Aliso: A Journal of Systematic and Floristic Botany

Volume 36 | Issue 2 Article 2

2018

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Aliso, 36(2), pp. 47–81
ISSN: 0065-6275 (print), 2327-2929 (online)

VASCULAR FLORA OF THE UPPER ROCK CREEK WATERSHED, EASTERN SIERRA NEVADA, CALIFORNIA

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ABSTRACT

The upper Rock Creek watershed is located on the east slope of the Sierra Nevada in Inyo and Mono counties. It is ca. 36.5 square miles (94.5 square km) in area and varies in elevation from 7360 to 13,750 ft (2243 to 4191 m). Quaternary glacial erosion and deposition produced striking landscape features, including alpine fellfields and numerous small lakes. Previous floristic inventories in Rock Creek recorded a combined 396 minimum-rank taxa (species, subspecies, varieties, named hybrids) but were restricted to Little Lakes Valley and the surrounding high areas. An updated, annotated checklist of vascular plants is presented, based on preexisting specimens and new collections. I conducted intensive fieldwork from 2012 through 2016, resulting in 1506 collections (including two collections from a brief 2018 visit). More than 1000 historical collections were examined. The resulting checklist contains 591 taxa, of which 25 (4.2%) are non-native to California and 32 (5.4%) are special-status plants. My fieldwork resulted in 128 taxa previously undocumented for the watershed. Eighty-one species historically collected were not rediscovered and are noted as such in the checklist. Nine taxa are new county records. The flora is represented by 77 families, 248 genera and 572 species. For each taxon, the checklist cites at least one collection and indicates the vegetation type(s) where it has been documented and its abundance in the watershed. A brief review of botanical exploration in the watershed during the past century is presented, along with geology, climate, vegetation and history of human activity.

Key words: alpine plants, California, eastern Sierra Nevada, flora, floristics, John Muir Wilderness, plant collections, rare plants, Rock Creek.

INTRODUCTION

Floristic inventories that utilize herbarium collections as their basis serve as important baselines of information about plants and the environments in which they occur. Studies of local floras are crucial to our understanding of biodiversity amid the realities of climate change and human impacts to the environment. With growing digitization of collections data, floristic datasets are proving to be increasingly useful and especially rich due to their breadth of information at spatial and temporal scales (Wolf et al. 2016).

The upper Rock Creek watershed is situated on the east slope of the Sierra Nevada mountain range (Inyo and Mono counties, California, USA) in the Inyo National Forest. Historical collections from Rock Creek contributed several additions to the California flora: four new taxa were described in the previous century, including *Tonestus peirsonii* (as *Haplopappus eximius* H.M. Hall subsp. *peirsonii* D.D. Keck) (Asteraceae), *Draba sierrae* (Brassicaceae), *Castilleja peirsonii* (Orobanchaceae) and *Festuca brachyphylla* subsp. *breviculmis* (Poaceae).

In spite of the great number of collections from the upper Rock Creek watershed prior to this study (>1000), and two previously published floristic checklists—F. W. Peirson (1938, 1942) and J. T. Howell (1946)—no collections-based floristic work had ever focused on the entire geographic area forming the upper watershed, i.e., Rock Creek Canyon (Fig. 1). The earlier checklists were restricted to the Little Lakes Valley area.

The main goal of the present study was to produce an updated vascular flora of the watershed combining pre-existing herbarium specimens and new collections.

PHYSICAL SETTING

Location and Features

The upper Rock Creek watershed (Fig. 1, 2–5) is located ca. 25 road miles (40 km) northwest of Bishop and ca. 19 miles (30 km) southeast of the town of Mammoth Lakes, California. A single paved road, Rock Creek Road, enters the canyon mouth ca. 1 mile (1.6 km) southwest of the road's junction with U.S. Route 395 (US-395) at Tom's Place. A secondary entry route, Sand Canyon Road (Forest Rd 5S08/30E302), is a four-wheel-drive (4WD) road accessible from the community of Swall Meadows that enters the area from the northeast. Two additional access points into the watershed are via hiking/pack trails traversing Mono Pass and Morgan Pass. The watershed is ca. 36.5 square miles (94.5 square km; 23,360 acres) in area, ca. 56% of which lies within the John Muir Wilderness (Fig. 1). The elevation ranges from 7360 to 13,750 ft (2243 to 4191 m).

The study boundary is the nearly continuous ridgeline that encompasses Rock Creek Canyon on the east, west and south (Fig. 1). Its northern boundary is the canyon mouth at the 7360 ft (2243 m) contour (37.5508 N, 118.6833 W), which is ca. 500 m north-northeast of the water tank along Rock Creek Road, near French Campground. Rock Creek continues its course downstream from this point, outside the study area, for ca. 1 mile (1.6 km) to Tom's Place before it turns sharply east into lower

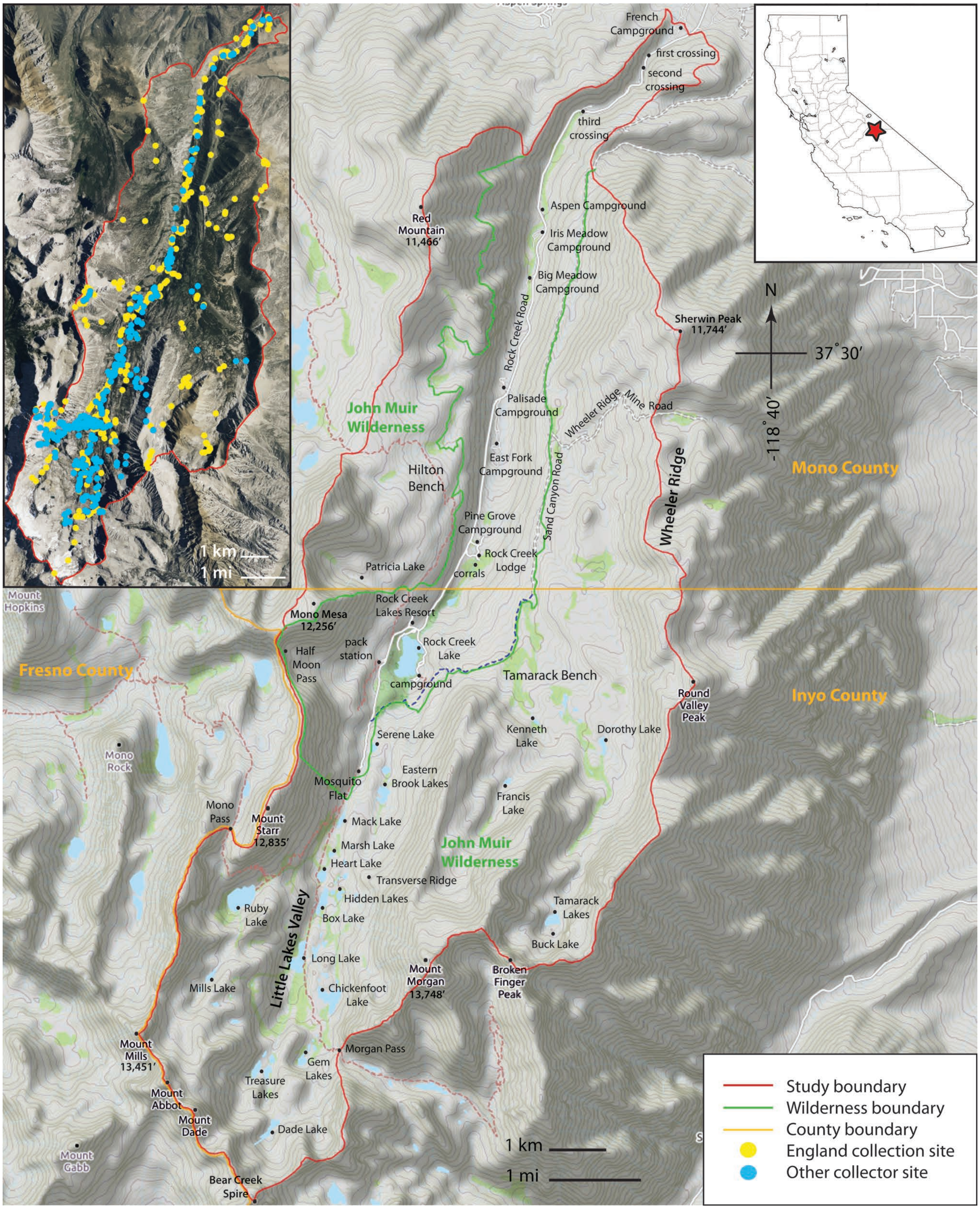

Fig. 1. Map of the upper Rock Creek watershed. The red line is the study area boundary. Plant collection sites are shown on the satellite image at upper left: England sites (yellow) 2012–2018 and other collector sites (blue). Locality data for historical collections were obtained from georeferenced specimen records in the Consortium of California Herbaria (CCH) online database, accessed 18 Feb 2013. Feature names were obtained from the USGS Geographic Names Information System (GNIS) database; some place names for collection localities are informal. Peak elevations were obtained from the USGS 7.5' map quad. Base map layers were used with permission (Source: CalTopo, OpenStreetMap contributors, Thunderforest, USDA).

