecrop Family

*Dudleya arizonica* Rose. Chalk-lettuce. Rare succulent perennial; crevices of granitic or calcareous cliffs; drs; 760–1225 m; only G and KR; Apr–June.

*Dudleya saxosa* (Jones) Britt. & Rose subsp. *aloides* (Rose) Moran. Live-forever. Frequent succulent perennial; gravelly to rocky upper bajadas, cyn bottoms and slopes; cbs–pjow; 900–1850 m; G, P, NY; Apr–June.

*Sedum niveum* A. Davids. Stonecrop. Rare succulent perennial; rocky, granitic, n-facing slopes; pjow, wfpw; 2050–2200 m; only NY (below crest of New York Peak and in Fourth of July Cyn); Aug.

#### Crossosomataceae—Wild-apple Family

*Forsellesia nevadensis* (A. Gray) Greene. Infrequent shrub; often in crevices of rocky calcareous slopes, cliffs, ridges, and cyn bottoms; dcs in pjw, pjow, wfpw; 1675–2150 m; P, NY, C, KR; June.

*Forsellesia pungens* (Bdg.) Heller (var. *glabra* Ensign). Rare matted shrublet; on n-facing, limestone cliffs; dcs in wfpw; 1975 m; only C (head of *Forsellesia* Cyn); May–June.

#### Cucurbitaceae—Gourd or Melon Family

*Cucurbita foetidissima* H.B.K. Calabazilla. Rare trailing perennial; damp, disturbed soil about spgs; dow; 1220–1500 m; only C (*Pachalka* Spg) and KR (*Crystal* Spg); June–Aug.

*Cucurbita palmata* S. Wats. Coyote Melon. Infrequent perennial; gravelly-rocky cyn bottoms and arroyos and sandy to gravelly washes; dws, cbs; below 1400 m; KD, P, C, KR; Apr–Oct.

#### Ericaceae—Heath Family

*Arctostaphylos pungens* H.B.K. Desert Manzanita. Infrequent shrub; on decomposed granitic soil of bouldery slopes and cyn bottoms; pw, pjw, pjow; 1675–1900 m; only G (on Cove Spgs-Cottonwood divide, *S. F. Warrick* 111) and NY (Fourth of July and Caruthers Cyns); Apr–May.

## Euphorbiaceae—Spurge Family

- Argythamnia serrata* (Torr.) Muell.-Arg. [*Ditaxis serrata* Heller]. Rare annual or perennial; only P ("Kelso," 1200 m, *M. E. Jones s. n.*, May 2, 1906); Apr–May. Also collected near Fenner by Jones and by Ralph Hoffman.
- Chamaesyce albomarginata* (T. & G.) Small. [*Euphorbia albomarginata* T. & G.]. Rattlesnake Weed. Common prostrate, mat-forming perennial; sandy-gravelly places in cyns and washes and on rocky slopes, mesas, open flats, and bajadas; dws–pju; 760–1650 m; all ranges; Mar–Oct.
- Chamaesyce exstipulata* (Engelm.) Rydb. [*Euphorbia exstipulata* Engelm.]. Rare erect summer annual; rocky e-facing slope; pju; 1830 m; only C (side, nw of Mountain Pass, *J. C. Roos 4976*, Sept. 3, 1950).
- Chamaesyce fendleri* (T. & G.) Small. [*Euphorbia fendleri* T. & G.]. Infrequent prostrate perennial; sandy or rocky cyn slopes and bottoms, and talus, mostly on limestone; pju; 1675–2150 m; only NY and C; May–Oct.
- Chamaesyce micromera* (Boiss.) Woot. & Standl. [*Euphorbia micromera* Boiss.]. Infrequent prostrate summer or winter annual; sandy dunes, flats, washes, and bajadas; dps, dws, cbs; (670–)775–1375 m; KD, G, P, NY, KR; Mar–June, Sept–Dec.
- Chamaesyce ocellata* (Dur. & Hilg.) Millsp. subsp. *arenicola* (Parish) Thorne, comb. nov. (based on *Euphorbia arenicola* Parish, *Erythea* 7: 93, 1899). Rare prostrate annual; dunes; dps; 730 m; only KD (2.5 km sw of Kelso, *Wolf 10848*, May 29, 1941) and KR (Coyote Holes, *de Nevers 203c*); May–Sept.
- Chamaesyce parishii* (Greene) Millsp. [*Euphorbia parishii* Greene]. Rare prostrate perennial; cbs; 1980 m; only C, east of Ivanpah Spgs; Aug.
- Chamaesyce parryi* (Engelm.) Rydb. [*Euphorbia parryi* Engelm.]. Rare sprawling annual; dunes; dps; 700–800 m; only KD (where often locally abundant); May–Oct.
- Chamaesyce polycarpa* (Benth.) Millsp. [*Euphorbia polycarpa* Benth., including var. *hirtella* Boiss.]. Sand-mat. Rare prostrate perennial; sandy soil; dps, cbs; 670–915 m; only KD (where locally abundant) and P (nw bajada); Apr–June and probably most months.
- Chamaesyce revoluta* (Engelm.) Small. [*Euphorbia revoluta* Engelm.]. Rare erect summer annual; rocky limestone slopes and talus; dcs; 1220–1310 m; only P (Bonanza King Mine) and C (north slopes); Oct.
- Chamaesyce serpyllifolia* (Pers.) Small var. *serpyllifolia*. [*Euphorbia serpyllifolia* Pers. var. *serpyllifolia*]. Infrequent weedy annual; sandy or gravelly cyn bottoms and washes and limestone hills; dws, cbs, jtw; 1220–1650 m; G, MH, NY, C; Aug–Oct.
- Chamaesyce setiloba* (Engelm.) Millsp. [*Euphorbia setiloba* Engelm.]. In-



frequent summer or winter annual; sandy-gravelly dunes, washes, flats, and bajadas; dps, dws, cbs, pjw; 775–1600(–1830); all ranges; most months.

*Croton californicus* Muell.-Arg. var. *mohavensis* Ferg. Rare suffrutescent perennial; sand dunes and washes; dps, dws; 730–800(–1370) m; only KD (where locally abundant) and reported KR.

*Euphorbia incisa* Engelm. Spurge. Frequent erect perennial, locally abundant; sandy, gravelly, or rocky slopes, often at base of granite boulders, rare on limestone; drs, pjw, wfpw; 915–2000 m; G, P, C; Apr–May.

*Stillingia linearifolia* S. Wats. Tooth-leaf. Rare perennial; dunes and sandy washes and cyn bottoms at lower elevation; 750–1375 m; dws, cbs; G, P, KR; Mar–May.

*Stillingia spinulosa* Torr. in Emory. Rare perennial; dunes and sandy-gravelly bajadas; dps, cbs, dws; 670–915 m; KD, G, P, and reported KR (Coyote Holes); Mar–May.

*Tragia stylaris* Muell.-Arg. [*Tragia ramosa* of some California authors]. Spurge-nettle. Infrequent perennial; talus, and rocky or gravelly cyn slopes and bottoms, mostly limestone, dcs; 900–1700 m; P, NY, C; Apr–July, Oct.

#### Fabaceae—Pea Family

*Acacia greggii* A. Gray var. *arizonica* Isley. Cat's-claw. Common shrub; primarily in gravelly to rocky washes and arroyos, around seeps and spgs, occasionally on rocky slopes and ridges; dws, cbs–pjw; below 1850 m; G, P, MH, NY, C, KR; June–July.

*Astragalus acutirostris* S. Wats. Locoweed, Milk-vetch. Infrequent annual; sandy or fine gravelly soils of bajadas and flats; cbs, bbs; 1250–1700 m; only G and MH; Apr–May.

*Astragalus bernardinus* Jones. Rare perennial herb; jtw; 1225 m; only MH (5 km from Cima on Govt. Holes Rd, *R. S. Ferris* 732, Apr. 25, 1928, CAS) and I (near Cima, *Munz* 13748); May.

*Astragalus calycosus* Torr. ex S. Wats. Rare perennial; pjw; 1650 m; only NY (on limestone hill in Fourth of July Cyn, *Alexander & Kellogg* 1392, May 10, 1940); May.

*Astragalus cimae* Jones subsp. *cimae*. Infrequent perennial, although locally common; decomposed granitic gravel on flats and gentle slopes; jtw, jsbs, pjw; 1250–1775 m; MH, NY, I, C; Mar–May.

*Astragalus didymocarpus* H. & A. var. *dispermus* (A. Gray) Jeps. Frequent annual; sandy to gravelly bajadas and slopes; cbs, bbs, mds; (670–)990–1475 m; G, P, KR; Apr–May.

*Astragalus layneae* Greene. Infrequent perennial; sandy to fine gravelly bajadas; cbs; 750–1225 m; only G and P; Apr–May.

- Astragalus lentiginosus* Dougl. var. *borreanus* Jones. Rattleweed. Rare perennial but locally common in dune swales; dps; 670–800 m; KD and reported KR (Coyote Holes); Apr–May.
- Astragalus lentiginosus* Dougl. var. *fremontii* (A. Gray) S. Wats. Common perennial; sandy to gravelly flats, bajadas, washes, and arroyos and gravelly-clayey to rocky slopes and gullies; dws, jtw–pjw; (915–)1150–1675 (–2075) m; G, P, MH, NY, I, C, KR; Mar–June.
- Astragalus minthorniae* (Rydb.) Jeps. var. *villosus* Barneby. Frequent calcicolous perennial; flats, calcareous hillsides, and gravelly-clay to rocky cyn bottoms and slopes; jtw–pjw; 1340–1925 m; NY, C, KR; Mar–May.
- Astragalus mohavensis* S. Wats. var. *mohavensis*. Frequent winter annual or short-lived perennial; gravelly to rocky arroyos and cyn bottoms and rocky slopes; dws, drs, pjw; 1100–1950 m; G, P, C, reported KR; Apr–May.
- Astragalus newberryi* A. Gray. Woolly Pod. Frequent perennial; gravelly, stony-clayey, or rocky soils of arroyos and cyn bottoms and slopes; jtw–pjw; 1525–2000 m; G, P, NY, I, C, KR; Mar–June.
- Astragalus nutans* Jones. Frequent annual or perennial; sandy washes, gravelly to rocky cyn bottoms, and bouldery slopes, occasionally around spgs; dws, dow, pjw, pjow; 1250–1925 m; G, P, NY, C; Mar–June.
- Astragalus nuttallianus* DC. var. *imperfectus* (Rydb.) Barneby. Common annual throughout; sandy to stony soils of flats, bajadas, washes, arroyos, slopes, cyn bottoms, and along intermittent streams; dws, bbs, pjw, ssm; 915–1675 m; G, P, MH, NY, C, KR; Mar–May.
- Astragalus tidestromii* (Rydb.) Clokey. Infrequent perennial; alkaline clayey, coarse sandy, and stoney-clayey soils of flats, bajadas, and gentle hillslopes; cbs, jtw, bbs; (820–)1050–1525 m; I, C, KR (e of Horse Thief Spgs, *R. Bacigalupi* 3653, JEPS); Apr–May.
- Cassia armata* S. Wats. Desert Senna. Infrequent but locally abundant shrub; sandy to gravelly washes and arroyos; dws, cbs; below 1280 m; G, P, MH, reported KR; Apr–May, Sept.
- Dalea mollis* Benth. Rare annual or short-lived perennial; dunes; dps; 710 m; only KD (s edge); Apr–May, Sept.
- Dalea mollissima* (Rydb.) Munz. Infrequent annual or short-lived perennial; sandy, fine gravelly, clayey-loam, and gravelly silt soils of flats, bajadas, and washes; dws, cbs; below 1050 m; KD, G, P, I, C, KR; Apr–June.
- Dalea searlsiae* (A. Gray) Barneby. [*Petalostemum searlsiae* A. Gray]. Prairie-clover. Infrequent perennial; sandy to gravelly slopes and cyn bottoms; jsbs, pjow; 1250–1760 m; P, MH, NY; May–June.
- Glycyrrhiza lepidota* Pursh var. *glutinosa* (Nutt.) S. Wats. Wild Liquorice. Rare perennial; moist sand along intermittent stream; ssm; 1670–1740 m; only G (unspecified locality, *M. E. Jones s. n.*) and NY (Caruthers Cyn); June–July.

- Hoffmannseggia glauca* (Ort.) Eifert. [*H. densiflora* Benth. ex A. Gray]. Rare perennial; flat areas with decomposed calcareous soils and along roadsides; jtw; (820–)1430–1530 m; only NY (near Barnwell) and reported KR (Stanleya Enclave); May–June. Also Mesquite Valley n of C.
- Lotus argyraeus* (Greene) Greene subsp. *multicaulis* (Ottley) Munz. Infrequent prostrate perennial; decomposed granitic soils of flats, slopes, and ridges and along intermittent stream; ssm, jtw, pjw, pjow; 1260–2230 m; only NY; Mar–June. Also reported by Munz (1974) from P but no specimens seen from there by us.
- Lotus humistratus* Greene. Infrequent prostrate annual; sandy to fine gravelly bajadas, rocky slopes and washes; cbs, jtw, bbs, jsbs; 880–1500 m; G, MH, NY, KR; Apr–May.
- Lotus rigidus* (Benth.) Greene. Rock-pea. Common erect perennial; gravelly to rocky soils of washes, cyn bottoms, and slopes; dws, cbs–pjw; (975–)1000–1700 m; KD, G, P, NY, KR; Apr–May.
- Lotus tomentellus* Greene. Frequent prostrate annual; sandy to fine gravelly soils of low dunes, bajadas, washes, and slopes; dps, dws, cbs, mds, jtw, bbs; below 1680 m; KD, G, P, NY, KR; Apr–May.
- Lupinus arizonicus* (S. Wats.) S. Wats. Lupine. Rare fleshy annual; damp, decomposed granitic soil around spgs and in streambeds; ssm, cbs; 970–1370 m; only G (Cottonwood Basin and Coyote Spgs); May–June.
- Lupinus brevicaulis* S. Wats. Rare densely villous annual; flats and slopes; bbs, pjow; 1370–1620 m; P, NY, C; May–June.
- Lupinus concinnus* Agardh. subsp. *orcuttii* (S. Wats.) D. Dunn. Common densely villous annual; sandy to gravelly soils of bajadas, washes, arroyos, and cyn bottoms; cbs–pjw; 760–1950 m; G, P, MH, NY, KR; Mar–June.
- Lupinus flavocolatus* Heller. Frequent annual; sandy to stony and gravelly-loamy soils of flats, bajadas, washes, and hillsides; dws, cbs, jtw, bbs, jsbs; 1060–1680 m; P, MH, NY, I, C, MM, KR; Apr–June.
- Lupinus ruber* Heller. Rare annual; only Fourth of July Cyn, NY (*E. C. Jaeger s. n.*, Mar. 18, 1932), not recently collected; Mar.
- Lupinus shockleyi* S. Wats. Infrequent annual; sandy flat and low dunes; dps, cbs; below 1070 m; KD, C (Shadow Valley), reported KR; Apr–May.
- Lupinus sparsiflorus* Benth. subsp. *mohavensis* Dziek. & Dunn. Infrequent annual; sandy loam to rocky granitic soils of bajadas and slopes; cbs, bbs, pjw; 760–1430 m; G, P, MH; Mar–May.
- \**Medicago sativa* L. Alfalfa. Rare Old World perennial adventive; moist disturbed ground near spg; 1415 m; KR (Horse Thief Spgs) May–Oct.
- \**Melilotus albus* Desr. White Sweet-clover. Rare Eurasian weedy annual or biennial; rocky roadbed and alkaline soil around spg; dow in jtw–pjw;

- 1415–1680 m; NY (Sagamore Mine area), C (Pachalka Spg), reported KR (Horse Thief Spgs); May–June(–Oct).
- \**Melilotus indicus* (L.) All. Yellow Sweet-clover. Rare Eurasian weedy annual or biennial; disturbed areas about spgs; dow; (1415–)1500 m; only C (Pachalka Spg) and reported KR; May–June(–Oct).
- \**Melilotus officinalis* (L.) Lam. Rare Eurasian annual or biennial weed; moist disturbed areas; 1415 m; only KR (Horse Thief Spgs, *Castagnoli 71*); May–Oct.
- Prosopis glandulosa* Torr. var. *torreyana* (L. Benson) M. C. Jtn. Mesquite. Infrequent low shrub or small tree; sandy to rocky, sometimes alkaline, soils about spgs and along intermittent streams in cyn bottoms and washes; dws, dow; below 1500 m; G, P, NY, C, KR; May–June.
- Psoralea castorea* S. Wats. Rare perennial; sandy soil; dps; 825 m; only KR (1 km w of Kingston Wash Confluence, *Castagnoli 64*) Apr–May.
- Psorothamnus fremontii* (Torr.) Barneby var. *fremontii*. [*Dalea fremontii* Torr. var. *fremontii*]. Indigo Bush. Frequent shrub; gravelly or rocky-clayey soils of bajadas and dissected older alluvial fans; cbs, dcs, jtw, bbs; 760–1250(–1370) m; G, P, C, MM, KR; Apr–June.
- Psorothamnus spinosus* (A. Gray) Barneby. [*Dalea spinosa* A. Gray]. Smoke Tree. Rare shrub or small tree; sandy to fine gravelly washes; dws; below 1070 m; only G; June–July.
- Robinia neomexicana* A. Gray. Desert Locust. Rare small tree; dow; 1770 m; only MH (where abundant and thriving about Bathtub Spgs, if introduced, certainly well naturalized); June.
- \**Robinia pseudo-acacia* L. Rare, introduced e American, deciduous tree; possibly naturalized about spg; 945 m; KR (Smith Mine, *de Nevers 89*); Apr–May.