Fig. 2–5. Upper Rock Creek watershed.—2. Wheeler Ridge (pictured at center), as seen from Red Mountain. Note the lateral moraine, Tamarack Bench, at its base.—3. Mount Morgan (13,748 ft/4190 m), the highest point in the study area, as seen from Mount Starr. Little Lakes Valley pictured in foreground.—4. South rim of watershed as seen from Little Lakes Valley. Peaks from left to right: Bear Creek Spire (13,730 ft/4185 m), Pip-squeak Spire (13,268 ft/4044 m), Mount Dade (13,615 ft/4150 m), Mount Abbot (13,704 ft/4177 m), Lookout Peak (11,902 ft/3628 m), Mount Mills (13,451 ft/4100 m).—5. Hilton Bench (ca. 10,000 ft/3048 m), a lateral moraine, pictured at center, as seen from Sand Canyon Road. Mono Mesa (12,256 ft/3736 m) pictured at left. Photo credit: Travis Columbus, Fig. 2.

Rock Creek and eventually, farther southeast, into the Owens River. Hereafter my use of the name Rock Creek implies the upper watershed, i.e., Rock Creek Canyon, unless otherwise noted.

Numerous high peaks are situated along the rim of the watershed, including 13,704 ft (4177 m) Mount Abbot on the south rim (Fig. 1, 4) and 12,835 ft (3912 m) Mount Starr on the west (Fig. 1). The highest point in the study area is the summit of Mount Morgan at 13,748 ft (4190 m) (Fig. 1, 3). Northwest of Mount Morgan is Transverse Ridge, which runs crosswise to the long axis of the watershed and is a collection locality on some F. W. Peirson herbarium specimens (Fig. 1). Wheeler Ridge (Fig. 1, 2) is a long, north-south ridge that divides the watershed from the Owens Valley. Mono Mesa (Pointless Peak) (Fig. 1, 5), ca. 12,256 ft (3736 m), is an unglaciated plateau above and west of Rock Creek Lake (Fig. 1).

Lakes and pools are abundant; the largest, Rock Creek Lake (Fig. 1), is nearly 59 acres (34 ha) in size. Little Lakes Valley (Fig. 1, 3–4) contains eight named lakes or groups of lakes; there are 12 additional named lakes in the watershed and several unnamed lakes. Rock Creek has two main divisions: a primary channel that flows northward from headwaters at ca. 13,000 ft (3962 m) above Little Lakes Valley, and the East Fork that originates near 12,200 ft (3718 m) above the Tamarack Lakes (Fig. 1). Mosquito Flat is an open area along a calm stretch of the main creek near the entry point to the John Muir Wilderness at ca. 10,328 ft (3148 m) (Fig. 1).

Geology and Geomorphology

Rock types.—The bedrock of the study area is primarily Mesozoic granite with a scattering of small Paleozoic metamorphic outcrops, as mapped by several studies (Bateman et al. 1965; Lockwood and Lydon 1975; Langenheim et al. 1982; Bateman 1992). Light-colored biotite granite and granodiorite are the most abundant rock types, followed by older formations of quartz monzonite. Secondary, infrequent plutonic outcrops include diorite, quartz diorite and gabbro: these dark, gray-colored rocks are common in the Tamarack Lakes area (Fig. 1, 11). Metasedimentary rock is uncommon and occurs only as small outcrops on the east side of the canyon along ridges between Mount Morgan and the north terminus of Wheeler Crest (Fig. 1). Reddish brown micaceous quartzite is visible on the high escarpment northwest of Tamarack Lakes and on Wheeler Ridge east of Dorothy Lake. Marble occurs only as a single small

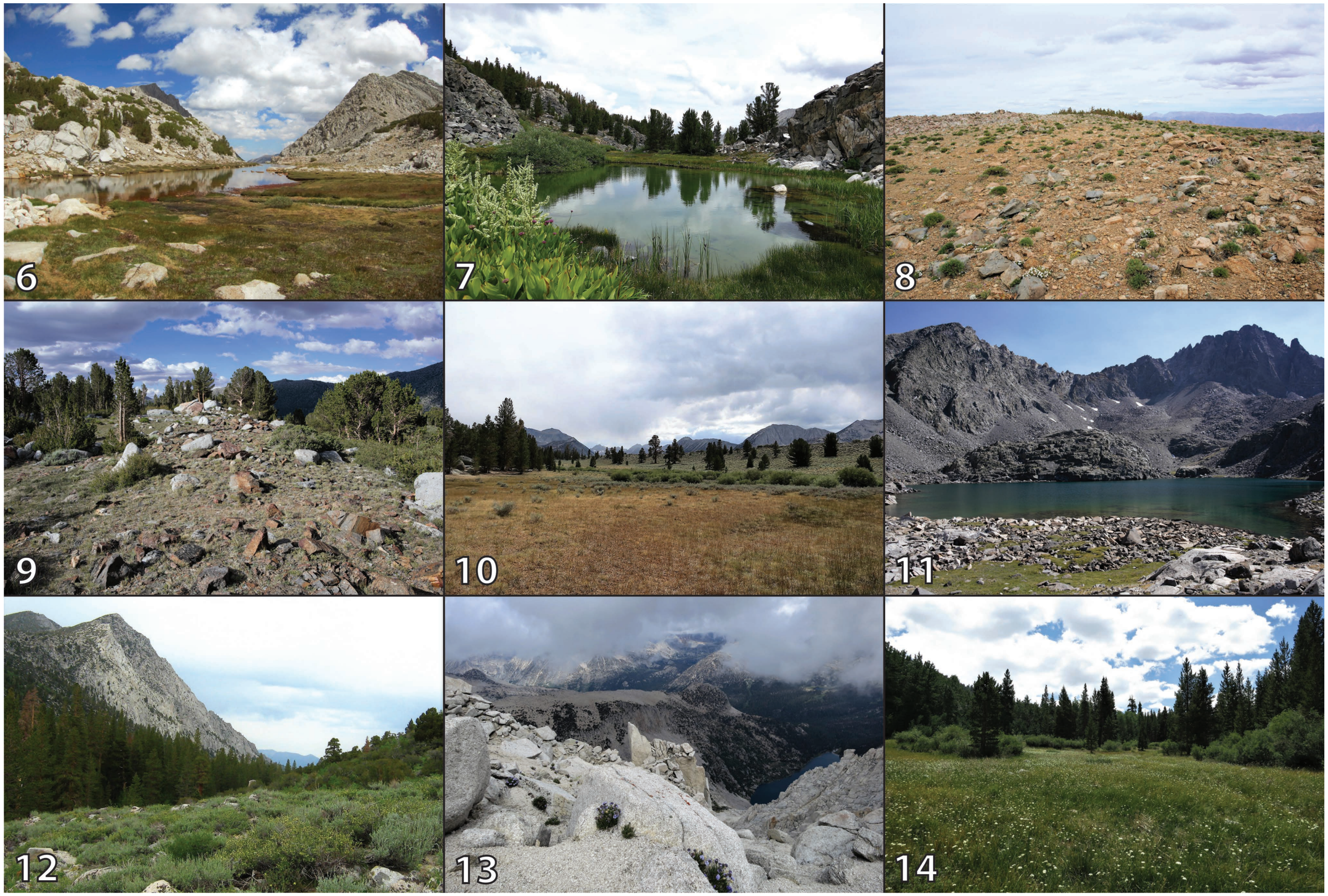

Fig. 6–14. Vegetation and habitats in the upper Rock Creek watershed.—6. Alpine meadow at margin of unnamed lake near 11,490 ft/3502 m. Krummholz *Pinus albicaulis* pictured on rocky slopes above lake.—7. Spring-fed pool near 10,715 ft/3266 m. Whitebark pine forest pictured in background.—8. Alpine fellfield on summit of Red Mountain, ca. 11,470 ft/3496 m.—9. Whitebark pine forest near Francis Lake, ca. 10,870 ft/3313 m.—10. Dry meadow on Tamarack Bench near 9900 ft/3018 m. Sagebrush scrub in background with scattered conifers.—11. Alpine lake margin at Tamarack Lakes, ca. 11,600 ft/3536 m.—12. Sagebrush scrub (foreground), East Fork Campground area, ca. 8930 ft/2722 m. Lodgepole pine forest at left.—13. Alpine ridgetop, west rim of study area above Mono Pass, ca. 12,680 ft/3865 m. *Polemonium eximium* in foreground.—14. Wet meadow at edge of lodgepole pine forest and riparian woodland near East Fork Campground, ca. 9000 ft/2743 m. *Salix* spp. and *Pinus contorta* subsp. *murrayana* in background. Photo credit: Travis Columbus, Fig. 8–9, 11.

outcrop at the northeast base of Mount Morgan. The oldest metamorphic rocks in the study area occur around the heavily weathered summit of Sherwin Peak (Fig. 1). These outcrops are biotite quartz hornfels, calc-hornfels and mixed calcareous rocks (Langenheim et al. 1982). Although the region immediately north, east and west of Rock Creek Canyon was heavily modified by Cenozoic volcanism which produced vast tablelands of lava flows and tuff (Birman 1964; Hildreth and Fierstein 2016), no volcanic formations occur within the study area.

Sierra Nevada uplift.—Relief in the watershed is largely a product of Late Cenozoic uplift of the Sierra Nevada caused by tectonic movements. Westward tilting and uplift of the Sierra batholith began in the Tertiary period about five million years ago and continues today, in concert with downward frontal faulting along the western edge of the Basin and Range floor where it meets the Sierra block (Wakabayashi and Sawyer 2001). The magnitude of uplift is dramatically exemplified by the precipitous eastern escarpment of Wheeler Ridge (Fig. 1, 2) above the Owens Valley floor.

Glaciation.—Thousands of years of Quaternary glacial erosion and deposition have markedly influenced landforms in the study area. There is general consensus that at least seven glaciations occurred in the Sierra Nevada with multiple advances and retreats (Birman 1964; Phillips et al. 2009; Hildreth and Fierstein 2016). These glaciations deposited successive moraines in Rock Creek Canyon. Two examples of lateral moraines from the Tahoe glaciation are the Tamarack and Hilton benches along the east and west shoulders of Rock Creek Canyon (Fig. 1, 2, 5) (Putnam 1960; Birman 1964; Bateman et al. 1965). Small remnant glaciers have been found on the northeast slopes of Mount Abbot and Mount Mills (Fig. 4) (Birman 1964; Lockwood and Lydon 1975). Some talus fields, including one at the northwest base of the ridge dividing Little Lakes Valley from the Tamarack Bench, are rock glaciers with reservoirs of slowly melting ice (Birman 1964; Bateman et al. 1965). Sedimentary deposits of alluvium by glacial meltwaters are abundant across the canyon floor and just outside its mouth.

Topography and soils.—The landforms of the study area are typical of eastern Sierra Nevada canyons heavily modified by glacial activity and faulting. The watershed descends in elevation from south to north. Steep rugged escarpments form the walls of Rock Creek Canyon which, in contrast to most major canyons in the Sierra Nevada, is oriented north-south. Smaller ridges and benches are scattered in the interior, creating a variety of orographic contours and elevational heterogeneity. The majority of the principal ridgeline is 11,000–13,000 ft (3353–3962 m) in elevation and is dominated by jagged, crumbling parent material routinely subjected to seasonal frost shattering (Putnam 1960). Rock debris is ubiquitous, often covering slopes below ridges and forming unstable piles of scree in some places. Piles of heavy, sharply broken boulders are scattered around the southern periphery of the basin in the shadows of towering peaks. Below the 11,000 ft (3353 m) contour near the tree line, slopes are generally more stable and have finer-textured soils from weathered rock and organic matter. Soils are absent or thin where bedrock is exposed, becoming deeper in the bottomlands through sediment buildup from stream activity. Composition of soils in the area is predominantly decomposed granitic rock with a coarse sandy-gravelly texture. The southern bottomlands consist of an elongate glacier-carved basin, Little Lakes Valley (Fig. 1, 3–4), through which Rock Creek meanders slowly northward, its course punctuated by numerous lakes. The valley sits ca. 2000 ft (610 m) below the surrounding ridges, and gently descends as the canyon gradually narrows to approximately the 9700 ft (2960 m) contour—here Rock Creek begins a steeper descent down a narrow canyon for about seven air miles (11.3 air km) to the canyon mouth. The East Fork follows a fairly leisurely northwest course across Tamarack Bench and is captured by the main channel near the 9200 ft (2800 m) contour. Farther north and downstream past the canyon mouth (outside the study boundary) near US-395, the creek makes a sharp turn to the east and south down lower Rock Creek gorge. During the Pleistocene, this lower section of Rock Creek drained in the opposite, northwest, direction into Crooked Creek in Little Round Valley (Putnam 1960; Hildreth and Fierstein 2016). Faulting along the range front resulted in redirection of Rock Creek down the eastward gorge. There is a minor distributary channel that flows northwest from the canyon mouth to Little Round Valley, albeit human engineered (Mono County Community Development Department Planning Division [MCCDDPD] 2007).

Climate

Historical trends.—The Sierra Nevada has a Mediterranean-like climate with typically cool, wet winters transitioning to warm, dry summers. Outside the California Floristic Province, the nearest region with a Mediterranean-like climate is over 4900 miles (ca. 8000 km) away, in central Chile (Baldwin 2014). The climate of the Sierra Nevada region millions of years ago was a wet tropical regime that gradually became cooler and drier, with a pattern of cyclic glaciations interspersed with warming periods (Hildreth and Fierstein 2016; Blakey and Ranney 2018). The past 150 years of the current interglacial period have been characterized by generally steady warming, with recent record high temperatures registered since climate data has been kept (U.S. Geological Survey 2017*a*). The year 2014 was the warmest on record for California, and 2016 the third warmest.

Precipitation.—The eastern slope of the Sierra Nevada is subject to the rain shadow effect, receiving significantly less precipitation than the western Sierra as prevailing air masses from the west release the bulk of their moisture on the cismontane slopes (Holland and Keil 1995). The majority of precipitation in the study area falls as snow in December, January and February. One recent study estimated an annual precipitation average of 22.1 in. (562 mm) in the Rock Creek watershed between 1971 and 2000 (Millar et al. 2012). Snowpack accumulated throughout the winter typically attains peak depths in April, but snowfall amounts can be highly variable between years (MCCDDPD 2007). Patches of snow often persist on high north-facing slopes through summer, but most of the study area is usually snow-free by the middle of June. Thundershowers are common in July and August; however, these events generally contribute a very low percentage of the annual precipitation total, according to hydrological studies from the nearby Convict Creek drainage (Orr and Howald 2000).

During the five-year span of the present study (2012–2016), California experienced significant drought coupled with record

Table 1. Snow depth (standard deviation in parentheses), measured on April 1, from three weather stations in the study area over a 90-year period. Measurements are from the California Department of Water Resources data portal (CDEC 2017). "RC1," RC2," and "RC3" are the station names (IDs) provided by the CDEC. For 1986, the March measurement was used in the 90-year average calculation because data for April were not available. No records were available for 1927.

Station ID (elevation-ft/m)	2012	2013	2014	2015	2016	1926–2016 average
RC1 (8700/2652)	6 in./15 cm	3 in./7.5 cm	1 in./2.5 cm	0	6 in./15 cm	20.8 (±17.4) in. 52.8 (±44.2) cm
RC2 (9050/2758)	10 in./26 cm	11 in./28 cm	8 in./20 cm	0	15 in./38 cm	27.8 (±20.6) in. 70.6 (±52.3) cm
RC3 (10,000/3048)	13 in./33 cm	14 in./36 cm	9 in./23 cm	0	21 in./53 cm	40.1 (±21.7) in. 101.9 (±55.1) cm

high temperatures (U.S. Geological Survey 2017*a*). Snowpack measurements for April (typically taken on April 1) are used by hydrologists to calculate total amount of winter precipitation in high mountain areas of California where most precipitation falls as snow (MCCDDPD 2007). Long-term April snow depth records from three weather stations in the Rock Creek watershed indicate that average annual snowfall from 2012 to 2016 was significantly below historical averages (Table 1).