#### Fagaceae—Beech Family

- Quercus chrysolepis* Liebm. Canyon Oak. Frequent small tree; fine gravelly, rocky, or gravelly-loamy soil of arroyos, cyn bottoms, and bouldery slopes; pjow, dow; 1250–1920 m; G, P, MH, NY; Apr–June.
- Quercus turbinella* Greene subsp. *turbinella*. Desert Scrub Oak. Frequent, and locally common, small tree or large shrub; decomposed granitic, gravelly, or rocky soil of arroyos, cyn bottoms, and bouldery slopes; pjow; only MH and NY; May.

#### Garryaceae—Silk-Tassel Family

- Garrya flavescens* S. Wats. subsp. *flavescens*. Silk-tassel Bush. Frequent large shrub; decomposed-rocky granitic and gravelly calcareous soils of cyn bottoms, slopes, and ridges; pjow, pjw; 1370–2140(–2230) m; G, P, MH, NY, C, KR; Feb–May.

## Gentianaceae—Gentian Family

*Centaurium exaltatum* (Griseb.) W. Wright. Centaury. Rare annual; moist sand; dow, ssm; 1250–1370 m; only G (Cove and Cottonwood Spgs); May–June.

*Frasera albomarginata* S. Wats. Green-gentian. Rare perennial; rocky, decomposed calcareous soils of cyn bottoms, slope, and ridges; dcs in pjw, pjow; 1670–1860 m; P, MH, NY, C; Apr–June.

## Geraniaceae—Geranium Family

\**Erodium cicutarium* (L.) L'Hér. Filaree. Common weedy annual; sandy to gravelly soils of flats, bajadas, washes, and cyn bottoms; dws–pjw; below 1920 m; all ranges; Apr–June.

*Erodium texanum* A. Gray. Rare annual; loose, silty soil; 820 m; only KR (Stanleya Enclave, *de Nevers 143*); Mar–May.

## Hydrophyllaceae—Waterleaf Family

*Emmenanthe penduliflora* Benth. Whispering Bells. Infrequent annual; fine gravelly to rocky soils of arroyos, cyn bottoms, and slopes; dws, cbs, bbs; (910–)1160–1530(–1710) m; G, P, KR; Apr–May.

*Eriodictyon angustifolium* Nutt. Yerba Santa. Rare shrub; decomposed granitic or gravelly limestone soils of rocky, bouldery cyn bottoms and slopes; pjw, pjow; 1370–1770 m; only G (Cottonwood Basin along Silver Peak Rd) and NY (Keystone and Caruthers Cyns); May–July.

*Eucrypta chrysanthemifolia* (Benth.) Greene var. *bipinnatifida* (Torr.) Const. Infrequent annual; sandy humus, and decomposed granitic soils, rock crevices, and shady places on bouldery slopes, cliffs, and cyn bottoms; cbs, drs, bbs, pjw; 840–1400(–1670) m; G, P, MH, KR; Mar–May.

*Eucrypta micrantha* (Torr.) Heller. Frequent annual; sandy to gravelly soils of bajadas, arroyos, and slopes, often growing through shrubs and in shaded places; cbs, dws, dcs; 840–1530 m; G, P, NY, C, MM, KR; Mar–May.

*Nama demissum* A. Gray var. *covillei* Brand. Rare annual; sand dunes; dps; 670 m; reported only KR (Coyote Holes); Apr–May.

*Nama demissum* A. Gray var. *demissum*. Purple Mat. Frequent annual; sandy to rocky soils of flats, bajadas, washes and slopes; cbs–pjw; below 1470 m; KD, P, NY, I, C; Apr–May.

*Nama demissum* A. Gray (var. *deserti* Brand). Infrequent annual; decomposed granitic and gravelly soils of bajadas, desert pavement and washes; cbs, bbs; (670–)990–1220 m; G, P, KR; May. This is a very weak variety, probably not worthy of recognition.

*Nama depressum* Lemmon ex A. Gray. Rare annual; sandy soil; dps; (670–)910 m; only P (sandy bajada 6.5 km se of Vulcan Mine, Henrickson

- 9247c, Apr. 23, 1973 and "Kelso," *M. E. Jones s. n.*, May 2, 1906) and reported KR (Coyote Holes); Apr.
- Nama pusillum* Lemmon ex A. Gray. Infrequent annual; rocky-gravelly limestone silt of flats, bajadas, desert pavement, and sands; cbs; (670–)910(–1070) m; only P (flats 3.7 km e of Hayden, *Wolf 19747*, May 26, 1941 and "Kelso," *M. E. Jones s.n.*, May 2, 1906) and reported KR; Mar–May.
- Nemophila menziesii* H. & A. subsp. *integrifolia* (Parish) Munz. Baby Blue-eyes. Rare annual; gravelly, bouldery slopes; pjw; 1220–1370 m; only G and P; Apr–May.
- Phacelia affinis* A. Gray. Infrequent annual; usually in shady places on moist sand, stony limestone-clay, and decomposed, granitic soils, crevices, and litter, on arroyo benches, along intermittent streams, and on slopes; ssm, bbs, pjw; 1190–1890(–2075) m; G, P, NY, C, reported KR; May–June.
- Phacelia anelsonii* Macbr. Rare viscid-pubescent annual; sandy bajada; jtw; 1420 m; only NY (14 km s of the intersection of Ivanpah Rd and the Union Pacific RR, *Henrickson 9655*, May 16, 1973); May.
- Phacelia barnebyana* J. T. Howell. Rare calcicolous annual; gravelly to stony slopes and crevices in limestone cliffs; dcs within pjw and wfpw; 1610–1950 m; only C; May.
- Phacelia campanularia* A. Gray subsp. *vasiformis* Gillett. Desert-bluebell, Wild-canterbury Bell. Infrequent annual; sandy to rocky soils in washes, arroyos, bajadas, cyn bottoms, and slopes; primarily below 1620 m, but one report from Granite Peak, 2070 m; cbs, drs, dws, bbs, pjw; only G and P; Mar–May.
- Phacelia coerulea* Greene. Rare annual; limestone slopes, sandy alluvium, and gravelly limestone; dcs in jtw; 1420–1680 m; NY (near junction of Ivanpah and Hart Mine Roads) and C (near Mt. Pass and above Pachalka Spg); May.
- Phacelia crenulata* Torr. var. *ambigua* (Jones) Macbr. Wild-heliotrope. Frequent annual; sandy to rocky soils of flats, bajadas, washes, cyn bottoms, and slopes; cbs, dcs, jtw, bbs; below 1560 m; G, P, I, C, KR; Apr–May.
- Phacelia crenulata* Torr. var. *crenulata*. Infrequent annual; gravelly to rocky limestone bajadas and slopes; cbs, jtw, bbs; (670–)910–1400 m; P, C, reported KR; May.
- Phacelia cryptantha* Greene. Frequent annual usually twining through shrubs; decomposed granite and gravelly to rocky shale, limestone, and granitic substrates in arroyos, cyn bottoms, and slopes; dws, cbs–pjw; 1060–1530 m; G, P, NY, KR; Apr–May.
- Phacelia curvipes* Torr. ex S. Wats. Infrequent annual; gravelly substrates of slopes and cyn bottoms; bbs, pjw, pjow; 1520–1980(–2075) m; G, NY, C, KR; May–June.

- Phacelia distans* Benth. Wild-heliotrope. Frequent annual, often growing under and through shrubs; sandy to rocky substrates of bajadas, washes, cyn bottoms, and slopes; dws, cbs-pjw; below 1830 m; all ranges; Mar-June.
- Phacelia fremontii* Torr. Yellow Throats. Common annual; primarily sandy or fine-gravelly soils, occasionally rocky substrates of flats, bajadas, washes, and slopes; dws, cbs-pjw; 850-1700(-2050) m; all ranges; Mar-May.
- Phacelia geraniifolia* Brand. [*P. perityloides* Cov. var. *jaegeri* Munz]. Rare annual; crevices of n-facing limestone cliffs; dcs in wfpw; above 1950 m; only C; May-July.
- Phacelia ivesiana* Torr. Rare annual; sandy or fine gravelly soils of flats, low dunes, and washes; dps, dws, cbs; below 1070 m; only KD and MM; Apr-May.
- Phacelia lemmonii* A. Gray. Frequent annual; sandy to gravelly soils or rock crevices of arroyos, cyn bottoms, and slopes; ssm, cbs, mds, pjw, pjow; 760-1890 m; G, P, MH, NY, I; Apr-June.
- Phacelia neglecta* Jones. Rare annual; desert pavements and bajadas; cbs; (885-)910 m; only P (3.7 km e of Hayden, UPRR, *Wolf 10737*) and KR (e and ne areas); May.
- Phacelia pachyphylla* A. Gray. Rare annual; rocky-silty soil of pavement of dissected bajada; cbs; 760 m; G (e side of Bull Cyn Wash), C; Apr-May.
- Phacelia pedicellata* A. Gray. Rare annual; granitic or limestone cliffs, steep slopes, and gravelly washes; drs; 760-1140 m; G, P, reported KR; (Mar-) May.
- Phacelia perityloides* Cov. Rare annual, locally common; crevices of dolomitic cliffs; dcs; 1065-1860 m; only KR (Silver Rule Mine, *Stone 128*, above Crystal Spg, *de Nevers 245*, reported Jupiter Mine, and "6191"); (Apr-)May(-June).
- Phacelia pulchella* A. Gray var. *gooddingii* (Brand) J. T. Howell. Rare annual; dolomitic desert pavement; 885 m; only KR (Northeast Camp, *de Nevers 123*); Apr-June.
- Phacelia rotundifolia* Torr. ex S. Wats. Common but scattered annual; crevices of granitic or calcareous rock on steep slopes and cliffs; drs; 850-1770 m; all ranges; Apr-June.
- Phacelia vallis-mortae* J. Voss var. *vallis-mortae*. Frequent annual, usually growing up through shrubs; sandy to gravelly soils of flats, washes, bajadas, slopes, and ridges; dws, cbs-pjw; (730-)970-1830 m; G, P, NY, C, MM, KR; Mar-May.
- Pholistoma membranaceum* (Benth.) Const. White Fiesta Flower. Frequent brittle-stemmed annual twining through shrubs or under rocks; sandy to

rocky substrates, often in shade in arroyos, cyn bottoms, and slopes; dws, mds, cbs-pw; (730-)1160-1370 m; G, P, KR; Apr-May.

*Tricardia watsonii* Torr. ex S. Wats. Infrequent perennial often growing through shrubs; sandy to rocky places on bajadas and desert pavement and on slopes; cbs; P, I, C, KR; Mar-Apr (May).

#### Krameriaceae—Ratany Family

*Krameria grayi* Rose & Painter. White Ratany. Frequent shrub; sandy to rocky soil of flats, bajadas, and washes; dps, dws, cbs; below 1370 m; KD, G, P; Apr-May.

*Krameria parvifolia* Benth. var. *glandulosa* (Rose & Painter) Macbr. Frequent shrub; fine gravelly to gravelly-rocky soil of bajadas, arroyos, slopes, and ridges; dws, cbs, jtw, bbs, pw; (670-)940-1940 m; G, P, NY, C, MM, KR; May-June.

*Krameria parvifolia* Benth. var. *imparata* Macbr. Common shrub; sandy to rocky soils; low dunes, flats, bajadas, and slopes; dps, cbs-pjw; below 1650 m; all ranges; Apr-July, Oct.

#### Lamiaceae—Mint Family

*Hedeoma nanum* (Torr.) Briq. subsp. *californicum* W. S. Stewart. Frequent, calcicolous perennial; primarily in crevices, occasionally in gravelly or rocky soil of cyn bottoms, slopes, screes, cliffs, and ridges; dcs; 930-2130 m; P, NY, C, MM, KR; May-July.

\**Marrubium vulgare* L. Horehound. Infrequent naturalized European perennial; spgs and disturbed areas; dow, bbs; 970-1490 m; P, NY, C, KR; May-July.

\**Mentha spicata* L. Spearmint. Infrequent naturalized perennial; wet ground around spgs; dow, ssm; 945-1375 m; only KR (Crystal and Beck Spgs); May-June.

*Monardella linoides* A. Gray subsp. *linoides*. Horsemint. Infrequent perennial; gravelly to rocky soil of cyn bottoms, slopes, and talus at base of cliffs; bbs, pjw, wfpw; 1220-2230 m; G, P, C, KR; June-Oct.

*Salazaria mexicana* Torr. Bladder-sage. Common shrub; gravelly to rocky soil of primarily washes, arroyos, and cyn bottoms, also bajadas and slopes; dws, cbs-pjw; 1000-1675 m; G, P, MH, NY, C, KR; Apr-Jun.

*Salvia columbariae* Benth. var. *columbariae*. Chia. Frequent annual; sandy to rocky soil of bajadas, washes, arroyos, cyn bottoms and slopes; dws, cbs-pjw; below 1700 m; KD, P, MH, NY, I, C, KR; Apr-May.

*Salvia dorrii* (Kell.) Abrams subsp. *dorrii*. Blue Sage. Common shrub; sandy to gravelly soils of washes, arroyos, cyn bottoms, and slopes; dws, cbs-pjw; below 1615 m; all ranges; Apr-June.



- Salvia mohavensis* Greene. Common shrub; gravelly to rocky soil and crevices of cyn bottoms and slopes; dws, cbs-pjw; 1160–1620(–1675) m; G, P, MH, NY, C, KR; May–June.
- Salvia pachyphylla* Epl. ex Munz. Infrequent shrub; gravelly to rocky soil of cyn bottoms and slopes; pjw, wfpw; 1640–2260 m; G, NY, C, KR; May–Oct.
- Salvia pachyphylla* × *S. mohavensis*. Rare hybrid shrub; slopes; pjw; 1525(–2075) m; G (Cottonwood Basin) and reported KR (s slope of Kingston Peak); May.

#### Lennoaceae—Sand Food Family

- Pholisma arenarium* Nutt. ex Hook. Rare root parasite; sandy soils; washes and bajadas; dws, cbs; (670–)1070–1220 m; only G (rd to Cottonwood Basin, mouth of Budweiser Cyn, mouth of Willow Spg Cyn, and Cove Spg) and reported KR (Coyote Holes and 1.6 km w of Kingston Wash Confluence); Apr–May. Reported on *Ambrosia dumosa*, *Hymenoclea salsola*, *Chrysothamnus paniculatus*, and *Haplopappus* spp.

#### Linaceae—Flax Family

- Linum lewisii* Pursh. Blue Flax. Frequent perennial; sandy to rocky soils of bajadas, cyn bottoms, slopes, and ridges; jtw, bbs, pjw; 1220–1950 m; G, MH, NY, C, KR; Apr–July.
- Linum puberulum* (Engelm.) Heller. Yellow Flax. Rare perennial; crumbly limestone soils of slopes and ridges; dcs in pjow, pjw; 1610–1770 m; only NY (Keystone and Fourth of July Cyns) and C (Forsellesia Cyn); May–July.