Wind and air temperature.—Based on the experience of the author, the majority of the watershed is not subject to strong winds during summer. Wind on exposed ridgelines can be gusty, especially during the night, and in May and June it can be mildly to moderately windy down canyon, usually below 9000 ft (2740 m). In winter, passing storms presumably create windy conditions.

Air temperature in the watershed fluctuates widely on a seasonal and daily basis. Daytime highs during winter often remain below freezing. Nighttime lows can drop below 32°F (0°C) any time of year, though uncommon in summer (MCCDDPD 2007). January tends to be the coldest month and July the warmest. Historical temperature records for the study area are limited, but daily air temperature data from two weather stations—one within the study area and one just outside—were obtained for a recent ten-year period (Table 2). Temperature ranges at elevations above 9700 ft (2960 m) in the study area during the same period in January and July were not available, but are expected to have been cooler than those recorded at lower elevations.

Growing season.—In North America, the annual growing season is defined as the period between the last spring date and first autumn date on which temperatures below 32°F (0°C) are experienced (Walsh et al. 2014). This frost-free period is negatively correlated with elevation; consequently, the growing season in the study area, as in other areas near the Sierra Nevada crest, is relatively short and varies with elevation. Plants occurring above 12,000 ft (3658 m) have only a few weeks to complete their annual growth cycle. It is important to note that freezing temperatures can occur any time of the year in the high Sierra Nevada but are less common in summer. In Rock Creek and nearby drainages of the region, consistently freezing temperatures typically begin in October with the arrival of snowfall and persist until April (MCCDDPD 2007).

On 21 May 2012 in the study area, Ruby Lake at 11,100 ft (3380 m) was completely covered with surface ice, and shoreline vegetation had not yet leafed out, while some shrubs and herbaceous species on south-facing slopes below 9000 ft (2740 m) were flowering (J. England, pers. obs.). The growth period of plants in the study area varies widely depending on aspect: species on south-facing aspects begin flowering weeks earlier than those on north aspects at similar elevation. It is not uncommon for snow to linger into July on north aspects above 11,000 ft. During 2012–2016, peak flowering in the study area began in June at the lowest elevations and progressed along an upward elevation gradient, peaking in August at elevations above treeline (J. England, pers. obs.).

Wildfire and Other Landscape Disturbances

Numerous small wildfires have been recorded in the watershed since 1950, the majority from natural causes (U.S. Geological Survey 2017*b*). In July 2002, the Birch Fire burned a large area near the northern part of the study area (MCCDDPD 2007). Over 2500 acres (1012 ha) of National Forest were burned in this human-caused fire, from the west side of lower Rock Creek across Birch Creek, Whiskey and Sand canyons, to Rock Creek Road. The western edge of the fire burned ca. 300 acres (121 ha) of the study area on a steep, west-facing slope above the canyon mouth. I observed severe impacts to pinyon pine woodland vegetation on the hillsides within the burn; hundreds of *Cercocarpus ledifolius* plants did not survive, nor the majority of *Pinus monophylla* trees.

Table 2. Daily air temperature ranges in the upper Rock Creek watershed region. Recordings from two weather stations were obtained from the California Department of Water Resources data portal (CDEC 2017). "RKC" and "RCK" are the station names provided by the CDEC. The RKC station is located outside the study area, ca. one air mile (1.6 air km) northeast of the study boundary; the RCK station is located within the study area. Summary of typical minimum and maximum temperature ranges for January and July is based on station recordings during 2006–2016. No January or July recordings at RKC were available for 2012–2014. No July data were available for RCK in 2016.

	RKC (7040 ft/2146 m)		RCK (9700 ft/2957 m)	
	Minimum	Maximum	Minimum	Maximum
January	0–27°F (-18 to -3°C)	32–49°F (0–9°C)	-3 to 15°F (-19 to -13°C)	25–39°F (-4–4°C)
July	45–60°F (7–15°C)	82–91°F (28–33°C)	40–47°F (4–8°C)	66–73°F (19–23°C)

Fire suppression in the canyon dates to the early twentieth century, at least in the more accessible and developed areas. Presuppression wildfires presumably occurred on a somewhat regular basis historically as a result of lightning strikes.

In addition to fire, historic natural causes of disturbance in forested areas of the region include insects and disease (Millar 1996), rock slides (J. England, pers. obs. 2012–2016) and avalanches such as the February 1986 snow slides (Birkeland and Mock 2001) which felled dozens of trees and destroyed a campground near Mosquito Flat (Jim King, pers. comm.).

BOTANICAL SETTING

Floristic Provinces

The watershed is geographically situated at the confluence of two floristic provinces circumscribed by the Jepson Flora Project (2018) that represent major biogeographical transitions: the California Floristic Province and the Great Basin Province. Floristic elements of both are evident in the study area. The Great Basin component, part of the East of the Sierra Nevada floristic region, is the smaller of the two in terms of species composition in the study area. The remainder of the study area is within the California Floristic Province, specifically the High Sierra Nevada floristic region.

Vegetation and Habitats

Describing vegetation is challenging. Efforts have been made to classify California's vegetation at a statewide level (e.g., Holland and Keil 1995; Sawyer et al. 2009). These treatments use terms such as communities and/or alliances to describe associations of species often found growing together which form repeated patterns of vegetation. The challenge of using such a classification system to describe a local flora is that vegetation can resemble a blended mixture of types across the landscape. This is certainly true of the upper Rock Creek watershed, which varies greatly in elevation and topography. Therefore, no attempt is made here to describe all of the plant associations and habitats encountered during fieldwork for this study. However, some vegetation types widely recognized by authors (e.g., Holland and Keil 1995) were encountered: Jeffrey pine forest; pinyon pine woodland; sagebrush scrub; riparian woodland; lodgepole pine forest; meadows, lake and stream margins, seeps; whitebark pine forest; and alpine. In addition, I call attention to aspen groves, which are frequent in the study area. Transitions between types are rarely abrupt, and usually occupy a fairly extensive area exhibiting a blended species composition with elements of both types. Microhabitat variation within and between types is presumably a result of environmental factors such as moisture regime, exposure, nutrient availability and elevation. I ascribe an elevation range to each vegetation type based on personal observations; these ranges are estimates only:

Jeffrey pine forest: 7450–8000 ft (2270–2440 m)
Pinyon pine woodland: 7450–9000 ft (2270–2740 m)
Sagebrush scrub: 7450–10,200 ft (2270–3110 m)
Riparian woodland: 7450–10,200 ft (2270–3110 m)
Aspen groves: 8000–10,200 ft (2440–3110 m)
Lodgepole pine forest: 8000–10,200 ft (2440–3110 m)
Meadows, lake and stream margins, seeps: 8000–13,200 ft (2440–4023 m)
Whitebark pine forest: 10,200–11,100 ft (3110–3380 m)
Alpine: 11,100–13,750 ft (3380–4190 m)

Following is a brief description of vegetation and habitats in the study area, including the dominant species and common shrubs, trees and herbaceous plants.

Jeffrey pine forest.—Pinus jeffreyi forms the backbone of the scarcest vegetation type in the study area. It is open in structure and has a woody understory dominated by sagebrush (*Artemisia tridentata* subsp. *vaseyana*). It covers the canyon bottom for a distance of roughly 1.5 miles (2.4 km) near the canyon mouth, in a narrow belt along both sides of the riparian woodland, and can best be seen between French Campground and "third crossing" (Fig. 1). DOMINANT: *Pinus jeffreyi*. SHRUBS AND TREES: *Artemisia tridentata* subsp. *vaseyana*, *Cercocarpus ledifolius* var. *intermontanus*, *Chamaebatiaria millefolium*, *Chrysothamnus viscidiflorus* subsp. *puberulus*, *Ericameria nauseosa* var. *speciosa*, *Opuntia polyacantha* var. *hystricina*, *Prunus emarginata*, *Purshia tridentata* var. *tridentata, Symphoricarpos rotundifolius* var. *rotundifolius*. HERBACEOUS: *Angelica lineariloba*, *Astragalus purshii* var. *lectulus*, *Bromus carinatus* var. *marginatus*, *Dieteria canescens* var. *canescens*, *Eriastrum wilcoxii*, *Erigeron breweri* var. *breweri*, *Gayophytum diffusum* subsp. *parviflorum*, *Lomatium dissectum* var. *multifidum*, *Phacelia bicolor*, *Stephanomeria exigua* subsp. *coronaria*, *Wyethia mollis*.

Pinyon pine woodland.—Dry rocky faces on the lower east and west slopes of the canyon are characterized by open woodland of single leaf pinyon pine (*Pinus monophylla*). The understory and open areas between individual trees are typically inhabited by scattered woody and herbaceous species growing in decomposing granitic soils. Pinyon pine woodland is best represented on rocky slopes along Rock Creek Road between "first crossing" and "third crossing" (Fig. 1). DOMINANT: *Pinus monophylla*. SHRUBS AND TREES: *Artemisia tridentata* subsp. *vaseyana*, *Cercocarpus ledifolius* var. *intermontanus*, *Chrysothamnus viscidiflorus* subsp. *puberulus*, *Ericameria nauseosa* var. *speciosa*, *Juniperus grandis*, *Prunus andersonii*, *Purshia tridentata* var. *tridentata.* HERBACEOUS: *Abronia turbinata*, *Argemone munita*, *Chamaesaracha nana* (Fig. 26), *Elymus elymoides* var. *elymoides*, *Eremogone ferrisiae*, *Eriogonum nudum* var. *westonii*, *E. umbellatum* var. *nevadense*, *Linanthus pungens*, *Lupinus argenteus* var. *heteranthus*, *Mentzelia congesta*, *Packera cana*, *Penstemon patens*, *Phacelia ramosissima*, *Stipa hymenoides*, *S. speciosa*.

Sagebrush scrub.—Artemisia tridentata subsp. *vaseyana* (mountain sagebrush) is the dominant species of sagebrush scrub (Fig. 12), which is patchy in distribution and has a wide elevation range in the study area. It commonly occurs in dry forest openings where trees are sparse, usually on rocky flats and gentle to moderately steep slopes up to ca. 10,000 ft (3048 m). Sagebrush scrub is well represented along Sand Canyon Road and on open slopes in the Rock Creek Lake vicinity. DOMINANT: *Artemisia tridentata* subsp. *vaseyana*. SHRUBS AND TREES: *Cercocarpus ledifolius* var. *intermontanus*, *Chrysothamnus viscidiflorus* subsp. *puberulus*, *Ericameria nauseosa* var. *speciosa*, *Purshia tridentata* vars. HERBACEOUS: *Apocynum androsaemifolium*, *Castilleja linariifolia*, *Elymus elymoides* var. *californicus*, *Ericameria discoidea*, *Eriogonum umbellatum* var. *nevadense*, *Leptosiphon nuttallii* subsp. *pubescens*, *Monardella odoratissima* subsp. *glauca*, *Muhlenbergia richardsonis*, *Penstemon rostriflorus*, *Silene bernardina*, *Stipa* spp.

Riparian woodland.—This vegetation dominates the stream banks of the main channel of Rock Creek (which runs more or less parallel to Rock Creek Road) along a corridor extending from the canyon mouth up to Mosquito Flat, where the riparian tree canopy phases out. The presence of a fairly dense tree canopy distinguishes the riparian woodland from streamside vegetation above Mosquito Flat, which is associated with the more openly structured whitebark pine forest. The riparian woodland canopy is occasionally broken, and in these places the vegetation intergrades with that of streamside meadows (Fig. 14). Species composition is highly transitional within the riparian woodland due to the sharp elevation gradient, and is best divided into two sections of dominant woody species: below 8500 ft (2591 m) and above 8500 ft. The lower riparian woodland is dominated by *Salix* species (willows) and other deciduous trees, and also includes Water Birch Riparian Scrub, a State-listed Rare vegetation type dominated by *Betula occidentalis* (CNDDB 2018). It is best observed along the creek between "first crossing" and Aspen Campground (Fig. 1). The upper riparian woodland is distinguished by different *Salix* species mixed with lodgepole pine and aspen. It is best represented along the creek between Big Meadow Campground and Rock Creek Lake. DOMINANTS BELOW 8500 FT: *Betula occidentalis*, *Populus trichocarpa*, *Salix lasiandra* var. *caudata*, *S. lutea*. SHRUBS AND TREES: *Cornus sericea* subsp. *sericea*, *Prunus emarginata*, *Rosa woodsii* subsp. *gratissima.* HERBACEOUS: *Artemisia douglasiana*, *Calamagrostis canadensis* var. *canadensis*, *Carex microptera*, *C. pellita*, *Glyceria elata*, *Lilium kelleyanum*, *Maianthemum stellatum*. DOMINANT ABOVE 8500 FT: *Pinus contorta* subsp. *murrayana*, *Populus tremuloides*. SHRUBS AND TREES: *Lonicera involucrata* var. *involucrata*, *Salix planifolia*. HERBACEOUS: *Agrostis idahoensis*, *Alopecurus aequalis* var. *aequalis*, *Aquilegia formosa*, *Carex abrupta*, *C. utriculata*, *Cystopteris fragilis*, *Deschampsia cespitosa* subsp. *cespitosa*, *Equisetum arvense*, *Heracleum maximum*.

Aspen groves.—*Populus tremuloides* is found in a variety of mesic habitats throughout the study area from lower to middle elevations, becoming less common above 10,200 ft (3110 m). Aspen trees are common associates in the riparian woodland and lodgepole pine forest, and the species can be co-dominant with *Pinus contorta* subsp. *murrayana* in wetter areas. In places where moisture is abundant, it is not unusual for aspens to form dense stands of tall trees and provide habitat for other plant species. *Populus tremuloides* tolerates a range of exposures and substrates in the study area, and exhibits different growth forms depending on habitat. Tall upright forms occur in canyon bottoms, but on steep, exposed slopes the species typically has a dwarfish, shrubby appearance. Aspen groves are best represented along the canyon bottom between Aspen Campground and East Fork Campground. DOMINANT: *Populus tremuloides*. SHRUBS AND TREES: *Ribes cereum* var. *cereum*, *Symphoricarpos rotundifolius* var. *rotundifolius*. HERBACEOUS: *Allium bisceptrum*, *Bromus porteri*, *Carex douglasii*, *C. praegracilis*, *Elymus* spp., *Ipomopsis aggregata*, *Maianthemum stellatum*.

Lodgepole pine forest.—At middle elevations along the canyon bottom and on mesic slopes, *Pinus contorta* subsp. *murrayana* is the dominant species (Fig. 12, 14). Occasionally, *P. contorta* forms dense stands, but frequently the forest is patchy and interspersed with other vegetation/habitats, such as riparian woodland, meadows, seeps, aspen groves, and dry rocky slopes vegetated by sagebrush scrub and scattered conifers such as *Juniperus grandis* and *Pinus flexilis*. Lodgepole pine forest is best observed between East Fork Campground and Mosquito Flat. DOMINANT: *Pinus contorta* subsp. *murrayana*. SHRUBS AND TREES: *Artemisia tridentata* subsp. *vaseyana*, *Cercocarpus ledifolius* var. *intermontanus*, *Holodiscus discolor* var. *microphyllus*, *Populus tremuloides*, *Ribes cereum* var. *cereum*, *R. montigenum*, *Symphoricarpos rotundifolius* var. *rotundifolius*. HERBACEOUS: *Achillea millefolium*, *Agrostis idahoensis*, *Aquilegia formosa*, *Chamerion angustifolium* subsp. *circumvagum*, *Deschampsia cespitosa* subsp. *cespitosa*, *Elymus elymoides* var. *californicus*, *Epilobium* spp., *Equisetum arvense*, *Fragaria virginiana*, *Ipomopsis aggregata* subsp. *aggregata*, *Koeleria macrantha*, *Leptosiphon nuttallii* subsp. *pubescens*, *Lupinus pratensis* var. *pratensis*, *Osmorhiza berteroi*, *Sphenosciadium capitellatum*, *Stipa occidentalis* var. *occidentalis*.