#### Loasaceae—Stick-leaf Family

- Eucnide urens* Parry. Rock-nettle. Infrequent perennial; gravelly to rocky limestone soils, crevices, and talus of cyn bottoms, slopes, and cliffs; dcs; (850–)1000–1130(–1675) m; C, MM, KR; May–June.
- Mentzelia affinis* Greene. Rare annual; volcanic substrate; 1100 m; only KR (Northside Camp, *de Nevers 109*); Mar–May.
- Mentzelia albicaulis* (Hook) T. & G. Blazing-star. Common annual; sandy to rocky soils of flats, bajadas, arroyos, and slopes; dws, cbs-pjw; 850–1830(–2075) m; all ranges; Apr–June.
- Mentzelia californica* Thompson & Roberts. Rare annual; sandy, rocky wash; 915 m; only KR (mouth of Porcupine Cyn, *Castagnoli 15* and *17*); Mar–May.
- Mentzelia congesta* T. & G. Rare annual; on granite; pjw; 2075 m; only KR (w of Kingston Peak, *Castagnoli 203*); May–July.

- Mentzelia desertorum* (Davids.) Thompson & Roberts. Rare annual; sandy wash; 640 m; only KR (Coyote Holes, *de Nevers* 215); Feb–Mar.
- Mentzelia involucrata* S. Wats. subsp. *involucrata*. Sand Blazing-star. Rare annual; loose, decomposed granitic soil of slopes; cbs; below 920 m; only G (Bull Cyn Wash) and P (Vulcan Mine); Apr–May.
- Mentzelia jonesii* (Urb. & Gilg.) Thompson & Roberts. Rare annual; gravelly flats; jtw; 1100 m; only KR (6.4 km s of Excelsior Talc Mine, *Wolf* 10391, Apr. 12, 1941); Apr.
- Mentzelia leucophylla* Bdg. [*Mentzelia oreophila* Darl.]. Infrequent calciculous perennial; gravelly to rocky, sometimes clayish or gypsiferous-loamy soil of crevices, upper bajadas, cyn bottoms, and slopes; dcs, gs, jtw, bbs; 970–1770 m; C, MM, KR; May–July (Sept).
- Mentzelia montana* (Davids.) Davids. Rare annual; ne-facing slope; pjw; 2010(–2135) m; only KR (below Kingston, northern peak); May (July).
- Mentzelia multiflora* (Nutt.) A. Gray subsp. *longiloba* (Darl.) Thompson & Zavortink. [*Mentzelia longiloba* Darl.]. Rare perennial; sandy flats and low dunes; dps, cbs; below 790 m; only KD; Apr–May (Aug).
- Mentzelia obscura* Thompson & Roberts. Infrequent annual; sandy to gravelly soils of bajadas and washes; cbs, jtw, bbs, pw; 1000–1620 m; G, MH, NY, C, MM, KR; Apr–June.
- Mentzelia polita* A. Nels. Rare perennial; gypsiferous-loam or clayish soils with limestone gravel of dissected upper bajada slopes and limestone crevices of steep slopes; dcs, gs, bbs; 1250–1460 m; only C; May–June.
- Mentzelia pterosperma* Eastw. Rare perennial; gypsiferous-clay slopes; gs, cbs, ca 1130 m; only C (near Valley Wells); Apr–June.
- Mentzelia reflexa* Cov. Rare annual; cbs; ca 910 m; only P (“Kelso,” *M. E. Jones s. n.*, May 2, 1906, not recollected); Apr–May.
- Mentzelia tricuspis* A. Gray. Rare annual; dolomitic scree fields; 1310 m; only KR (s slope of “4439,” *de Nevers* 360); Apr–May.
- Mentzelia veatchiana* Kell. Rare annual; decomposed granitic soils of flats and slopes; bbs, pjw; 1500–1700 m; MH, C, KR; Apr–May.
- Petalonyx nitidus* S. Wats. Sandpaper Plant. Rare suffrutescent subshrub; rocky slopes and washes, cliffs, and talus slopes; dcs, bbs; 1070–1370 m; only KR; May–June (July).
- Petalonyx thurberi* A. Gray subsp. *thurberi*. Infrequent suffrutescent perennial; sandy soils of flats, lower bajadas, and washes; dws, cbs; below 1100 m; KD, G, P, C; May–June, Sept.

#### Malvaceae—Mallow Family

- Abutilon parvulum* A. Gray. Rare perennial; rocky cyn slopes; bbs, pw; 1065–1345 m; only P (near Mitchell Caverns and Bonanza King Mine); Apr–May.

- Eremalche exilis* (A. Gray) Greene. Infrequent annual; sandy soils and desert pavement on flats, washes, and slopes; dps, cbs; below 1220 m; KD, G, reported KR; Apr–May.
- Eremalche rotundifolia* (A. Gray) Greene. Desert five-spot. Infrequent annual; sandy soil of flats, washes, and rocky or gravelly slopes; cbs; below 1150 m; KD, G, reported KR; Apr–May.
- Sphaeralcea ambigua* A. Gray subsp. *ambigua*. Globe-mallow, Desert-hollyhock. Infrequent perennial with woody base; sandy to rocky soils of flats, bajadas, washes, and slopes; dws, cbs, drs; below 1500 m; KD, G, P, NY, KR; Apr–June.
- Sphaeralcea ambigua* A. Gray subsp. *monticola* Kearn. Common perennial; sandy to rocky substrates of flats, bajadas, washes, cyn bottoms, and slopes; dws, cbs–pjw; below 1920 m; KD, G, P, MH, NY, I, C, KR; Apr–June.
- Sphaeralcea rusbyi* A. Gray subsp. *eremicola* (Jeps.) Kearn. Rare perennial; gravelly- to rocky-clayish soils of bajadas, slopes, and arroyos; cbs, bbs; 970–1430 m; only C; Apr–May.

#### Nyctaginaceae—Four-O’Clock Family

- Abronia micrantha* Torr. Rare annual; stabilized sand dunes; dps; 730 m; KD (s end of dunes near Bull Cyn Wash); Apr–May.
- Abronia nana* S. Wats. subsp. *covillei* (Heimerl.) Munz. Rare perennial; rocky, limestone substrate of cyn bottoms and slopes; dcs in pjow, pjw; 1670–1900 m; only NY and C; May–June.
- Abronia villosa* S. Wats. var. *villosa*. Sand-verbena. Infrequent annual; sandy soils of dunes, flats, and lower bajadas; dps, cbs; below 910 m; only KD and reported KR (Kingston Wash); Mar–June.
- Allionia incarnata* L. Windmills. Frequent perennial or winter-annual; sandy to rocky soils of bajadas, washes, arroyos, and slopes; dws, cbs, dcs, jtw, bbs; 850–1430 m; G, P, C, reported KR; Apr–Sept.
- Boerhaavia coulteri* (Hook. f.) S. Wats. Rare summer annual; sandy washes; dws, jtw; 1130 m; only C (near Valley Wells, *Roos 4980*); Sept.
- Boerhaavia erecta* L. var. *intermedia* (Jones) Kearn. & Peebles. Rare summer annual; only C (Mountain Pass, *J. Roos 13*); Aug. Also Kingston Spg.
- Boerhaavia triquetra* S. Wats. Frequent summer annual; sandy to rocky soils of bajadas, washes, arroyos, and slopes; cbs, jtw, bbs; 910–1620 m; G, P, MH, I, C, KR; Aug–Oct.
- Boerhaavia wrightii* A. Gray. Rare summer annual; rocky bajadas; jtw, bbs; 1220–1280 m; P (Bonanza King Mine area) and C (n-slopes, *J. C. & A. R. Roos 4892*); Aug–Oct.

- Mirabilis bigelovii* A. Gray. [incl. var. *aspera* (Greene) Munz, var. *bigelovii*, and var. *retrorsa* (Heller) Munz]. Desert Four-o'clock, Wishbone Herb. Common perennial; gravelly to rocky soils of arroyos, cyn bottoms, and slopes; dws, cbs-pjw; (670-)870-1980 m; G, P, MH, NY, C, KR; Mar-June.
- Mirabilis coccinea* (Torr.) B. & H. [*Oxybaphus coccineus* Torr.]. Infrequent perennial; sandy to rocky soils of bajadas, arroyos, and cyn bottoms; dws, jtw, jsbs, pjw; 1280-1770 m; MH, NY, I, KR; May-July, Oct.
- Mirabilis comata* (Small) Standl. [*Oxybaphus comatus* (Small) Weath.]. Rare perennial; gravelly soils of arroyos and bajadas; dws, jtw, pjw; 1520-1770 m; MH (Bathtub Spr), NY (road to Keystone Cyn), I (near Riley's Camp); June-July, Oct.
- Mirabilis multiflora* (Torr.) A. Gray subsp. *pubescens* S. Wats. [*M. froebelii* (Behr) Greene var. *froebelii* and var. *glabrata* (Standl.) Jeps.]. Giant Four-o'clock. Common perennial; sandy to rocky soils of bajadas, washes, cyn bottoms, and slopes; cbs-pjw; 1000-1830 m; P, MH, NY, I, C, KR; Apr-July.
- Mirabilis pumila* Standl. [*Oxybaphus pumilus* (Standl.) Standl.]. Infrequent perennial; gravelly to rocky soils of washes and slopes; jtw, pjw; (1220-)1370-1980 m; P, MH, NY, C, reported KR; May-July.
- Selinocarpus nevadensis* (Standl.) Fowler & Turner. [*S. diffusus* of some authors]. Rare perennial; shale outcrops; 1160 m; only KR (between peaks "4037" and "4439," *de Nevers* 358); June-July (Sept). Not reported from California by Fowler and Turner (1977).

#### Oleaceae—Olive Family

- Forestiera neomexicana* A. Gray. Desert-olive. Infrequent shrub; sandy to rocky soils of washes, arroyos, and cyn bottoms; dws, ssm; 1220-1800 m; G, P, MH, NY, I, C, KR; Apr-May.
- Fraxinus anomala* Torr. ex S. Wats. Dwarf Ash. Frequent shrub or small tree; gravelly to rocky cyn bottoms and steep slopes; pjow, pjw, wfpw; (1250-)1340-2290 m; P, MH, NY, C; Apr-May.
- Menodora scabra* A. Gray. Rare, suffrutescent perennial; sandy granitic soil or crumbly calcareous substrate of cyns and ridges; pjw; 1730-1770 m; only NY (Fourth of July Cyn) and C (Forsellesia Cyn); June.
- Menodora scoparia* Engelm. ex A. Gray. Frequent suffruticose perennial; gravelly to rocky soils of upper bajadas, cyn bottoms, and slopes; dws, bbs-pjw; 1220-2010 m; P, MH, NY, C; May-July.
- Menodora spinescens* A. Gray. Common, thorny subshrub; gravelly to rocky, sometimes clayey, soils of bajadas, cyn bottoms, and slopes; cbs-pjw; (1100-)1160-1650(-1830) m; G, P, MH, NY, I, C, KR; Apr-May.

## Onagraceae—Evening-Primrose Family

- Camissonia boothii* (Dougl. in Hook.) Raven subsp. *condensata* (Munz) Raven. Bottle Cleaner. Infrequent annual; sandy soil of flats, lower bajadas, and washes; cbs; below 980 m; KD, G, P, C, reported KR; Apr–May.
- Camissonia boothii* (Dougl. in Hook.) Raven subsp. *intermedia* (Munz) Raven. Rare annual; sandy to gravelly soils of washes and slopes; cbs, bbs; 700–1520 m; only G (Budweiser Wash, *Hart 52*) and KR (Horse Thief Valley, *Wolf 10515*); May.
- Camissonia brevipes* (A. Gray) Raven subsp. *brevipes*. Yellow Cups. Common annual; sandy to rocky soil of bajadas, washes and slopes; dws, cbs, dcs, jtw, bbs; below 1530 m; KD, G, P, C, MM, KR; Apr–June.
- Camissonia californica* (Nutt. ex T. & G.) Raven. Rare annual; sandy valley floor; cbs; ca 760 m; only P (vicinity of Bonanza King Mine, *Munz & Harwood 3447*, Mar. 30, 1920); March.
- Camissonia campestris* (Greene) Raven. Field-primrose. Rare annual; sandy soils of flats and washes; cbs; 1000–1280 m; only MH (nw of Burro Spg) and NY (ese of Brant siding UPRR); Apr–June.
- Camissonia chamaenerioides* (A. Gray) Raven. Willow-herb Primrose. Frequent annual; gravelly to rocky soils of arroyos, cyn bottoms, and slopes, occasionally on bajadas; dws, drs, jtw, bbs, pw, pjw; 850–1980 m; G, P, NY, C, MM, KR; Apr–May.
- Camissonia claviformis* (Torr. & Frém.) Raven subsp. *aurantiaca* (S. Wat.) Raven. Infrequent annual; sandy to gravelly soil of flats, dunes, lower bajadas, and washes; dps, dws, cbs; below 1220 m; KD, G, P, NY, C, KR; Mar–May.
- Camissonia claviformis* (Torr. & Frém.) Raven subsp. *claviformis*. Rare annual; cbs; 975 m; only P (Dawes siding UPRR, *Raven 11924*); Mar.
- Camissonia claviformis* (Torr. & Frém.) Raven subsp. *funerea* (Raven) Raven. Rare annual; sandy washes; below 1000 m; only KR (Coyote Holes and 1 km w of Kingston Wash Confluence, *Castagnoli 90* and *80*); Mar–May.
- Camissonia kernensis* (Munz) Raven subsp. *gilmanii* (Munz) Raven. Infrequent annual; sandy or decomposed granitic soils of flats and lower bajadas; cbs; 900–1220 m; P, MH, I, C, KR; Mar–May.
- Camissonia munzii* (Raven) Raven. Rare annual; gravelly limestone arroyo; dws, cbs; 1100 m; only C (vicinity of Shire Gypsum Deposits, *Prigge 779*, Apr. 28, 1973); Apr.
- Camissonia pallida* (Abrams) Raven subsp. *pallida*. Infrequent annual; sandy to gravelly soils of bajadas, washes, and cyn bottoms; dws, cbs, bbs, pjw; 970–1680 m; only G and P; Mar–May.

- Camissonia palmeri* (S. Wats.) Raven. Rare annual; cbs; 1100 m; only G/P (n of Granite Pass, *Henrickson 10072*).
- Camissonia pterosperma* (S. Wats.) Raven. Rare annual; gravelly-rocky, somewhat clayish, soil on slopes; pjw; 1610–1700 m; only C (*Forsellesia Cyn, Prigge et al. 2980 and 3057*); Apr–May.
- Camissonia refracta* (S. Wats.) Raven. Infrequent annual; gravelly to rocky soils of bajadas, arroyos, cyn bottoms, and slopes; cbs, dcs, jtw, bbs; 760–1220(–1950) m; G, P, C, MM, KR; Apr–May.
- Camissonia walkeri* (A. Nels.) Raven subsp. *tortilis* (Jeps.) Raven. Rare annual; calcareous or gypsiferous-loamy soils of rocky crevices, benches, slopes; cds, gs; 1160–1530 m; P, C, KR; Apr–May.
- Epilobium canum* (Greene) Raven subsp. *garrettii* (Nels.) Raven. [*Zauschneria garrettii* A. Nels.]. Infrequent perennial; sandy to rocky granitic, moist soil of cyn bottoms, and among boulders, drs, pjw, ssm; 1160–2040 m; only G and KR.
- Epilobium ciliatum* Raf. subsp. *ciliatum*. [*E. adenocaulon* Hausskn. var. *parishii* (Trel.) Munz]. Rare perennial; wet soil about spgs; dow; 1450–1490 m; only C (*Pachalka Spg*) and KR (*Horse Thief Spgs*); June–Oct.
- Gaura coccinea* (Nutt.) Pursh. Frequent, calcicolous perennial; fine gravelly to rocky, occasionally clayey, soils of bajadas, washes, arroyos, cyn bottoms, and steep slopes; dws, cbs, jtw, bbs, pjw; 1100–1620 m; P, NY, C; Apr–June.
- Gayophytum diffusum* T. & G. subsp. *parviflorum* Lewis & Szweykowski. Rare diminutive annual; pjw; 2075–2135 m; only KR (*Kingston Peak, Castagnoli 187, de Nevers 386*); June–Aug.
- Oenothera avita* (Klein) Klein subsp. *avita*. Frequent perennial; sandy to gravelly soil of flats, arroyos, and slopes; dws, cbs, jtw, bbs, pjow, pjw; 970–1740 m; G, MH, NY, C, reported KR; Apr–July.
- Oenothera caespitosa* Nutt. subsp. *caespitosa* var. *marginata* (Nutt.) Munz. Evening-primrose. Frequent perennial; gravelly soils of arroyos, cyn bottoms, and occasionally slopes; dws, jtw–pjw; (915–)1310–1980 m; G, P, MH, NY, C, reported KR; Apr–July.
- Oenothera caespitosa* Nutt. subsp. *crinita* (Rydb.) Munz. Rare perennial; only C (*Wolf 7598*).
- Oenothera deltoides* Torr. & Frém. subsp. *deltoides*. Infrequent spring or winter annual; sandy soils of flats, dunes and lower bajada slopes; dps, cbs; below 1130 m; KD, G, reported KR; Mar–May.
- Oenothera longissima* Rydb. subsp. *clutei* (A. Nels.) Munz. Rare biennial or short-lived perennial; wet loam or moist sand, along intermittent streambeds and at spgs; dow, ssm; 1770 m; P (*Cornfield Spr Cyn*) and NY (*Keystone Spr*); Aug.
- Oenothera primiveris* A. Gray subsp. *primiveris*. Rare annual or winter

annual; gravelly arroyos and cyn bottoms; dws, pjw; 1070–1530 m; P, MH, NY, C; May–June.

#### Orobanchaceae—Broom-rape Family

*Orobanche cooperi* (A. Gray) Heller. Broom-rape. Rare perennial root parasite; sandy soils of dunes and flats; dps, cbs; ca 670 m; KD, G, KR; Apr. Reportedly parasitic on *Larrea*, *Ambrosia dumosa*, *Hymenoclea salsola*, and *Hilaria rigida*.

*Orobanche fasciculata* Nutt. Infrequent perennial root parasite on *Artemisia nova* and *A. ludoviciana*; gravelly to rocky soils of cyn bottoms and slopes; pw, pjw; (1490–)1580–1980 m; P, NY, C, KR; May–June.

*Orobanche multiflora* Nutt. var. *arenosa* (Suksd.) Munz. Rare root parasite on *Artemisia*; gravelly to rocky soils; dcs, dws, pjw; 1220–1630 m; only NY and C; May–June.

*Orobanche parishii* (Jeps.) Heckard subsp. *parishii*. Rare, root parasite on *Baccharis sergiloides*; moist sand or gravelly soil of arroyos and cyn bottoms; dws; 1370–1530 m; only G and C; May–June.

#### Papaveraceae—Poppy Family

*Arctomecon merriamii* Cov. Bear Poppy. Rare perennial; stony-gypsiferous-loamy soils of slopes, saddles, and flats; gs, cbs; 970–1250 m; only C (Umberci Mine area, Shire Gypsum Deposits area, and Bear Poppy Saddle); Apr–May.

*Argemone corymbosa* Greene. Prickly Poppy. Infrequent perennial; sandy to gravelly soil of dunes and flats; dps, cbs; below 1000 m; KD, P, C; May–June.

*Argemone munita* Dur. & Hilg. subsp. *rotundata* (Rydb.) G. Ownbey. Infrequent annual or perennial; sandy to gravelly soil of slopes, washes, and arroyos; dws; (670–)1310–1590(–1740) m; only C and KR; May–June.

*Eschscholzia californica* Cham. subsp. *mexicana* (Greene) C. Clark. Mexican Poppy. Infrequent annual; sandy to gravelly soils of washes and slopes; dws, jtw, jsbs; 1160–1530 m; P, MH, NY, KR; Apr–May.

*Eschscholzia covillei* Greene. Rare annual; sandy soil; cbs, pjw; 700–1600 m; reported recently from G (M. Krawycz). Other specimens from G, P, MH are under investigation by C. Clark.

*Eschscholzia glyptosperma* Greene. Mojave Poppy. Frequent annual; sandy, sandy-loam, to rocky, occasionally gypsiferous, soils of flats, bajadas, washes, arroyos, and slopes; dps, drs, gs, cbs, jtw, bbs; below 1530 m; KD, all ranges; Apr–May.

*Eschscholzia minutiflora* S. Wats. Pigmy Poppy. Common annual; sandy to rocky soils of flats, dunes, bajadas, washes, arroyos, and slopes; dps, dws, cbs–pjw; below 1530 m; KD, all ranges; Mar–June.

*Platystemon californicus* Benth. Cream Cups. Rare annual; sandy to gravelly soils; slopes; jtw; 1490 m; MH (road to Pinto Valley); Apr–June.

Plantaginaceae—Plantain Family

*Plantago fastigiata* Morris. [*P. insularis* Eastw. var. *fastigiata* (Morris) Jeps.]. Plantain. Frequent annual; sandy to rocky soils of flats, bajadas, washes, and slopes; dps, dws, drs, cbs–bbs; below 1220 m; KD, G, P, I, C, MM, KR; Apr–May.

\**Plantago major* L. Common Plantain. Rare, weedy European perennial; wet organic soil about spgs; dow; (1415–)1490 m; only C (Pachalka Spr) and reported KR (Horse Thief Spgs); May–July.

*Plantago purshii* R. & S. var. *oblonga* (Morris) Shinners. Frequent annual; sandy to rocky soils of washes, slopes, and plateaux; dws, drs, cbs–pjjw; (915–)1070–1530(–1830) m; G, P, MH, NY, C, KR; Apr–June.

Polemoniaceae—Phlox Family

*Eriastrum densifolium* (Benth.) Mason subsp. *mohavensis* (Craig) Mason. Rare perennial; sand dunes; dps; 730 m; only KD; Jun–Oct.

*Eriastrum diffusum* (A. Gray) Mason. Frequent annual; sandy to rocky soil of flats, bajadas, slopes, washes, and arroyos; dws, cbs–pjjw; below 1460 m; G, P, MH, NY, C, reported KR; May–June.

*Eriastrum eremicum* (Jeps.) Mason. Common annual; sandy to rocky soils of flats, bajadas, washes, arroyos, and slopes; dws, cbs–pjjw; 820–1770 m; G, P, MH, NY, C, KR; May–June.

*Eriastrum sparsiflorum* (Eastw.) Mason. Rare annual; only P (“Kelson,” *M. E. Jones* 9938, May 2, 1906, and *Brandeggee s. n.*) and KR (Coyote Holes, *Castagnoli* 97); Apr–June.

*Gilia aliquanta* A. & V. Grant subsp. *breviloba* A. & V. Grant. Infrequent annual; gravelly to rocky bajadas and slopes; cbs, bbs, mds; 1220–1530 m; G, P, MH, KR; Mar–May. Type locality: G (Willow Spr Cyn).

*Gilia australis* (Mason & A. Grant) V. Grant. Rare annual; sandy to gravelly soil of washes and cyn bottoms; cbs, dws; 820–1220 m; only G; May.

*Gilia cana* (Jones) Heller subsp. *speciformis* A. & V. Grant. Infrequent annual; sandy to rocky soil of washes, dunes, flats, and slopes; dps, dws, cbs, bbs; 540–1280 m; KD, P, MM, KR; Apr–May.

*Gilia cana* (Jones) Heller subsp. *triceps* (Brand) A. & V. Grant. Frequent annual; coarse sandy to rocky, occasionally clayish, soils of bajadas, washes, cyn bottoms, and slopes; drs, cbs–bbs; 930–1530 m; G, P, MH, I, C, KR; Apr–May. Occasionally, intermediates occur between subsp. *triceps* and subsp. *speciformis*.

*Gilia clokeyi* Mason. Rare annual; rocky bajadas; jtw, bbs; 1160–1400 m; only C and KR; Apr–May.



- Gilia filiformis* Parry ex A. Gray. Frequent annual; rocky sometimes clayish, soils of slopes and cliff bases; mds, gs, jtw-pjw; 850–1720 m; G, P, C, KR; Apr–June.
- Gilia hutchinsifolia* Rydb. Rare annual; sandy washes, flats, and cyn bottoms; cbs; 990–1190 m; G, C, reported KR; May–June.
- Gilia latiflora* (A. Gray) A. Gray subsp. *latiflora*. Rare annual; dunes; dps; ca 760 m; only KD (se end, *Wolf 10205*, May 1, 1941) and reported KR (Coyote Holes and Kingston Wash); Apr–May.
- Gilia latifolia* S. Wats. Rare annual; rocky to rocky-loamy soil or desert pavement; flats, arroyos, and cyn bottoms; cbs; below 1100 m; G, P, reported KR; Apr–May.
- Gilia leptomeria* A. Gray. Rare annual; sandy soil of dunes and flats; dps, cbs, bbs; below 1600 m; KD, P; Apr–May.
- Gilia malior* A. Day & V. Grant. Rare annual; gravelly slopes; cbs, mds; 1220–1470 m; only P (vicinity of Vulcan Mine, *Gregory & Alt 15*) and KR (Horse Thief Spgs, *Abrams 14184*); Apr.
- Gilia ochroleuca* Jones subsp. *ochroleuca*. Rare annual; sandy soil of washes and flats; cbs, jtw; 1050–1620 m; only G and NY; Apr–May.
- Gilia ophthalmoides* Brand. Common annual; sandy to rocky soils of flats, bajadas, slopes, ridges, arroyos, and cyn bottoms; dws, bbs-pjow; 1160–2200 m; G, P, MH, NY, C, KR; Apr–June.
- Gilia ripleyi* Barneby. Rare perennial; on dolomite; dcs; 915–1220 m; reported only from KR (ne area); Aug–Oct.
- Gilia scopulorum* Jones. Infrequent annual; rocky substrates of slopes and desert pavement; cbs, drs; 850–1530 m; G, P, C, reported KR; Apr–May.
- Gilia sinuata* Dougl. ex Benth. Common annual; sandy to gravelly soil of flats, bajadas, and washes; dws, cbs, jtw, pjw; 880–1770 m; KD, G, P, MH, NY, I, C, KR; Mar–May.
- Gilia splendens* Dougl. ex Lindl. subsp. *splendens*. Rare annual; slopes; pjw; G (e-facing slope of Cottonwood Cyn, *Stein 42*); May.
- Gilia stellata* Heller. Common annual; sandy to rocky soil of bajadas, arroyos, cyn bottoms, and slopes; dws, cbs, jtw, bbs, mds; 850–1530 m; KD, G, P, MH, NY, I, C, reported KR; Apr–June.
- Gilia transmontana* (Mason & A. Grant) A. & V. Grant. Frequent annual; sandy to rocky, sometimes clayish, soils of arroyos, bajadas, and slopes; dws, dcs, cbs-pjw; 670–1740 m; KD, G, P, NY, C, KR; Apr–June.
- Gilia triodon* Eastw. Rare annual; flats; bbs; 1580 m; only C (below Colosseum Mine, *Roos 3541* and *3542*); May–June.
- Ipomopsis aggregata* (Pursh) V. Grant subsp. *arizonica* (Greene) V. & A. Grant. Common biennial (winter annual) or perennial herb; gravelly or rocky slopes and cyn bottoms; bbs-wfpw; 1580–2350 m; P, NY, C; May–Oct.
- Ipomopsis polycladon* (Torr.) V. Grant. Infrequent annual; sandy to rocky,

- somewhat clayish, soils of slopes, flats, mesas, and washes; dws, dcs, gs, cbs, jtw, bbs; below 1590 m; MH, I, C, KR; May–June.
- Langloisia matthewsii* (A. Gray) Greene. Desert Calico. Infrequent annual; sandy soils of bajadas, flats, washes, and dunes; dps, cbs, jtw; below 1150 m; KD, G, P, NY, reported KR; Apr–May.
- Langloisia punctata* (Cov.) Goodd. Common annual; gravelly to rocky, clayey or loamy soils of flats, bajadas, and slopes; cbs, jtw, bbs, pw; below 1650 m; G, P, C, KR; Apr–June.
- Langloisia schottii* (Torr.) Greene. Infrequent annual; sandy flats; cbs, jtw; (670–)1000–1370 m; P, MH, C, reported KR; Apr–May.
- Langloisia setosissima* (T. & G.) Greene. Rare annual; rocky limestone (gypsiferous?) or sandy soils of bajada; gs, cbs, jtw; 1060–1420 m; only NY and C; May.
- Leptodactylon pungens* (Torr.) Rydb. subsp. *hallii* (Parish) Mason. Common low branching shrub; crevices of cliffs and slopes, and talus of steep slopes; dcs, pjw, wfpw; above 1220 m; G, P, NY, C, KR; May–July.
- Linanthus arenicola* (Jones) Jeps. & Bailey. Rare annual; sandy to fine gravelly soils of flats; cbs; 550–920 m; P (“Kelso,” *M. E. Jones 9955*, May 2, 1906); May. Recently collected by Prigge in Budweiser Valley west of KD.
- Linanthus aureus* (Nutt.) Greene (var. *aureus*). Golden Gilia. Common annual; sandy to rocky, occasionally clayish, soils of flats, bajadas, arroyos, and slopes; dws, gs, cbs, jtw, bbs, pjw; below 1770 m; G, P, MH, NY, I, C, MM, KR; Mar–May.
- Linanthus aureus* (Nutt.) Greene [var. *decorus* (A. Gray) Jeps.]. Frequent annual; sandy to gravelly soils of flats, washes, and dunes; dps, dws, cbs, pjw; KD, G, P, C, reported KR; Apr–May.
- Linanthus bigelovii* (A. Gray) Greene. Frequent annual; sandy soils of flats, bajadas, and washes; dws, cbs–jsbs; 970–1740 m; G, P, MH, NY, C, KR; Apr–May.
- Linanthus demissus* (A. Gray) Greene. Frequent annual; sandy to rocky, clayish soils of washes, bajadas, and slopes; dws, cbs–pjw; below 1590 m; KD, G, P, C, KR; Apr–May.
- Linanthus dichotomus* Benth. subsp. *dichotomus*. Rare annual; granitic sand; jtw, pjw; 1630–1680 m; only NY (mouth of Caruthers and Fourth of July Cyns); Apr–May.
- Linanthus jonesii* (A. Gray) Greene. Rare annual; sandy to gravelly soil of washes and bajadas; cbs, jtw; 760–1050 m; KD, P, C, reported KR; Apr. Difficult to distinguish from *L. bigelovii*.
- Microsteris gracilis* (Hook.) Greene subsp. *humilis* (Greene) V. Grant. Rare annual; moist, moss-covered soil in tenaja; 1525–1585 m; only KR (Horse Thief Valley, *Wolf 10503*, and tenaja in Sheep Tanks Cyn); Mar–Apr.
- Phlox viridis* E. Nels. subsp. *compacta* (Brand) Wherry. Common woody-

based perennial; gravelly to rocky, sometimes clayish, soil of slopes and cyn bottoms; jtw-pjw; 1260–1890 m; G, P, MH, NY, C, KR; Mar–June.

Polygalaceae—Milkwort Family

*Polygala acanthoclada* A. Gray. Infrequent thorny shrub; rocky soils of bajadas, cyn bottoms, and slopes; jtw, pjow, pjw; 1580–1830 m; only NY; May–July.

Polygonaceae—Buckwheat Family

*Chorizanthe brevicornu* Torr. subsp. *brevicornu*. Frequent annual; sandy or gravelly soils; dps, dws, dcs, cbs, bbs; 670–1530 m; KD, G, P, NY, C, reported KR; Apr–May.

*Chorizanthe corrugata* (Torr.) T. & G. Rare annual; 915 m; only P (“Kelso,” *M. E. Jones s.n.*, May 2, 1906).

*Chorizanthe rigida* (Torr.) T. & G. Common, but rarely collected, prickly annual; sandy to rocky soils of flats and bajadas; cbs, jtw; 730–1040 m; KD, G, C, KR; Apr–May.

*Chorizanthe thurberi* (A. Gray) S. Wats. Frequent annual; sandy to gravelly soil of flats, bajadas, washes, cyn bottoms, and slopes; cbs-jsbs; 1000–1700 m; G, P, MH, NY, KR; Apr–June.

*Chorizanthe watsonii* T. & G. Rare annual; open bajada; bbs; 1300(–2040) m; only G (Cottonwood Cyn, *Hart 20*) and reported KR (Landing Strip Valley and High Camp); Apr.

*Eriogonum brachyanthum* Cov. Rare annual; sandy soil of alluvial fan; cbs; 1100 m; only G (Willow Sprs Basin, *H. J. Thompson 3635*, May 31, 1970); May.

*Eriogonum brachypodum* T. & G. Tecopa Skeleton Weed. Infrequent spring and summer annual; gravelly to rocky substrate of flats and slopes; cbs-pjw; 760–1530 m; P, C, KR; May–June, Sept–Oct.