Meadows, lake and stream margins, seeps.—A profusion of mesic habitats in the study area contain a highly variable association of species due to differences in elevation and other microenvironmental factors. Meadows in the lodgepole pine forest, for example, have different species associations than meadows in the whitebark pine forest. Lakeside vegetation at Rock Creek Lake differs from that of lake margins in Little Lakes Valley. Therefore the reader should take note that describing a single vegetation type each for meadows, lake and stream margins, and seeps is not practical in the context of this study.

Meadows in the watershed are patchy in distribution and have different associations of species depending on moisture regime, but are typically dominated by grasses, sedges, and rushes (Fig. 6, 10, 14). Willows and other scattered shrubs occasionally occur in meadows. Meadow margins at lower to middle elevations are often densely vegetated by willows, aspen groves, lodgepole pine forest and riparian woodland (Fig. 14). DOMINANT: *Carex* spp., *Juncus* spp., Poaceae spp. SHRUBS AND TREES: *Artemisia cana* subsp. *bolanderi*, *Kalmia polifolia*, *Phyllodoce breweri*, *Salix* spp., *Vaccinium* spp. HERBACEOUS: *Achillea millefolium*, *Agrostis idahoensis*, *Antennaria* spp., *Calamagrostis muiriana*, *Carex abrupta*, *C. aurea*, *C. microptera*, *Castilleja* spp. including *C. peirsonii* (Fig. 19), *Danthonia intermedia* subsp. *intermedia*, *Deschampsia cespitosa* subsp. *cespitosa*, *Drymocallis lactea* var. *lactea*, *Erythranthe primuloides*, *Gentianopsis holopetala*, *Iris missouriensis*, *Juncus mexicanus*, *J. nevadensis* var. *nevadensis*, *Luzula orestera*, *Oreostemma alpigenum* var. *andersonii*, *Pedicularis attollens*, *Penstemon heterodoxus* var. *heterodoxus*, *Perideridia parishii*, *Potentilla* spp., *Primula tetrandra*, *Solidago multiradiata*.

Lakes are widely scattered in the study area from 9400 ft (2865 m) and higher, commonly encountered in the John Muir Wilderness (Fig. 1, 3–4, 6, 11). Runoff from rock glaciers and

Fig. 15–29. Selected plants of the upper Rock Creek watershed. Rare taxa (bold font), as recognized by the CNPS Inventory of Rare and Endangered Plants (CNPS 2018).—15. *Botrychium simplex* var. *compositum* (Ophioglossaceae).—16. *Cassiope mertensiana* (Ericaceae).—17. *Carex helleri* (Cyperaceae).—18. ***Calyptridium pygmaeum*** (Montiaceae).—19. *Castilleja peirsonii* (Orobanchaceae).—20. *Castilleja nana*.—21. *Lewisia glandulosa* (Montiaceae).—22. ***Draba sierrae*** (Brassicaceae).—23. *Epilobium obcordatum* (Onagraceae).—24. *Erigeron pygmaeus* (Asteraceae).—25. *Eriogonum lobbii* (Polygonaceae).—26. *Chamaesaracha nana* (Solanaceae).—27. *Polemonium eximium* (Polemoniaceae).—28. *Rhodiola integrifolia* subsp. *integrifolia* (Crassulaceae).—29. ***Tonestus peirsonii*** (Asteraceae). Photo credit: Travis Columbus, Fig. 15–17, 19, 21, 23–24, 27.

snowmelt provides year-round moisture to Little Lakes Valley, where numerous lakes are interconnected by permanent streams. Smaller pools of water (Fig. 7) and rivulets of gently flowing or trickling water (streamlets and seeps) are frequently encountered in the whitebark pine forest and alpine region. Seeps, pools, and margins of lakes and streams host a wide variety of species but are typically dominated by sedges and rushes. DOMINANT: *Carex* spp. including *C. aquatilis* var. *aquatilis*, *C. spectabilis* and *C. utriculata*, *Juncus* spp. including *J. nevadensis* var. *nevadensis*. SHRUBS AND TREES: *Dasiphora fruticosa*, *Kalmia polifolia*, *Phyllodoce breweri*, *Rhododendron columbianum*, *Salix eastwoodiae*, *S. orestera*, *S. petrophila*, *S. planifolia*, *Vaccinium uliginosum* subsp. *occidentale*. HERBACEOUS: *Allium validum*, *Botrychium simplex* var. *compositum* (Fig. 15), *Deschampsia cespitosa*, *Erythranthe tilingii*, *Isoetes bolanderi*, *Lupinus lepidus* var. *confertus*, *Luzula orestera*, *Micranthes odontoloma*, *Muhlenbergia filiformis*, *Phleum alpinum*, *Platanthera dilatata* var. *leucostachys*, *Potentilla* spp., *Solidago multiradiata*, *Thalictrum* spp., *Veratrum californicum*, *Veronica wormskjoldii*.

Whitebark pine forest.—Above the lodgepole pine forest, *Pinus albicaulis* is the dominant species of the highest forested vegetation zone in the watershed. At the ecotone between whitebark pine forest and alpine vegetation, *P. albicaulis* exhibits a gradient of growth forms from upright trees to dwarf, stunted (Krummholz) forms (Fig. 6). The forest has a very open structure with scattered trees and shrubs. Dry rocky slopes with large boulders and loose, decomposing granite soils characterize much of the whitebark pine forest (Fig. 9), but there are extensive patchworks of mesic vegetation—especially in Little Lakes Valley—such as meadows and margins of streams, lakes and pools that support taxa not found in the drier areas of the forest.

Whitebark pine forest is well represented in the John Muir Wilderness from Little Lakes Valley (Fig. 3–4) to Morgan Pass and along the Mono Pass trail to Ruby Lake. It is prevalent on the Tamarack Bench and the high eastern and western slopes of Rock Creek Canyon. DOMINANT: *Pinus albicaulis*. SHRUBS AND TREES: *Amelanchier utahensis*, *Artemisia tridentata* subsp. *vaseyana*, *Dasiphora fruticosa*, *Holodiscus discolor* var. *microphyllus*, *Jamesia americana* var. *rosea*, *Purshia tridentata* var. *glandulosa*, *Ribes cereum* var. *cereum*, *Spiraea splendens*. HERBACEOUS: *Angelica lineariloba*, *Aquilegia pubescens*, *Boechera* spp., *Calamagrostis purpurascens*, *Calyptridium umbellatum*, *Cassiope mertensiana* (Fig. 16), *Castilleja* spp., *Cystopteris fragilis*, *Draba* spp., *Elymus elymoides* var. *californicus*, *Ericameria* spp., *Erigeron* spp., *Eriogonum* spp. including *E. lobbii* (Fig. 25), *Koeleria macrantha*, *Linanthus pungens*, *Monardella odoratissima* subsp. *glauca*, *Muhlenbergia richardsonis*, *Penstemon newberryi* var. *newberryi*, *Phacelia hastata* var. *compacta*, *Poa* spp., *Pyrrocoma apargioides*, *Rhodiola integrifolia* subsp. *integrifolia* (Fig. 28), *Selaginella watsonii*, *Trisetum spicatum*.

Alpine.—The transition from subalpine to alpine vegetation in montane areas of California has been helpfully discussed by authors such as Sawyer and Keeler-Wolf (2007). Ruby Lake is an example of a location in the study area where this ecotone occurs. The delimitation of the alpine vegetation zone is all areas above tree line (timberline). Less than one percent of California is above tree line, the majority of it along the Sierra Nevada crest (Holland and Keil 1995). Alpine habitat in the study area is a heterogeneous patchwork of fellfields (Fig. 8), dry slopes of decomposing granite soils, crumbling talus, mesic lake margins (Fig. 6, 11), pools, seeps and moist depressions. Vegetative cover is relatively low compared to other communities. Environmental conditions are harsh and the growing season is extremely short, typically two months long. High exposure to sunlight and wind, along with significant water runoff owing to typically shallow, poorly developed soils, collectively contribute to a relatively xeric environment.