*Eriogonum davidsonii* Greene. Infrequent annual; gravelly to rocky soils of washes and slopes; bbs, pjw; 1400–1750 m; G, MH, NY, C, reported KR; May–June.

*Eriogonum deflexum* Torr. in Ives subsp. *baratum* (Elmer) Munz. Rare annual; rocky slopes and alluvial flats; jtw, pjw; 850–1470 m; P (Globe Cyn), C (Windmill Station); June and Aug.

*Eriogonum deflexum* Torr. in Ives subsp. *deflexum*. Skeleton Weed. Frequent spring and summer annual; sandy to rocky soils of washes, arroyos, cyn bottoms, and slopes; dcs, bbs, jsbs, pw; 1150–1680 m; G, P, MH, NY, C, KR; May–Oct.

*Eriogonum ericifolium* Torr. subsp. *thornei* (Reveal & Henrickson) Thorne, comb. nov. (Based on *E. ericifolium* Torr. var. *thornei* Reveal & Henrickson, *Madroño* 23: 205–206, fig. 1. 1975). Rare, mat-forming shrub;

gravelly-rocky copper-rich soil of S-facing slopes; pjw; 1830 m; only from type locality in NY (western branch of Fourth of July Cyn); June.

*Eriogonum fasciculatum* Benth. subsp. *polifolium* (Benth.) Stokes. California-Buckwheat. Common shrub often locally abundant; rocky slopes, gravelly upper bajadas and washes; drs, jtw, bbs, pjw; 760–1530(–2225) m; G, P, MH, NY, C, KR; Mar–June.

*Eriogonum glandulosum* (Nutt.) Nutt. ex Benth. Rare annual; dolomitic slopes and benches; dcs; 850–1375 m; only KR (Crystal Spg area and reported from ne area and Blackwater Mine); June–Aug.

*Eriogonum* aff. *E. heermannii* Dur. & Hilg. Rare subshrub; dolomitic benches; 1000–1220 m; reported only KR (ne area).

*Eriogonum heermannii* Dur. & Hilg. subsp. *argense* (Jones) Munz. Infrequent intricately-branched, rounded shrub; rocky, granitic or calcareous slopes; bbs, drs, pjw; 1120–2320 m; G, P, NY, I, C, KR; Aug–Nov.

*Eriogonum heermannii* Dur. & Hilg. subsp. *floccosum* (Munz) Munz. Frequent intricately-branched shrub; gravelly or rocky substrate of slopes, cyn bottoms, and arroyos; drs, pw, pjw; above 910 m; G, P, MH, NY, I, C, reported KR; Aug–Oct. Type locality: Clark Mtn.

*Eriogonum heermannii* Dur. & Hilg. subsp. *sulcatum* (S. Wats.) Munz. Rare subshrub; granitic or limestone slopes and ridges; drs, bbs, pw, pjw; 1120–1680 m; P, C, KR; Oct.

*Eriogonum inflatum* Torr. & Frém. subsp. *inflatum*. Desert Trumpet. Common annual; sandy to rocky soils of washes, arroyos, bajadas, and slopes; dws, drs, cbs–bbs; below 1710 m; KD, G, P, NY, C, KR; Mar–Aug.

*Eriogonum insigne* S. Wats. Annual. Expected in area but no specimens seen. Nearest locality is Old Dad Mts, adjacent to G.

*Eriogonum maculatum* Heller. Common annual; sandy or gravelly soils of dunes, flats, washes, and slopes; dws, dps, cbs–pjw; below 1530 m; KD, G, P, NY, I, C, KR; Apr–July.

*Eriogonum microthecum* Nutt. subsp. *rigidum* (Eastw.) S. Stokes. [*E. microthecum* var. *foliosum* (Torr.) Reveal]. Common suffrutescent shrub; gravelly to rocky soils of cyn bottoms, steep slopes, ridges, and flats; drs, jtw, pjw; 1370–1950 m; P, MH, NY, I, C, KR; July–Oct.

*Eriogonum nidularium* Cov. Frequent winter annual; sandy, gravelly, or rocky, sometimes clayish, soils of washes, arroyos, cyn bottoms, and slopes; dws, dcs, jtw–pjw; 910–1620 m; G, P, NY, I, C, KR; May–Sept.

*Eriogonum palmerianum* Reveal in Munz. Infrequent annual; sandy to rocky soils of washes, cyn bottoms, slopes, and rock outcrops; dws, drs, jtw–pjw; 1150–1950 m; G, P, MH, NY, C, reported KR; May–Oct.

*Eriogonum panamintense* Morton subsp. *panamintense*. Infrequent perennial herb with woody caudex; gravelly to rocky soils of arroyos, cyn bottoms, slopes, and ridges; pjw, wfpw; 1610–2170(–2230) m; G, P, MH, NY, C, KR; Aug–Oct.

- Eriogonum plumatella* Dur. & Hilg. Infrequent perennial with rather woody base; sandy to gravelly soils of alluvial fans, flats, arroyos; cbs; 1210–1280 m; G, P, MH; July–Oct.
- Eriogonum pusillum* T. & G. Frequent annual; sandy to gravelly soil of washes; dws, cbs–pjw; 1030–1170(–1375) m; G, P, NY, C, KR; Apr–June.
- Eriogonum reniforme* Torr. & Frém. Infrequent annual; sandy to gravelly soils of flats, washes, bajadas, and dunes; dps, cbs, jtw; below 1160 m; KD, G, P, MH, NY, reported KR; Apr–June.
- Eriogonum thomasii* Torr. Infrequent annual; sandy to gravelly-clayish soils of dunes, bajadas, slopes, and washes; dps, cbs–bbs; below 1220 m; KD, G, P, C, KR; Apr–June.
- Eriogonum thurberi* Torr. Rare annual; gravelly wash; dws, cbs; 1070 m; only NY (0.8 km w of Ivanpah, *Thorne 49359b*); May.
- Eriogonum trichopes* Torr. Infrequent annual; sandy to gravelly soils of dunes, flats, bajadas; dps, cbs, jtw; below 1180 m; KD, G, P, MH, C; May–June.
- Eriogonum umbellatum* Torr. ex Benth. subsp. *ferrissii* (A. Nels.) Stokes. Sulphur flower. Common subshrub; gravelly to rocky soils, often in litter of cyn bottoms and slopes; pw–wfpw; 1340–2240 m; G, P, MH, NY, C, KR; Aug–Oct.
- Eriogonum wrightii* Torr. ex Benth. subsp. *wrightii*. Common subshrub; sandy to rocky soils of arroyos, cyn bottoms, slopes, and ridges; mds, bbs, pw, pjw, wfpw; 1430–2140 m; G, P, MH, NY, I, C, KR; Aug–Oct.
- Oxytheca perfoliata* T. & G. Saucer Plant. Infrequent annual; sandy to rocky, sometimes clayish, soils of flats, bajadas, gentle slopes, and arroyos; dws, cbs–bbs; 1030–1280 m; G, P, C, MM, KR; May–June.
- Pterostegia drymarioides* F. & M. Infrequent annual; among boulders and in crevices on slopes; cbs, mds; 970–1220 m; G, P, KR; Apr–June.
- \**Rumex crispus* L. Curly Dock. Infrequent Eurasian perennial weed; sandy soil of washes; riparian pjw, dow; (915–)1170(–1220) m; NY (Caruthers and Sagamore Cyns) and reported KR (Smith Mine and Beck Spg); May–June.
- Rumex hymenosepalus* Torr. Wild-rhubarb. Infrequent perennial; sandy soil of dunes, washes, and roadsides; dps, cbs–bbs; below 1400 m; KD, G, P, C, KR; Apr–May.

Portulacaceae—Purslane Family

- Calyptridium monandrum* Nutt. in T. & G. Sand-cress. Infrequent prostrate annual; sandy to rocky soil of flats and cyn bottoms; cbs, bbs; 1030–1310 m; G, P, KR; Mar–May.
- Claytonia perfoliata* Donn. var. *utahensis* Poelln. Miner's-lettuce. Infrequent annual; moist, shaded crevices, humus, and loam on rocky slopes,

ledges, and cyn bottoms; drs, bbs, pjw; 1160–1860 m; G, P, MH, C, KR; Apr–May.

*Portulaca mundula* Jtn. Rare annual; sandy wash; dws, 1130 m; only C (Valley Wells, *J. C. Roos 4951*, Sept. 1, 1950); Aug.

\**Portulaca oleracea* L. Purslane. Rare succulent annual; sandy soil of wash; dws; 1570 m; only C; May–Sept.

#### Ranunculaceae—Crowfoot Family

*Anemone tuberosa* Rydb. Wind Flower. Frequent perennial; rocky substrates and crevices of cyn bottoms, outcrops, and steep slopes; dws, drs, jtw–pjw; (915–)1030–1950 m; G, P, NY, C, KR; Mar–May.

*Aquilegia shockleyi* Eastw. Columbine. Rare perennial; moist places of spgs and in crevices; dow, wfpw; 1740–2350 m; NY (Keystone Spr) and C (base of cliff on N-side of Clark Mtn); June–Sept.

*Delphinium parishii* A. Gray subsp. *parishii*. Larkspur. Common perennial; sandy to rocky soils of flats, bajadas, cyn bottoms, and slopes; cbs–pjw; (760–)990–1920 m; G, P, MH, NY, I, C, KR; Apr–June.

*Myosurus cupulatus* S. Wats. Mouse-tail. Infrequent annual; sandy to rocky soils in shaded areas of cyn bottoms and slopes; cbs, dcs, pw, pjw; 1190–1680(–1700) m; G, P, NY, KR; Apr–May.

#### Resedaceae—Mignonette Family

*Oligomeris linifolia* (Vahl) Macbr. Rare annual; sandy, rocky-gravelly-silty soils and desert pavement on flats and bajadas; cbs; below 920 m; G, P, KR; May.

#### Rhamnaceae—Buckthorn Family

*Ceanothus greggii* A. Gray subsp. *vestitus* (Greene) Thorne, comb. nov. (based on *C. vestitus* Greene, *Pittonia* 2: 101. 1980). Desert Buck Brush. Rare, but locally abundant, shrub; rocky slopes and cyns; pjow, pjw; 1760–1950 m; only in NY; Apr–May.

*Rhamnus californica* Esch. subsp. *ursina* (Greene) C. B. Wolf. Coffeeberry. Frequent shrub; rocky cyn bottoms, slopes, and cliff bases; dws, pjow, pjw, wfpw; 1030–2200 m; P, NY, C; May–June.

*Rhamnus ilicifolia* Kell. Redberry, Buckthorn. Frequent shrub; rocky slopes and cyn bottoms; dcs, pw, pjw; 1160–1740 m; G, P, NY, C; Apr–May.

#### Rosaceae—Rose Family

*Amelanchier utahensis* Koehne subsp. *covillei* (Standl.) Clokey. Service

- Berry. Infrequent large shrub; rocky slopes and cyn bottoms; bbs, pjw, wfpw, dow; 1340–2070 m; only G and C; Apr–May.
- Amelanchier utahensis* Koehne subsp. *utahensis*. Infrequent large shrub; rocky slopes and cyn bottoms; pw, pjw; 1580–1890 m; P, NY, C, KR; Apr–May.
- Cercocarpus intricatus* S. Wats. Mountain-mahogany. Frequent, and locally dominant, shrub; apparently restricted to limestone and dolomite cliffs, slopes, and ridges; dcs in pjow, pjw, wfpw; above 1400 m; P, NY, C, KR; Apr–May.
- Cercocarpus ledifolius* Nutt. Rare shrub; rocky, granitic slopes; pjw, wfpw; 1640–2140(–2230) m; NY, C, KR; May–June.
- Coleogyne ramosissima* Torr. Blackbush. Dominant shrub at middle elevations; gravelly to rocky-clayish soils of upper bajadas, mesas, and slopes; cbs–pjw; 1090–1650 m; all ranges; Apr–June.
- Cowania mexicana* D. Don var. *stansburiana* (Torr.) Jeps. Cliff-rose. Common large shrub; gravelly to rocky soil and rock crevices, predominantly calcareous, in arroyos, cyn bottoms, slopes, cliffs, ridges; dcs, jtw–pjow, pjw; (1065–)1150–2100 m; P, NY, I, C, KR; Apr–July.
- Fallugia paradoxa* (D. Don) Endl. Apache-plume. Common, large shrub; sandy to rocky soils; primarily arroyos but also on slopes; dws, jtw–pjow, pjw; 1140–2220 m; G, P, MH, NY, I, C, KR; May–June.
- Holodiscus microphyllus* Rydb. subsp. *microphyllus*. Cream Bush. Frequent shrub; rocky, steep n-facing slopes; pw, pjow, pjw, wfpw; 1340–2320 m; G, P, MH, NY, C, KR; June–Oct.
- Ivesia jaegeri* M. & J. Rare perennial; crevices of n-facing limestone cliffs; pjw, wfpw; above 1830 m; only C, June–July.
- Petrophytum caespitosum* (Nutt.) Rydb. Rock-spiraea. Frequent mat-forming shrub; calcareous crevices; dcs in pw, pjw, wfpw; above 1490 m; P, NY, C, KR; June–Oct.
- Potentilla patellifera* J. T. Howell. Cinquefoil. Rare caespitose perennial; shaded granitic crevices of n-facing slopes and cliffs; pjw, wfpw; 1580–2220 m; endemic to KR; June–Oct.
- Potentilla saxosa* Lemmon ex Greene. Rare caespitose perennial; shaded granitic crevices; mds; 1220 m; only G (Snake and Cottonwood Spgs); May–June.
- Prunus fasciculata* (Torr.) A. Gray. Desert-almond. Common shrub; sandy to rocky soils, primarily washes and arroyos, also cyn bottoms and slopes; dws, jtw–pjw; 1060–2190 m; all ranges; Mar–May.
- Purshia glandulosa* Curran. Antelope Bush. Frequent shrub; sandy to rocky, sometimes clayey, soils of washes, bajadas, and slopes; dws, bbs, pjow, pjw; all ranges; Apr–May.

## Rubiaceae—Madder Family

- Galium angustifolium* Nutt. subsp. *gracillimum* Demp. & Steb. Bedstraw. Infrequent perennial; rocky limestone soil and crevices in arroyos, cyn bottoms, and slopes; cbs, dcs, pw, pjw; 870–1470 m; only P; May–June.
- \**Galium aparine* L. Rare introduced Eurasian annual; decomposed granitic-humus soil among rocks; dow, bbs; ca 1300 m; only P (vicinity of Bonanza King Mine; Munz, Johnston, & Harwood 4151) and KR (2 km ese of Horse Thief Spgs, Wolf 10499, and spg in Granite Cyn); Apr–May.
- Galium hilendiae* Demp. & Ehrend. subsp. *kingstonense* (Demp.) Demp. & Ehrend. Rare perennial; granitic-loam or rocky soils of ravines and slopes; pjw, wfpw; 1670–1980 m; only KR; (May–)June.
- Galium matthewsii* A. Gray. Infrequent suffrutescent perennial; gravelly to rocky soils of washes and n-facing slopes; dcs, bbs, pjw; 1250–1770 (–2230) m; only C and KR; May.
- Galium munzii* Hilend & Howell. Common perennial; gravelly to rocky soil of cyn bottoms and slopes; bbs–wfpw; 1340–2290 m; G, P, MH, NY, C; May–June. Type locality: vicinity of Bonanza King Mine.
- Galium parishii* Hilend & Howell. Frequent suffrutescent herb; crevices, talus, and rocky slopes; pjw; 1230–1980 m; G, P, MH, NY, C, KR; May–Aug.
- Galium proliferum* A. Gray. Rare annual; rocky limestone substrate and crevices of slopes; dcs; 1180–1560 m; only C and KR; Apr–May.
- Galium stellatum* Kell. subsp. *eremicum* (Hilend & Howell) Ehrend. Frequent suffrutescent herb; rocky substrates and crevices, primarily on steep slopes, occasionally in washes and upper bajadas; drs, dws, cbs; 850–1370 m; G, P, KR; Mar–May.
- Galium wrightii* A. Gray. Infrequent perennial; gravelly to rocky limestone soil, often in litter under pinyons or junipers on slopes, cyn bottoms, and talus slopes; pjw; 1610–2290 m; only C; June–July.

## Rutaceae—Rue Family

- Thamnosma montana* Torr. & Frém. Turpentine-broom. Common aromatic shrub; gravelly to rocky, sometimes clayey soils of bajadas, arroyos, and slopes; dws, cbs–pjw; 850–1620 m; all ranges; Mar–May.

## Salicaceae—Willow Family

- Populus fremontii* S. Wats. var. *fremontii*. Cottonwood. Infrequent tree; spgs; dow; 1140–1470 m; G, MH, NY, C, KR; Apr.
- Salix exigua* Nutt. Willow. Infrequent shrub; moist gravelly soil of intermittent streambeds and spgs; dow, ssm; 1060–1740 m; G, P, MH, NY, C, KR; Mar–May.



- Salix gooddingii* Ball (var. *gooddingii*). Infrequent tree; spgs; dow; 1220–1480 m; G, P, C, KR; Apr–May.
- Salix gooddingii* Ball (var. *variabilis* Ball). Rare tree; spgs; dow; 1250 m; only C (Ivanpah Spgs, *Prigge 1084*); Apr. Capsules pilose.
- Salix lasiolepis* Benth. var. *lasiolepis*. Infrequent shrub; moist gravel of spgs and seeps; dow; 1220–1660 m; only G and NY; Apr–May.

#### Saururaceae—Lizard-tail Family

- Anemopsis californica* Hook. Yerba Mansa. Rare perennial; wet soil about spgs; dow; 1490 m; now only C (Pachalka Spg); May–June. Formerly known from KR (Beck Spg) and still present at Kingston Spg.

#### Saxifragaceae—Saxifrage Family

- Fendlerella utahensis* (S. Wats.) Heller. Yerba Desierto. Infrequent low shrub; calcareous crevices of n-facing, shaded slopes and cliffs; dcs in pw, pjw, wfpw; above 1670 m; P, C, KR; May–June.
- Heuchera rubescens* Torr. var. *pachypoda* (Greene) Rosend., Butt., & Lak. Alum Root. Frequent perennial; gravelly- to rocky-humus soils and rocky crevices on shaded slopes and cliffs; pw, pjow, pjw, wfpw; 1340–2290 m; P, MH, NY, C, KR; May–July.
- Philadelphus microphyllus* A. Gray subsp. *stramineus* (Rydb.) C. L. Hitchc. Mock-orange. Frequent shrub; crevices and rocky substrates of steep, n-facing cyn slopes, bottoms, and cliffs; pjw, wfpw; 1640–2320 m; P, NY, C; May–July.
- Ribes cereum* Dougl. Squaw Currant. Infrequent deciduous shrub; gravelly to rocky soils and talus of steep, n-facing slopes and cyn bottoms; pjw, wfpw; 1890–2320 m; only C and KR; May–June.
- Ribes velutinum* Greene [var. *glanduliferum* (Heller) Jeps.]. Plateau Gooseberry. Frequent, spiny shrub; gravelly to rocky granitic substrates of steep cyn slopes and bottoms; pjow, pjw, wfpw; 1340–2230 m; G, MH, NY, C, KR; Mar–May.

#### Scrophulariaceae—Figwort Family

- Antirrhinum filipes* A. Gray. Twining Snapdragon. Infrequent annual twining through shrubs; sandy, gravelly or rocky- gypsiferous-loam soils; cbs, dcs, gs, dws, jtw, bbs; 1090–1620 m; G, P, C, MM, KR; Mar–May.
- Antirrhinum kingii* S. Wats. Rare annual; steep, rocky slopes; lower pjw; 1770 m; only C (Little Pachalka Cyn, *Prigge 963*, and Colosseum Mine, *J. C. Roos 3531*); May.
- Castilleja chromosa* A. Nels. Indian Paintbrush. Common perennial from

woody root crown; sandy to rocky, sometimes granitic-loam, soils of flats, bajadas, arroyos, cyn bottoms, and steep slopes; dws, dcs, cbs-pjw; below 1950 m; G, P, MH, NY, I, C, KR; Mar-June.

*Castilleja linariaefolia* Benth. Frequent perennial with woody root crown; sandy to rocky soils of bajadas, and arroyos, cyn slopes and floors; jtw-pjw; 1310-1920 m; G, P, MH, NY, C; June-Oct.

*Cordylanthus parviflorus* (Ferris) Wiggins. Bird's-beak. Infrequent, but locally common, annual; sandy to rocky soils of bajadas and arroyos; jtw; pw; 1490-1740 m; only P and NY; Aug-Sept.

*Keckiella antirrhinoides* (Benth.) Straw subsp. *microphylla* (A. Gray) Straw. Bush Penstemon. Frequent shrub; stony to rocky soils, among boulders, and in crevices, usually on steep slopes, rarely in arroyos; drs, jtw, pw, pjw; 1000-1710 m; G, P, MH, NY, KR; Apr-June.

*Maurandya antirrhiniflora* Humb. & Bonpl. ex Willd. Rare perennial vine; rocky, limestone substrates and crevices of cyn bottoms, slopes, and cliffs; dcs; 1280-1560 m; only P; May-Sept.

*Mimulus bigelovii* (A. Gray) A. Gray var. *bigelovii*. Monkey-flower. Frequent annual; sandy to gravelly, sometimes gypsiferous-loamy, soils of arroyos, bajadas, and steep slopes; dws, cbs-bbs, dcs, gs; 990-1560 m; G, P, I, C, MM, KR; Apr-May.

*Mimulus guttatus* Fisch. ex DC. subsp. *guttatus*. [incl. *M. nasutus* Greene]. Frequent annual; moist to wet sand, humus, and loam of seeps, spgs, and intermittent streams; ssm, dow; 970-1830 m; G, P, MH, NY, C, KR; Apr-June.

*Mimulus parishii* Greene. Rare glandular-villous annual; moist sand of intermittent streambeds; ssm; 1280-1730 m; only G (Bull Cyn) and NY (Keystone Cyn); May-Aug.

*Mimulus pilosus* (Benth.) S. Wats. Infrequent villous annual; moist sand of seeps, spgs, intermittent streambeds, and slopes; dws, ssm, dow, pw, pjw; 1580-2260 m; G, P, MH, NY, KR; Apr-June.

*Mimulus rubellus* A. Gray in Torr. Common annual; sandy to gravelly soils of arroyos, bajadas, and slopes; dws, jtw-pjw; 1030-1890 m; G, P, MH, NY, C, MM, KR; Apr-June.

*Mohavea breviflora* Coville. Ghost Flower. Infrequent annual; dws; 915-1920 m; P ("Kelso," *M. E. Jones s. n.*, May 2, 1906) and reported KR (Sheep Tanks Cyn, Smith Mine, and Coyote Holes); Apr-June, Fall.

*Penstemon bridgesii* A. Gray. Beard-tongue. Infrequent perennial; rocky soils and crevices among boulders on cyn slopes and bottoms; pjw, pjow, wfpw; 1760-2320 m; NY, C, KR; June-Oct.

*Penstemon calcareus* Bdg. Rare perennial; limestone gravel and crevices of cyn bottoms, slopes, and cliffs; dcs in pw, pjw; 1060-1530 m; only P; Apr-May. *Jones s. n.*, Kelso—type for *P. desertorum* Jones.

- Penstemon centranthifolius* Benth. Scarlet Bugler. Rare perennial; jtw, pjw; 1410–1800 m; only NY (14 km s of Ivanpah on Hart Mine Rd and Keystone Cyn); Apr–July.
- Penstemon eatonii* A. Gray var. *eatonii*. Frequent glabrous perennial; gravelly to rocky soils of cyn bottoms and slopes; sbs, pjow, pjw, wfpw; 1400–2380 m; G, I, C, reported KR; May–July (Sept).
- Penstemon eatonii* A. Gray var. *undosus* Jones. Infrequent puberulent perennial; gravelly to rocky soils of cyn slopes and bottoms; pw, pjw, wfpw; 1250–2080 m; P, NY, C; May–July.
- Penstemon fruticiformis* Cov. subsp. *amargosae* Keck. Rare shrub; rocky scree slopes and washes; 975–1375 m; only KR; June–July, Sept.
- Penstemon palmeri* A. Gray. Common tall perennial; gravelly to rocky soils primarily of arroyos and cyn bottoms, also on bajadas and slopes; dws, cbs–pw, jsbs, pjw; 850–1710 m; P, MH, NY, C, MM, KR; Apr–June.
- Penstemon pseudospectabilis* Jones. Rare perennial; gravelly-rocky to rocky granitic soils, among boulders on steep slopes; mds, pjw; 1220–1940 m; only G; Apr–June.
- Penstemon stephensii* Bdg. Infrequent, but locally common, perennial; gravelly to rocky granitic or dolomitic soils and crevices of cyn bottoms, slopes, cliffs; dws, drs, pjw; 1160–1850 m; P, MH, KR; Apr–June.
- Penstemon thompsoniae* (A. Gray) Rydb. Rare prostrate perennial with woody caudex; whitish, crumbly, calcareous soils of slopes and ridges; dcs in pjw, pjow; 1700–1890 m; only NY (Keystone and Caruthers Cyns and Hard Cash Mine) and C (Juniper Claims); Apr–June.
- Penstemon thurberi* Torr. subsp. *thurberi*. Rare subshrub; sandy to gravelly soils; dunes, open flats, and cyn bottoms; dps, jsbs; 730–1550 m; only KD and MH (Gold Valley); Apr–May.
- Penstemon utahensis* Eastw. Infrequent perennial; gravelly to rocky soils of slopes; jtw, bbs, pjow; 1220–1740 m; NY, C, KR; Apr–May.
- Veronica americana* Schwein. Brooklime. Rare perennial; wet, clayish soils; spgs; dow; 945–1370 m; only KR (spg at Smith Talc Mine and Crystal and Beck Spgs); June–Aug.
- \**Veronica anagallis-aquatica* L. Speedwell. Rare naturalized perennial from Europe; wet places about spgs; dow; 945–1160 m; only KR (Smith Mine, *de Nevers* 295, and Crystal Spg); Apr–July.

\*Simaroubaceae—Quassia Family

- \**Ailanthus altissima* (Mill.) Swingle. Tree of Heaven. Rare introduced small tree from Asia; locally abundant at spg; dow; 1130 m; KR (Crystal Spg, where spreading as numerous seedlings).

## Solanaceae—Nightshade Family

- Chamaesaracha coronopus* (Dunal) A. Gray. Rare perennial, clayey soil of slopes and flats; jtw; only NY (Barnwell, *J. C. Roos 3548*); June.
- Datura wrightii* Regel. [*D. meteloides* A. DC.]. Thorn-apple, Jimson Weed. Frequent large perennial; sandy to rocky soils of disturbed areas, washes, bajadas, and spgs; dws, dow, cbs-pjw; below 2130 m; all ranges; May–Aug.
- Lycium andersonii* A. Gray. Box-thorn. Common shrub; gravelly to rocky soils of bajadas, arroyos, and slopes; dws, dcs, cbs-jsbs, pjw; below 1680 m; G, P, MH, NY, I, C, KR; Apr–May.
- Lycium cooperi* A. Gray. Common thorny shrub; sandy to rocky soils of arroyos, flats, bajadas, and cyn bottoms; dws, cbs-jsbs, pjw; 910–1970 m; G, P, MH, NY, I, C, KR; May–July.
- Lycium pallidum* Miers var. *oligospermum* C. L. Hitchc. Rare, locally abundant, shrub, calcareous-cemented desert pavement of bajada; cbs; 825–975 m; only KR (n area, *Stone 116*); Mar–May.
- Nicotiana attenuata* Torr. Coyote Tobacco. Infrequent annual; sandy to gravelly soil of disturbed areas, washes, and arroyos; dws, bbs, pjw; 1310–1740 m; MH, NY, C, KR; June–Oct.
- Nicotiana trigonophylla* Dunal in A. DC. Desert Tobacco. Frequent perennial or biennial; sandy to rocky soil, among boulders, and in crevices of arroyos, slopes, and cliffs; dws, drs, cbs-bbs; 880–1560 m; G, P, C, KR; Mar–June.
- Physalis crassifolia* Benth. var. *crassifolia*. Ground-cherry. Frequent perennial; gravelly to rocky soils and crevices of arroyos, washes, cyn bottoms, and slopes; drs, cbs-pjw; 715–1675 m; G, P, NY, C, KR; Apr–Oct.
- Physalis hederæfolia* A. Gray var. *cordifolia* (A. Gray) Waterfall. Frequent perennial; sandy to rocky soils of arroyos, cyn bottoms and slopes; dws, bbs, pjw; 1030–2140 m; G, P, MH, NY, C, reported KR; May–July, Oct.
- \**Solanum elaeagnifolium* Cov. Silverleaf-nettle. Rare perennial; disturbed areas of arroyos; dws; 1430 m; only NY (0.6 km e of Barnwell); July.
- \**Solanum nodiflorum* Jacq. Nightshade. Rare annual or perennial; moist silty or clayey soil of spgs; dow; 1160–1490 m; C (Pachalka Spg) and KR (Crystal and Horse Thief Spgs); May–June.
- Solanum triflorum* Nutt. Rare annual; sandy-gravelly and gravelly-clayey soil of disturbed areas; dws, bbs; 1580–1630 m; only C (corral below Green's Well and Colosseum Mine); June–Sept.

## \*Tamaricaceae—Tamarisk Family

- \**Tamarix ramosissima* Ledeb. Tamarisk, Salt-cedar. Infrequent w Asian shrub; wet, sandy-gravelly, sometimes alkaline, soils of spgs and inter-

mittent streambeds; dow, ssm; 1030–1500 m; G, P, NY, C, KR; May–Oct.

#### Ulmaceae—Elm Family

*Celtis reticulata* Torr. Hackberry. Rare tree; gravelly-rocky soil of seeps and spgs; dow; 1030–1490 m; P (Cornfield Spg), NY (Dove Spg), C (Colosseum Gorge); Apr–May.

#### Urticaceae—Nettle Family

*Parietaria hespera* var. *californica* Hinton. Pellitory. Rare annual; rocky limestone substrates and crevices of cyn bottoms and slopes; dcs; 930–1370 m; only P (Cornfield Spr and Bonanza King Cyns); Apr–May.

*Urtica dioica* subsp. *holosericea* (Nutt.) Thorne. [*Urtica holosericea* Nutt.]. Nettle. Rare perennial; margin of pond; 1280 m; only G (Cove Spg area, Thorne 45732).

#### Verbenaceae—Vervain Family

*Aloysia wrightii* (A. Gray ex Torr.) Heller. [*Lippia wrightii* A. Gray ex Torr.]. Vera Dulce. Rare shrub; rocky limestone substrates and crevices of slopes and cyn bottoms; dcs; 1310–1530 m; only P (Bonanza King Mine and Cyn) and C (vicinity of Pachalka Spg); May.

*Verbena bracteata* Lag. & Rodr. Vervain. Rare annual; moist, disturbed ground at spgs; 1415 m; only C (spg at Mountain Pass, J. & L. Roos 4413) and KR (Horse Thief Spgs, Castagnoli 165, de Nevers 404); May–Oct.

*Verbena gooddingii* Briq. Verbena. Frequent perennial; sandy to rocky soil of flats, arroyos, cyn bottoms, and slopes; jtw, bbs, jsbs, pjw; 1370–1830 m; P, MH, NY, I, C; Apr–Sept.

#### Viscaceae—Mistletoe Family

*Arceuthobium divaricatum* Engelm. Dwarf Mistletoe. Common, but infrequently collected, perennial parasite on *Pinus monophylla*; pw, pjow, pjw, wfpw; 1615–2260 m; all ranges; summer.

*Phoradendron californicum* Nutt. Desert Mistletoe. Common, but infrequently collected, perennial parasite on *Acacia greggii* and *Prosopis glandulosa torreyana*; dws, dow; 760–1220 m; all ranges; summer.

*Phoradendron juniperinum* Engelm. ex A. Gray subsp. *juniperinum*. Frequent perennial parasite on *Juniperus californica* and *J. osteosperma*; jsbs, pjw, wfpw; above 975 m; all ranges; summer.