Woody and annual species are uncommon; most alpine plants in the watershed are perennials with low cushion- or mat-like forms. *Pinus albicaulis*, where present, is in small isolated stands of highly stunted plants (Fig. 6). Talus-covered ridgetops and peaks above 12,000 ft (3660 m) do not support many species but do provide habitat for certain plants not typically found below that elevation, including *Hulsea algida* and *Polemonium eximium* (Fig. 13, 27). Alpine vegetation occurs in all areas above 11,100 ft (3380 m) and as high as 13,750 ft (4190 m) on the summit of Mount Morgan. No single dominant species characterizes alpine vegetation in the study area. SHRUBS AND TREES: *Dasiphora fruticosa*, *Kalmia polifolia*, *Phyllodoce breweri*, *Pinus albicaulis* (Krummholz form). HERBACEOUS: *Agrostis variabilis*, *Calamagrostis muiriana*, *Carex* spp. including *C. helleri* (Fig. 17), *Castilleja nana* (Fig. 20), *Draba* spp., *Epilobium obcordatum* (Fig. 23), *Ericameria* spp., *Erigeron* spp. including *E. pygmaeus* (Fig. 24), *Eriogonum incanum*, *E. lobbii*, *E. ovalifolium* var. *nivale*, *Festuca saximontana*, *Ivesia muirii*, *Juncus* spp., *Lewisia glandulosa* (Fig. 21), *Luzula* spp., *Minuartia* spp., *Oreocarya nubigena*, *Oxyria digyna*, *Pellaea breweri*, *Penstemon davidsonii* var. *davidsonii*, *Phlox condensata*, *Poa* spp., *Sibbaldia procumbens*, *Trisetum spicatum.*

Plant Geography

A helpful synthetic discussion of various studies that address the origin of the High Sierra Nevada flora was provided by Sawyer and Keeler-Wolf (2007). Stebbins (1982) hypothesized four origins of the high montane, subalpine and alpine flora of the High Sierra Nevada south of Donner Summit, which he termed Old Cordilleran (39% of the flora), Circumboreal (26%), Lowland Cismontane California (19%) and Great Basin (16%). Stebbins' analysis, informed in part by fossil flora records, generally aligns with previous work by Smiley (1921), Chabot and Billings (1972) and Raven and Axelrod (1978). Of the four floristic sources, one—Lowland California—consists of an endemic element that evolved in California. The other elements are said to have arrived via migration from areas pre-dating the Sierra Nevada, outside the state. The most commonly proposed route for the majority of the Old Cordilleran invaders is from the north along the Cascade-Sierra Nevada axis; most of these species' relatives are found in North America. The presence of Rocky Mountain disjuncts in the Sierra has led some to propose a westward migration route for certain taxa associated with the Old Cordilleran group (e.g., Major and Bamberg 1963). The Circumboreal group is composed of cosmopolitan species believed by Stebbins to have had multiple migration pathways; this group contains a large number of woody taxa including *Salix*. He proposed that the Great Basin element originated from the desert and Basin and Range floras east of the Sierra.

This generalized way of thinking about how California's flora originated has provided a useful groundwork for discussion. However, growing use of molecular phylogenetic data and genomic tools to explore what have been longstanding biogeographical questions are showing that the story is much more complex than can be summarized here (Baldwin 2014).

HUMAN ACTIVITY

Prior to the Twentieth Century

Indigenous groups.—Relatively little information is known about the presence of prehistoric humans in the high Sierra Nevada, but there is evidence that alpine sites in the Sierra were traversed during early hunting and gathering forays, and for commerce between human groups (Arkush 1993; Stevens 2005). Artifacts from "Paleoindian" encampments in nearby Long Valley date to the early Holocene (Basgall 1989). The only evidence of indigenous people in Rock Creek Canyon is documentation by archaeological surveyors of obsidian flake detritus indicative of historical tool making and at least one projectile point (MCCDDPD 2013).

European-American settlers.—By the middle of the nineteenth century, Euro-Americans had begun to lay claim to the valleys adjacent to the study area, settling and making a livelihood from cattle and sheep ranching as well as farming. Basque sheep herders made their mark (quite literally, as discussed below) in the eastern Sierra Nevada during the peak of the state's wool industry in the 1880s and 1890s (Busby et al. 1980). Herders typically brought flocks over the Sierra from the west side, moving the animals to summer forage in eastern montane meadows. Numerous arborglyphs were carved by the Basque on trees—usually aspen, occasionally pines—depicting humans and other figures. There are a number of glyphs on trees in Rock Creek Canyon, some with dates from the late 1800s (McNeill 2016), suggesting that the herders brought sheep on multiple occasions into the study area for grazing.

Twentieth Century Until Present

Road construction.—Sand Canyon Road (Forest Rd 5S08/30E302) is a 4WD road that is accessible from the community of Swall Meadows and enters the study area from the northeast. It runs south, along the base of Wheeler Ridge, for ca. 5 miles (8 km) and terminates near the Wilderness boundary on Tamarack Bench (Fig. 1, 2). The road was originally constructed in 1918 as a route to transport mining equipment to Morgan Pass and the Pine Creek prospects just outside the study area, and served as the primary route up the canyon until Forest Highway 89/Rock Creek Road was built shortly thereafter (Kurtak 1998).

Rock Creek Road winds ca. 10.5 miles (16.9 km) up the canyon and now terminates at the Mosquito Flat trailhead (the old section of the road from Mosquito Flat to Morgan Pass was permanently closed to vehicles following the Wilderness Act in the 1960s). The Little Lakes Valley hiking trail follows the route of the old road to Morgan Pass, and remnants of discarded mining equipment are evident along the trail.

Nine miles (14.5 km) of Rock Creek Road underwent construction for improvements in 2014 and 2015, including the addition of a bicycle lane (MCCDDPD 2013). The only other vehicle-accessible road within the study area is Wheeler Ridge Mine Road (Forest Rd 30E301), a steep east-west 4WD route between Sand Canyon Road and the crest of Wheeler Ridge (Fig. 1).

Recreation.—Tourism and recreation in Inyo and Mono counties began to grow substantially in the 1930s, and by the 1960s had become the mainstay of the region's economy (Busby et al. 1980). Two resorts, a pack station and 12 developed campgrounds were constructed in Rock Creek Canyon (Fig. 1) (MCCDDPD 2013). Horseback riding (sometimes with pack mules), hiking, backpacking, cross-country skiing, fishing and camping are among the recreational activities popular in the watershed.

Land management.—The study area has been under federal administration since 1893 with the establishment of the Sierra Forest Reserve, and was incorporated into the Inyo National Forest 14 years later (Inyo National Forest 2014). The John Muir Wilderness was established under the Wilderness Act in 1964, which aimed to preserve much of the Sierra Nevada wildlands from negative human impacts (SierraWild.gov 2017). The Wilderness encompasses ca. 20 square miles (52 sq. km) (56%) of the watershed including all but two of the lakes, and contains several hiking and pack trails. In extra-Wilderness areas of Rock Creek, monitoring of sensitive habitats, selective trimming of roadside vegetation and removal of hazardous trees in developed campgrounds are ongoing Forest Service activities as per the Multiple Resource Area Management Prescription (Inyo National Forest 2014).

Commercial and residential use.—The author's research yielded no evidence of historical commercial timber harvesting and mining within the study area, although as noted above, a road was built through the study area to access the Pine Creek mines in the adjacent watershed. Two resorts and a pack guide outfit have been operating in Rock Creek Canyon since the early twentieth century, and presumably rely on local water sources for necessary operations. A small number of private cabins are used for seasonal residences; all cabins today are outside the Wilderness.

HISTORY OF BOTANICAL DOCUMENTATION

Previously Published Checklists

The first known collections in the watershed were made in 1930 by Frank W. Peirson in the Little Lakes Valley area. Peirson made a total of eight collecting trips to "Rock Creek Lake Basin" between 1930 and 1940, resulting in 822 collections that I was able to locate through searches of online databases, the majority of which are housed at RSA/POM (SEINet Portal Network [SEINet] 2016; Consortium of California Herbaria [CCH] 2018). The earliest day and month Peirson recorded in his journal for any of those trips was July 17, and the latest was August 22. Peirson published the first checklist for the watershed in 1938: *Plants of Rock Creek Lake Basin*, *Inyo County*, followed by a short addendum list in 1942. Both lists were restricted to Little Lakes Valley and the surrounding high areas, from 10,500 ft (3200 m) and above. His highest documented collection locality was above Mono Pass at 12,500 ft (3810 m)

(*Carex helleri*, *Peirson s.n.*, 15 Aug 1933, CAS). A total of 344 minimum-rank taxa (species, subspecies, varieties, named hybrids) were reported.