## Zygophyllaceae—Caltrop Family

- Kallstroemia parviflora* Nort. Rare summer annual; sandy soil of bajadas and slopes; cbs, bbs; 1600–1710 m; only MH and C (Colosseum Mine, J. & A. Roos 4904 and Ivanpah Valley, Prigge 376); Aug–Sept.
- Larrea divaricata* (Sesse & Moç. ex DC.) subsp. *tridentata* (Sesse & Moç. ex DC.) Felger & Lowe. Creosote bush. Very common, often dominant shrub; sandy to rocky soils of washes, flats, bajadas, and slopes; dps, drs, cbs, jtw; below 1500 m; KD, all ranges; May–Oct.
- \**Tribulus terrestris* L. Caltrop, Puncture Vine. Infrequent annual; disturbed areas; dws, cbs, bbs, pjw; 1150–1650 m; P, NY, C, KR; May–Oct.

## Monocotyledoneae

## Cyperaceae—Sedge Family

- Carex alma* Bailey. Sedge. Infrequent perennial; moist sand or gravel in springy places and stream beds; ssm within pjw; 1025–1850 m; G, P, NY; May–June.
- Carex aurea* Nutt. Rare perennial; springy area; ssm within pjw; 1800 m; only NY (Keystone Spg); May.
- Carex brevipes* W. Boott. Rare perennial; locally abundant on steep slopes; wfpw; 1890–2200 m; only NY and C; May.
- Carex occidentalis* Bailey. Rare perennial; 1500 m; only MH (e side of Wild Horse Cyn); May–June.
- Carex subfusca* W. Boott. Rare perennial; moist sandy or springy places in seeps or near stream beds in cyns; ssm within pjw; 1770–1950 m; only NY; May–Aug.
- Eleocharis montevidensis* Kunth [var. *parishii* (Britt.) V. Grant.]. Spike-rush. Infrequent perennial; springy places wet with seepage; dow, ssm; 1050–1700 m; G, P, NY, C, reported KR; May–July.

## Iridaceae—Iris Family

- Sisyrinchium halophilum* Greene. Blue-eyed-grass. Rare perennial; wet sand in streambeds; ssm; 1000–1250 m; only G; Apr–May.

## Juncaceae—Rush Family

- Juncus bufonius* L. Toad Rush. Rare small annual; wet, sandy soil; ssm; 975–1200 m; only G (Snake Spgs, Dripping Spg pond, and Bull Cyn); Apr–Sept. Also at Kingston Spg.
- Juncus cooperi* Engelm. Rush. Rare perennial; areas wet with seepage; ssm; 1220 m; only P (Arrowweed Spg); Apr–May. Also Kingston Spg.

- Juncus macrophyllus* Cov. Infrequent perennial; moist springy places; dow, ssm within pjw; 915–1700 m; G, P, NY; June–July.
- Juncus mexicanus* Willd. Wire-grass. Infrequent rhizomatous perennial; moist, springy places; dow, ssm within pjow; 1150–1950 m; G, P, NY, C, reported KR; May–July.
- Juncus nodosus* L. Rare perennial; sand wet with seepage; dow; 1525 m; only C (Colosseum Gorge); June.
- Juncus occidentalis* (Cov.) Wieg. [*Juncus tenuis* Willd. var. *congestus* Engelm.]. Rare perennial; sandy streambed wet with seepage; ssm; 1830–1850 m; only NY (Fourth of July Cyn); June.
- Juncus torreyi* Cov. Rare perennial; ssm; 1770 m; only NY (Keystone Spg, Munz 13858, Oct. 13, 1935), not found there by us.
- Juncus xiphioides* E. Mey. Infrequent gladiate perennial; wet, sandy soil of springs and cyns; dow, ssm within pjw; 975–1700 m; G, P, NY, C, reported KR; May–July.

#### Liliaceae—Lily Family

- Agave deserti* Engelm. Century Plant. Infrequent semisucculent-leaved, rosette shrub; sunny, rocky, granitic or limestone slopes; drs; 1050–1850 m; only G and P; May–July.
- Agave utahensis* Engelm. var. *nevadensis* Engelm. ex Greenm. & Rousch. Frequent semisucculent-leaved, acaulescent shrub; sunny, rocky, often steep calcareous and volcanic slopes; drs, bbs, pjw; 1050–1650 m; locally abundant in I, C, MM, KR; May–June.
- Allium nevadense* S. Wats. var. *cristatum* (S. Wats.) Ownbey. Wild Onion. Frequent bulbous perennial; sandy, gravelly, or rocky, granitic or calcareous slopes; drs, pjw; 1100–2150 m; G, P, MH, NY, C, MM, KR; May–June.
- Calochortus flexuosus* S. Wats. Sego-lily, Mariposa-lily. Infrequent bulbous, viny perennial; loamy, gravelly, or rocky, often calcareous slopes, bajadas, and washes; dcs, jtw, pjw; 1050–1750 m; C, MM, KR; May.
- Calochortus kennedyi* Porter (var. *kennedyi*). Desert Mariposa-lily. Frequent showy, bulbous perennial; sandy or rocky soils of bajadas, mesas, and rocky slopes; cbs–pjw; 1025–1950 m; G, P, MH, NY, C; Apr–May.
- Calochortus kennedyi* Porter (var. *munzii* Jeps.). Less frequent, yellow-flowered variety of similar habitats; G, P, C; May.
- Dichelostemma pulchellum* (Salisb.) Heller [var. *pauciflorum* (Torr.) Mort.]. Blue Dicks, Wild-hyacinth. Infrequent bulbous perennial; sandy-gravelly bajadas and rocky slopes; cbs, jtw, pjw; 1200–2000 m; G, P, MH, NY, C, KR; May–June.
- Hesperocallis undulata* A. Gray. Desert-lily. Rare bulbous perennial; sandy soil; dps; 670–730 m; only KD (where locally abundant in good yrs) and KR (Coyote Holes); Apr–May.

- Muilla coronata* Greene. Rare bulbous perennial; granitic soil; pjw; 1550 m; only NY (Caruthers Cyn); Apr–May.
- Muilla transmontana* Greene. Rare bulbous perennial; sandy flats; dps; 670–730 m; only KD (in Kelso); Apr–May.
- Nolina wolfii* (Munz) Munz. Infrequent, but conspicuous, and locally abundant, sword-leaved shrub; rocky slopes; drs, pjw; 1050–2230 m; only KR; May–June.
- Yucca baccata* Torr. var. *baccata*. Banana Yucca. Common, and locally abundant, acaulescent shrub; rocky, granitic or calcareous slopes and sandy or gravelly washes; jtw, bbs, pjw; 975–1950 m; P, NY, I, C, KR; May–June.
- Yucca baccata* Torr. var. *vespertina* McKelvey. Infrequent caespitose shrub; mostly on lower, rocky slopes; drs, cbs, bbs, pjw; 1220–2230 m; G, MH, NY, C, KR; Apr–June.
- Yucca brevifolia* Engelm. in S. Wats. var. *jaegeriana* McKelvey. Joshua Tree. Common, conspicuous small tree; sandy, gravelly, or rocky bajadas and slopes; jtw, bbs, pjw; (1050–)1200–1675 m; MH, NY, I, C, MM, KR; Apr–May.
- Yucca schidigera* Roezl. ex Ortgies. Spanish Bayonet, Mojave Yucca. Common shrub; rocky slopes and bajadas and sandy washes; drs, cbs, jtw, bbs; 760–1675(–1750) m; all ranges; Apr–May.
- Zigadenus brevibracteatus* (Jones) Hall. Desert Zygodene. Rare bulbous perennial; sandy soil; cbs; 975–1275 m; only G (where locally abundant at se end); Apr–May.

#### Poaceae—Grass Family

- Agropyron trachycaulum* (Link) Malte. Wheat Grass. Infrequent perennial; rocky slopes and cyns; drs, pw, pjw; 1350–1700 m; G, P, NY; May–June.
- \**Agrostis semiverticillatus* (Forsk.) C. Chr. Bent Grass. Infrequent weedy European annual or perennial; moist sandy or springy places; ssm, dow; 1035–1800 m; G, P, NY, C, KR; May–July.
- Aristida adscensionis* L. var. *modesta* Hack. Dogtown Grass. Infrequent annual; gravelly to rocky flats, wash margins, and slopes; dws, drs, bbs; 760–1400 m; G, P, NY, C, KR; Apr–May.
- Aristida fendleriana* Steud. Three-awned Grass. Common perennial bunch grass; sandy to rocky washes, wash margins, and slopes; dws–pjw; 1050–1775 m; P, MH, NY, I, C, KR; May–June.
- Aristida glauca* (Nees) Walp. Common perennial bunch grass; rocky slopes, bajadas, benches, and wash margins; drs, cbs–pjw; 975–2000 m; G, P, MH, NY, C, KR; May–June.
- Aristida hamulosa* Henr. Rare perennial; gravelly, granitic cyn bottom; mds; 1340 m; only G (Budweiser Cyn); Oct.
- Aristida longiseta* Steud. var. *robusta* Merr. Red Three-awn. Rare caespitose



- tose perennial; sandy to gravelly washes, wash margins, cyn bottoms, and slopes; dws, cbs, pjw; 1065–1585 m; only NY and KR (upper Porcupine Cyn, *Stone 181*); Mar–May.
- Aristida parishii* Hitchc. Rare tufted perennial; rocky cyn slopes; drs; 1220–1265 m; G, P, KR (near top of hill “4439,” *de Nevers 363 and 148*); Oct.
- Aristida wrightii* Nash. Rare perennial bunch grass; rocky slopes; pjw; 1800 m; only NY (Caruthers and Keystone Cyns); May–June.
- \**Avena fatua* L. Wild Oat. Rare weedy annual; rocky slopes; drs; 1265 m; only P (Bonanza King Mine); (Apr–June), Oct.
- Bothriochloa barbinodis* (Lag.) Herter. Beard Grass. Rare perennial; rocky slopes; cbs, drs; 975–1400 m; only P (near Bonanza King Mine) and C (sw of Stateline Pass); Apr–May.
- Bouteloua aristidoides* (H.B.K.) Griseb. Needle Grama. Infrequent summer-fall annual; sandy to rocky washes and slopes; cbs, dcs, bbs; 915–1650 m; G, P, MH, I, C; Aug–Oct.
- Bouteloua barbata* Lag. Six-weeks Grama. Infrequent summer-fall annual; sandy to rocky washes, open flats, and slopes; dws, drs, cbs–pjw; 915–1650 m; G, P, MH, NY, C, KR; Aug–Oct.
- Bouteloua curtispendula* (Michx.) Torr. Side-oats Grama. Common tufted perennial; rocky slopes and gravelly arroyos; drs, bbs, pjw; 1275–1825 m; P, MH, NY, I, C, KR; June–Oct.
- Bouteloua eriopoda* (Torr.) Torr. Infrequent, but locally common, tufted perennial; sandy or gravelly washes, clayey flats, and rocky slopes; cbs–pjw; 1220–1830 m; P, MH, NY, C; May–Oct.
- Bouteloua gracilis* (Willd. ex H.B.K.) Lag. Blue Grama. Infrequent, but locally abundant, tufted perennial; grassy plateaux, rocky slopes, and arroyo margins; drs, jsbs, pjw; 1585–2285 m; MH, NY, I, C; May–Oct.
- Bouteloua trifida* Thurb. Rare tufted perennial; rocky slopes, especially on limestone; dcs within pjw; 1220–1950 m; P, NY, C, KR; May–June, Sept.
- \**Bromus arenarius* Labill. Australian Chess. Infrequent Old World weedy annual; mostly in moist, springy, sandy places wet with seepage, less often on open slopes; dws, pjw; 975–1675 m; P, MH, NY, KR; May–June.
- \**Bromus diandrus* Roth. Ripgut Grass. Infrequent weedy annual; mostly in moist, sandy areas wet with seepage; ssm, dow; 1275–1950 m; G, P, MH, NY, C, KR; Apr–June.
- \**Bromus marginatus* Nees. Bromegrass. Rare weedy annual; open slopes and damp, springy soil of cyns; 975–1525(–1770) m; P, C, reported KR; May–June.
- \**Bromus rubens* L. Foxtail Chess. Abundant weedy annual everywhere; sandy and disturbed places; cbs–pjw; 750–2150 m; all ranges; Apr–May.
- \**Bromus tectorum* L. Cheat Grass. Frequent European weedy annual;

- sandy places, wet with seepage, disturbed sites, and open slopes; bbs-pjw; 1525–1975 m; G, MH, NY, C, KR; May–June.
- \**Bromus trinii* Desv. in Gay. Infrequent South American weedy annual; sandy, gravelly washes and rocky slopes; dws, drs, pjw; 1050–1650 m; G, P, MH, MM, KR; Apr–May.
- \**Bromus unioloides* H.B.K. Rescue Grass. [*B. willdenowii* Kunth]. Rare South American weedy annual; shady, disturbed ground at spg; 1415 m; only KR (Horse Thief Spgs, *Stone 295a*); Apr–Sept.
- \**Cenchrus longispinus* (Hack. in Kneucker) Fern. Sandbur. Rare annual weed; disturbed ground; 1150 m; only KR (below Crystal Spg); July–Sept.
- \**Cynodon dactylon* (L.) Pers. Bermuda Grass. Rare weedy perennial; disturbed, springy places; ssm, dow; 1200–1525 m; P, C, KR; May–July.
- Deschampsia danthonioides* (Trin.) Munro. ex Benth. Hair Grass. Rare annual; moist cyn bottoms; ssm in pjow, pjw; (1585–)1725 m; only NY (Fourth of July and Caruthers Cyns) and reported KR (Sheep Tanks Cyn); May–June.
- \**Echinochloa crusgalli* (L.) Beauv. var. *crusgalli*. Barnyard Grass. Rare weedy annual; sandy wash; dws; 1150 m; only P (Bonanza King Mine); (July–Oct).
- Elymus cinereus* Scribn. & Merr. Great Basin Wild-rye. Rare robust perennial; subalkaline seepage about spgs and in rocky washes; dws, dow; 975–1555 m; only KR (Beck Spg, *J. & L. Roos 4524*, and reported at Smith Mine and Tadpole Cyn); May–Sept.
- Elymus glaucus* Buckl. subsp. *glaucus*. Western Rye Grass. Rare perennial; rocky cyn slopes; pw, pjw; 975–1475 m; only P; May–June.
- Elymus salinus* Jones. Infrequent perennial bunch grass; rocky slopes, especially on n-facing talus slopes; pjw; 1450–1900 m; P, NY, C; May–June.
- Elymus triticoides* Buckl. Rare rhizomatous perennial; alkaline disturbed area; dow; 1500 m; only C (Pachalka Spgs, in a 3 × 3 m colony in 1940, not recently seen); May.
- Enneapogon desvauxii* Beauv. Infrequent perennial; rocky, limestone slopes and sandy cyn bottoms; dcs, dws, pjw; 1275–1825 m; P, I, C; Aug–Oct.
- \**Eragrostis cilianensis* (All.) E. Mosher. Stinkgrass. Infrequent European weedy annual; especially in sandy or gravelly washes, disturbed ground, and rocky slopes; dws, pjw; 1200–1675 m; G, P, MH, NY, C, reported KR; June–Oct.
- Erioneuron pilosum* (Buckl.) Nash. Rare perennial; rocky calcareous ridges and slopes in cyns; dcs; 1530–1825(–1875) m; only C (Fir and Forsellesia Cyns) and reported KR (near top of peak “6191”); May–June.
- Erioneuron pulchellum* (H.B.K.) Tateoka. Fluffgrass. Common perennial; dunes, sandy washes and flats, and rocky slopes and cyn bottoms; dws, dcs, cbs-pjw; 760–1675 m; all ranges; Apr–June, Aug–Oct.

- Hilaria jamesii* (Torr.) Benth. Galleta. Frequent perennial; sandy to rocky slopes; dcs-pjw; 1250–1850 m; MH, NY, I, C, KR; May–June, Sept.
- Hilaria rigida* (Thurb.) Benth. ex Scribn. Big Galleta. Frequent perennial throughout at lower elevations; sandy washes, dunes, open flats, alluvial fans, and rocky slopes; dps-bbs; 730–1600 m; KD, all ranges; Feb–June.
- \**Hordeum glaucum* Steud. Wild Barley. Infrequent European weedy annual; only about disturbed spgs; ssm, dow; 1050–1500 m; NY (Dove Spg), C (Pachalka Spg), reported KR (spg at Smith Mine); May.
- \**Hordeum vulgare* L. Common Barley. Rare spontaneous annual; disturbed ground; 1500 m; only C.
- Melica frutescens* Scribn. Melic. Infrequent perennial; rocky slopes; dcs, pw, pjw; 975–1585 m; G, P, MH, KR; May–June.
- Melica imperfecta* Trin. [incl. vars. *flexuosa* Bol. and *minor* Scribn.]. Infrequent perennial; rocky cyn slopes; drs, cbs-pjw; 975–2100 m; G, P, NY, KR; Apr–June.
- Muhlenbergia arsenei* Hitchc. Rare perennial; rocky, limestone slopes and ridges; dcs; 1525–1800 m; only NY and C; Aug–Oct.
- Muhlenbergia asperifolia* (Nees & Mey.) Parodi. Scratchgrass. Rare perennial; only moist, usually alkaline places, about spgs or in open arroyos; ssm, dow within pjw; 1765–1830 m; only NY (Fourth of July and Keystone Cyns); Aug. Also at Kingston Spg.
- Muhlenbergia microsperma* (DC.) Kunth. Frequent annual; rocky slopes and gravelly cyn bottoms; dws, drs, pjw; 760–1675 m; G, P, MH, I, C, KR; May–Oct.
- Muhlenbergia minutissima* (Steud.) Swallen. Rare annual; gravelly limestone soil of wash; dws; 1570 m; only C (below corral at Green's Well); Oct.
- Muhlenbergia porteri* Scribn. Mesquite Grass. Frequent perennial at lower elevations; sandy washes, gravelly cyn bottoms, and open, rocky slopes among shrubs; dws, cbs-bbs; 1035–1675 m; all ranges; June–Oct.
- Muhlenbergia rigens* (Benth.) Hitchc. Deer Grass. Rare tufted perennial; sandy places moist with seepage in cyn bottoms and about spgs; ssm, drs; 975–1775 m; only G and NY; May–Oct.
- Oryzopsis hymenoides* (R. & S.) Ricker. Indian Rice Grass, Sand Bunch Grass. Common perennial throughout; sandy or gravelly places, especially washes, dunes, and cyn bottoms, and rocky slopes; dps, dws, cbs-pjw; 670–1750(–2230) m; KD, all ranges; Apr–May.
- Oryzopsis hymenoides* × *Stipa speciosa*. [*Stiporyzopsis* × *bloomeri* (Bol.) B. L. Johns.]. Rare but beautiful perennial; rocky slopes and ridges; pjw, pjow; 1675–2025 m; only NY (Fourth of July and Caruthers Cyns); May.
- Oryzopsis micrantha* (Trin. & Rupr.) Thurb. Little-seed Rice Grass. Rare tufted perennial; rocky calcareous or granitic slopes and cyn bottoms; dcs, pjw, wfpw; 900–2000 m; only C and KR.

- Panicum urvilleanum* Kunth. Dune Panic Grass. Rare robust rhizomatous perennial; locally abundant on dunes; dps; 670–760 m; only KD; May.
- Phragmites australis* (Cav.) Trin. ex Steud. Common Reed. Rare tall rhizomatous perennial; cyn bottoms and slopes wet with seepage; ssm in pjw, pjow; (975–)1400–1725 m; G (Budweiser Cyn), NY (Caruthers Cyn), reported KR (Smith Mine spg); July–Nov.
- \**Poa annua* L. Winter Grass. Rare weedy European annual; disturbed ground at spgs; dow; 1160–1415 m; only KR (Crystal and Horse Thief Spgs, *Castagnoli 166*); (Jan–)June.
- Poa bigelovii* Vasey & Scribn. Blue Grass. Infrequent annual; sandy cyn bottoms, near spgs, alluvial fans, and rocky slopes; mds, jtw, bbs, pw; 760–1550 m; G, P, NY, C, KR; Apr–May.
- Poa fendleriana* (Steud.) Vasey. Mutton Grass. Common perennial bunch grass; sandy to gravelly bouldery slopes, limestone talus, cyn bottoms, and shaly benches; pjw, wfpw; 1450–2300 m; G, P, MH, NY, C, KR; May–June.
- Poa scabrella* (Thurb.) Benth. ex Vasey. Malpais Blue Grass. Frequent perennial bunch grass; sandy, gravelly, or bouldery slopes, drs, pjw; 915–1525 m; G, P, MH, KR; Apr–May.
- \**Polypogon australis* Brongn. Beardgrass. Rare weedy perennial; dow; 1500 m; only C (Pachalka Spg); May.
- \**Polypogon monspeliensis* (L.) Desf. Infrequent weedy annual; locally abundant about spgs and seepage places in cyn bottoms; dow, ssm in pjw; 1050–1830 m; G, P, NY, C, KR; May–Aug.
- \**Schismus barbatus* (L.) Thell. Frequent mediterranean weedy annual, though locally abundant at lower elevations; sandy or disturbed places; cbs; 730–1500 m; KD, G, P, MH, NY, C, KR; Apr–May.
- Scleropogon brevifolius* Phil. Burro Grass. Rare perennial; along sandy roadside; jtw; 1585 m; reported only NY (ca 1 km e of Caruthers Cyn); Aug.
- \**Setaria geniculata* (Lam) Beauv. Bristle grass. Rare weedy perennial, presumably introduced; cyn; 1400 m; only P (Bonanza King Mine); June–Oct.
- Sitanion hystrix* (Nutt.) J. G. Smith var. *hystrix*. Bottlebrush Squirreltail. Rare caespitose perennial; rocky cyns; 1220–1675 m; only KR (Loco Heifer Cyn, *Stone 176a* and *de Nevers 172*); Apr–May.
- Sitanion jubatum* J. G. Sm. Big squirreltail. Frequent perennial; rocky bajadas and cyn slopes; jtw, bbs, pjw; 1100–1800 m; G, P, MH, NY, C, KR; Apr–June.
- Sitanion longifolium* J. G. Sm. Squirreltail. Common caespitose perennial; sandy washes and cyns and rocky or bouldery slopes, ridges, and peaks; dws, cbs–wfpw; 1100–2350 m; all ranges; Apr–June.

- \**Sorghum bicolor* (L.) Moench. Sorghum. Rare spontaneous annual, presumably not persistent; 1265 m; only P (Bonanza King Mine); Oct.
- Sporobolus airoides* (Torr.) Torr. Alkali Sacaton. Rare tufted perennial; alkaline soils; jtw; 1300–1700 m; MH, NY, reported KR; Apr–Oct. Also Mesquite Valley.
- Sporobolus contractus* Hitchc. Dropseed. Rare tufted perennial; sandy washes and limestone slopes; dws, bbs; 1125–1585 m; only I and C; Sept–Oct.
- Sporobolus cryptandrus* (Torr.) A. Gray. Sand Dropseed. Frequent tufted perennial; rocky cyn slopes and sandy flats, on granite or limestone; dcs, jtw, jsbs, pjw; 1150–1850 m; G, P, MH, NY, C, KR; May–Oct.
- Sporobolus flexuosus* (Thurb.) Rydb. Rare robust perennial; sandy wash; dws, jtw; 1130 m; MH (1.5 km nw of Burro Spg), C (Valley Wells, *J. C. Roos* 4949, Sept. 1, 1950); Aug–Sept. Also 8 km n of Goffs.
- Stipa arida* Jones. Needlegrass. Infrequent tufted perennial; rocky, often steep, limestone slopes; dcs, bbs; 1125–1750 m; only C and KR; May–June.
- Stipa comata* Trin. & Rupr. Needle-and-thread. Rare tufted perennial; rocky limestone or granitic slopes; dcs, pjw; 1700–1850(–1935) m; NY, C, reported KR; June.
- Stipa parishii* Vasey. Porcupine Grass. Common perennial bunch grass; gravelly or rocky slopes, limestone ridges, volcanic flats, cyn bottoms, rocky slides, and summits; dcs, pjw; 975–2350 m; G, P, MH, NY, C, reported KR; May–June.
- Stipa speciosa* Trin. & Rupr. Desert Needlegrass. Common perennial bunch grass, abundant throughout; sandy to rocky flats, mesa tops, arroyos, and cyn slopes and bottoms; drs, cbs, pjw; 975–2150(–2225) m; all ranges; Apr–June.
- Tridens muticus* (Torr.) Nash. Common perennial; rocky slopes and cyns, mostly on limestone or dolomite; dcs, bbs, pjw; 915–1750(–1830) m; G, P, NY, I, C, KR; Apr–June, Aug.
- Vulpia microstachys* (Nutt.) Benth. var. *pauciflora* (Beal) L. & G. [*Festuca reflexa* Buckl.]. Infrequent annual; sandy or gravelly moist cyn bottoms and slopes; pw, pjw; 1375–2025; P, MH, NY, reported KR; May–June.
- \**Vulpia myuros* (L.) K. C. Gmel. [*Festuca myuros* L.]. Rat's-tail Fescue. Rare weedy annual; 1350 m; only G (near Cottonwood Spg); May.
- Vulpia octoflora* (Walt.) Rydb. [*Festuca octoflora* Walt.]. Six-weeks Fescue. Frequent annual; sandy or gravelly soils of washes, dunes, cyn bottoms, open flats, and rocky slopes; dps, dws, cbs–pjw; 750–2025(–2075) m; KD, G, P, MH, NY, C, reported KR; Apr–May.

Table 3. Statistical summary of the vascular plants of the higher ranges and the Kelso Dunes of the eastern Mojave Desert in California.

	Indigenous				Naturalized additional				Totals				
	Families	Genera	Species	Intra-specific taxa	Families	Genera	Species	Intra-specific taxa	Families	Genera	Species	Intra-specific taxa	All taxa
Lycopodiaceae	1	1	1	0					1	1	1	0	1
Equisetaceae	1	1	1	0					1	1	1	0	1
Filices	3	8	17	1					3	8	17	1	18
Coniferae	2	3	4	1					2	3	4	1	5
Gnetaceae	1	1	5	0					1	1	5	0	5
Dicotyledoneae	61	259	604	31	4	21	44	65	280	648	31	679	
Monocotyledoneae	6	35	85	3	0	12	22	6	47	107	3	110	
Grand totals	75	308	717	36	4	33	66	79	341	783	36	819	

Table 4. Twelve largest families.

	Indigenous			Introduced additional		Total			Taxa
	Genera	Species	Intra-specific taxa	Genera	Species	Genera	Species	Intra-specific taxa	
Asteraceae	64	132	5	7	10	71	142	5	147
Poaceae	21	55	1	12	22	33	77	1	78
Polemoniaceae	8	38	2	0	0	8	38	2	40
Fabaceae	12	36	1	2	5	14	41	1	42
Polygonaceae	5	31	2	0	0	5	31	2	33
Boraginaceae	8	30	0	0	0	8	30	0	30
Scrophulariaceae	9	25	1	0	1	9	25	1	27
Brassicaceae	14	23	2	3	7	17	30	2	32
Onagraceae	5	22	4	0	0	5	22	4	26
Loasaceae	3	19	0	0	0	3	19	0	19
Cactaceae	6	18	4	0	0	6	18	4	22
Euphorbiaceae	6	17	0	0	0	6	17	0	17
Totals	161	446	22	24	45	185	490	22	513

#### Typhaceae—Cattail Family

*Typha domingensis* Pers. Cattail. Infrequent rhizomatous perennial; about spgs and along streams in cyn bottoms; ssm, dow; 975–1475 m; G, P, NY; July–Oct.

#### STATISTICAL SUMMARY

Table 3 presents a statistical summary of the vascular plants of the higher ranges and the Kelso Dunes of the eastern Mojave Desert in California. Ferns and "fern allies" total 19 species in 10 genera of 5 families; gymnosperms 9 species in 4 genera of 3 families; dicotyledons 604 indigenous and 21 naturalized species and 31 infraspecific taxa for a total of 679 taxa in 65 families; monocotyledons 85 native and 22 introduced species and 3 infraspecific taxa for a total of 110 taxa in 6 families.

Table 4 lists the 12 largest of the 79 families in the flora. It is noteworthy that these 12 families comprise nearly 63% of the total taxa of the flora with the largest family, Asteraceae, contributing 18% of the total taxa. Table 5 similarly lists the 12 largest genera, comprising more than 22% of the taxa of the 341 total genera.

Table 6 presents the number of taxa in the various physiographic units in the order of richness of known flora for each unit. Had each range received equivalent botanical attention, which they did not, the ranges with the most taxa could be expected to have the largest area, highest elevations, and/or greatest geological diversity, with the resulting greatest diversity of habitat.

Table 5. Twelve largest genera.

	Species	Infra-specific taxa	Total taxa
<i>Eriogonum</i>	23	2	25
<i>Phacelia</i>	20	1	21
<i>Gilia</i>	19	1	20
<i>Cryptantha</i>	17		17
<i>Mentzelia</i>	16		16
<i>Camissonia</i>	13	3	16
<i>Astragalus</i>	13	1	14
<i>Opuntia</i>	11	2	13
<i>Penstemon</i>	11	1	12
<i>Chamaesyce</i>	11		11
<i>Brickellia</i>	9		9
<i>Galium</i>	8	1	9
Totals	171	12	183

Table 7, with ranges listed in order of decreasing size of area, indicates for indigenous taxa the degree of floristic diversity per unit area. The greatest floristic diversity thus is found in the Granite, Providence, and Clark Mountain ranges with the Kingstons, New Yorks, Mid Hills, and Kelso Dunes having equivalent and lesser diversity. The relatively small Granites have received rather concentrated botanical attention; whereas, the larger Clark and Providence ranges reach higher elevations and have greater geological diversity. The relatively low Ivanpah-Mescal and Mesquite ranges have less diversity, geological and floristic, but also have been relatively little botanized.

#### ACKNOWLEDGMENTS

In the years of field work leading to the preparation of this flora, the three authors are indebted to many associates, as well as to each other, for help and company in the field. Among those spending much time with us in the field and helping with the collection of many hundreds of specimens are R. K. Benjamin, L. D. DeBuhr, C. Davidson, J. Dourley, D. Lau, D. C. Michener, J. W. Prigge, L. Prigge, L. M. Shultz, C. W. Tilforth, B. Tucker, R. J. Vogl, and W. Wisura. Carl B. Wolf, one of the most competent field botanists to explore botanically the state of California from one end to the other, began this survey of the higher ranges of the eastern Mojave Desert in California and requested the senior author to complete this flora. We dedicate this work to him. P. A. Munz also encouraged our early efforts.

Henry J. Thompson, of the University of California, Los Angeles, gen-



Table 6. Number of taxa in various physiographic units.

	Indigenous taxa			Introduced Species	Totals		Grand total
	Species	Infra-specific taxa	Hybrids		Species	Infra-specific taxa	
Kingston Range	463	17	1	44	507	18	525
Clark Mountain Range	433	17		35	468	17	485
Providence Mountains	414	16		24	438	16	454
New York Mountains	380	9	2	19	399	11	410
Granite Mountains	382	10		16	398	10	408
Mid Hills	260	1		10	270	1	271
Ivanpah Mountains	162	1		3	165	1	166
Kelso Dunes	103	2		2	105	2	107
Mesquite Mountains	97	2		2	99	2	101

erously made available to us all the collections and data gleaned by him and his class from the Granite Mountains in 1970. The first set of those collections is now at RSA. Likewise K. C. Hart, B. A. Stein, and S. F. Warrick, of the Environmental Field Program of the University of California, Santa Cruz deposited the first set of their specimens at RSA and quickly made available to us the results of their resource survey in 1978 of the Granite Mountains. Similarly, S. Castagnoli, G. de Nevers, and R. D. Stone, of the same Environmental Field Program at Santa Cruz, have made available to us the results of their splendid resource survey made during 1980 in the Kingston Range and have deposited, at this time, some of their collections at RSA. We were fortunate to be able to spend some time with both teams of students in their respective ranges. This report would be much less complete without the availability of the results from their intensive field surveys. John Emmel, in the course of his field work with the butterflies of California,

Table 7. Size of physiographic units and floristic diversity.

Physiographic unit	Approximate area in km <sup>2</sup>	Percent of total area	Total indigenous taxa	Diversity (taxa/area)
1. Kingston Range	643	19.5	478	0.74
2. New York Mountains	556	16.9	387	0.70
3. Clark Mountain Range	403	12.2	447	1.11
4. Mid Hills	359	10.9	259	0.72
5. Providence Mountains	349	10.6	428	1.23
6. Ivanpah (and Mescal) Mountains	316	9.9	163	0.52
7. Mesquite Mountains	272	8.3	99	0.36
8. Granite Mountains	251	7.6	391	1.56
9. Kelso Dunes	142	4.3	105	0.74

has kept us informed of his botanical discoveries and placed his botanical vouchers at RSA.

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