A second inventory was carried out during a Sierra Club trip led by John T. Howell in July 1946. Howell's publication, *Base Camp Botany, 1946*, in which he presents his species checklist, does not provide exact dates of that trip. However, his specimen labels for those collections—housed at CAS/DS and other herbaria—are dated from July 14 to July 29 (SEINet 2016; CCH 2018). Howell's checklist for Rock Creek was restricted to the same general region that Peirson documented but extended downstream to Mosquito Flat, at the 10,300 ft (3139 m) contour. His highest collections in the study area were from Mono Mesa at 12,200 ft (3718 m) (e.g., *Cystopteris fragilis*, *Howell 22752*, CAS). Howell (1946) reported 313 taxa for the Rock Creek "basin," including 52 species not recorded by Peirson, which he noted were mostly found in the Mosquito Flat vicinity, not surveyed by Peirson. All together, Peirson and Howell recorded 396 minimum-rank taxa for the study area.

Other Collections

Sporadic botanical documentation by others from the 1930s to the early 2000s resulted in over 400 additional herbarium records that I was able to locate (SEINet 2016; CCH 2018). Significant contributions, in order of earliest to most recent, were made by R. Woglum, A. Crafts & M. Halperin, E. Robinson, C. Sharsmith, R. Ferris, J. Thomas and G. Wallace. Except for the last two, the collections were made before 1950.

Type Localities

Type specimens I encountered from the watershed include *Castilleja peirsonii* Eastw. (Orobanchaceae; Fig. 19), *Peirson 9078* (CAS-BOT-BC32643, holotype); *Draba sierrae* Sharsm. (Brassicaceae; Fig. 22), *Sharsmith 3058* (UC624298, holotype); *Festuca brachyphylla* Schult. & Schult. f. subsp. *breviculmis* Fred. (Poaceae), *Howell 22706* (CAS-BOT-BC123977, holotype); and *Tonestus peirsonii* (D.D. Keck) G.L. Nesom & D.R. Morgan (Asteraceae; Fig. 29), *Peirson s.n.* 5 Aug 1933 (UC511812, holotype) (as *Haplopappus eximius* H.M. Hall subsp. *peirsonii* D.D. Keck). Locality data from these type specimens are presented in the annotated checklist (Appendix 1).

PROJECT OBJECTIVES AND METHODS

The primary objective of the study was to produce a vascular plant checklist based on preexisting and new collections. I spent 89 days in the study area from 2012 to 2016 and made 1506 collections (including two collections made during a short visit in 2018). An effort was made to document as many taxa as possible by surveying as much of the watershed as time, resources and accessibility allowed. Early and late season taxa were documented in 2012 and 2013, the two years that fieldwork was conducted at regular intervals throughout the growing season (May–Sep). Areas targeted for fieldwork include those poorly documented based on records in the SEINet and CCH data portals (SEINet 2016; CCH 2018) (Fig. 1: left inset). Examples of undercollected areas were the high peaks, the eastern half of the watershed and areas below 10,000 ft (3048 m).

Locality data were recorded in the field at each collection site, including coordinates obtained from a Global Positioning System (GPS) unit, elevation, abundance, habitat description and associated taxa. Duplicates were collected for later distribution to herbaria, with a full set deposited at RSA. I examined, verified and annotated more than 1000 pre-existing collections housed in the following herbaria: ASC, CAS/DS, CDA, GH, LA, NMC, NY, PASA, RSA/POM, SBBG, SD, UC/JEPS, UCD and UCR. Taxonomy follows the Jepson Flora Project (2018) with the following exceptions: family classification for Boraginales is according to the Boraginales Working Group (2016); recent treatments in *Cryptantha* (Hasenstab-Lehman and Simpson 2012) and *Luzula* (Zika et al. 2015*a*) were also followed. Additional resources were consulted for help with identification, including Flora of North America (FNA Editorial Committee 1993+) and Intermountain Flora (Cronquist et al. 1972–2012) for various plant groups, Correll and Correll (1975) for aquatic plants and Isely (1998) for Fabaceae. The author relied heavily on the RSA collection for identifying plants in challenging taxonomic groups, especially specimens recently annotated by taxonomic specialists. The determinations of some specimens were confirmed by experts in the groups as needed.

RESULTS AND DISCUSSION

Summary of Floristic Results

The vascular plant inventory includes 591 minimum-rank taxa (including 25 non-native) represented by 77 families (three non-native), 248 genera (13 non-native) and 572 species (25 non-native) (Table 3). Nineteen species have multiple varieties and subspecies present in the study area. Collecting efforts by the author resulted in 128 taxa previously undocumented for the watershed, including two species new to the Sierra Nevada and nine new county records. However, 81 taxa documented by previous collectors were not rediscovered (discussed below). The five largest families are Asteraceae (72 native taxa plus three non-native), Poaceae (65 plus 11 non-native), Cyperaceae (54), Rosaceae (33) and Brassicaceae (31 plus one non-native). The largest genera are *Carex* (47 native), *Boechera* (16), *Eriogonum* (15), *Stipa* (12), *Poa* (11 plus three non-native), *Penstemon* (ten), *Epilobium* (ten), *Erigeron* (ten), *Juncus* (ten), *Potentilla* (ten), *Draba* (nine) and *Salix* (nine).

The remarkably rich composition of grasses (65 native taxa) is noteworthy when comparing the Rock Creek flora with several other floras in the eastern Sierra Nevada region (Table 4), as is the relatively high diversity of Rosaceae (33 taxa) and *Carex* (47). Rock Creek is the only one of these floras to have Rosaceae among the five largest families represented. Rock Creek shares notable similarities with the two study areas closest in geographic distance—the Glass Mountain Region flora (Honer 2001) and the San Joaquin Roadless Area flora (Constantine-Shull 2000)—in having *Carex*, *Boechera* and *Eriogonum* as the three largest genera represented. It should be noted that these two study areas are geologically dissimilar to Rock Creek in having primarily volcanic substrates in contrast to granitic.

Thirty-two taxa (5%) in the study area are rare (special-status) plants recognized by California and/or the California

Table 3. Numerical summary of the flora of the upper Rock Creek watershed.

	Total taxa (non-native)	% of total flora
Total Flora		
Families	77 (3)	
Genera	248 (13)	
Species	572 (25)	
Minimum-rank taxa (species, subspecies, varieties, named hybrids)	591 (25)	
Native/Non-Native		
Native	566	95.8
Non-native	25	4.2
Largest Families		
Poaceae	76 (11)	12.9
Asteraceae	75 (3)	12.7
Cyperaceae	54	9.1
Rosaceae	33	5.6
Brassicaceae	32 (1)	5.4
Largest Genera		
Carex	47	7.9
Boechera	16	2.7
Eriogonum	15	2.5
Poa	14 (3)	2.4
Stipa	12	2.0
Annuals/Short-Lived Perennials	74 (11)	12.5
Endemic to High Sierra Nevada Region	19	3.2
Special-Status	32	5.4

Native Plant Society (California Natural Diversity Database [CNDDB] 2018; CNPS 2018), including 11 previously undocumented in Rock Creek (Table 5). Nineteen taxa are endemic to the High Sierra Nevada region, representing 3% of the total flora (Table 6). Twenty-five non-native taxa constitute 4% of the flora. Seventy-four taxa are annuals or short-lived perennials (13%); 57 (77%) of these are obligate annuals and 11 (15%) are non-native (Jepson Flora Project 2018). Twenty (35%) of the obligate annuals were documented as high as the whitebark pine forest (10,200–11,100 ft/3110–3380 m). Only one obligate annual—*Rorippa curvisiliqua* (Brassicaceae)—was found above treeline, where it was seen at one locality at 11,624 ft (3543 m).

Taxa Omitted From the Catalog

Collections historically identified as *Lupinus gracilentus* Greene were determined to be misidentifications (*Butler s.n.*, Jul 1931, PASA1662; *Peirson s.n*., 11 Aug 1933, UC511825; *Peirson 9055*, RSA). *Lupinus gracilentus* (slender lupine; Fabaceae) is a special-status species (Rank 1B, CNPS 2018) that is known to occur on the west slope of the central Sierra Nevada in Yosemite National Park. The extent of its distribution, especially for collection records east of the Sierra crest, is in need of study (Sholars and Riggins 2012). All collections from the Rock Creek watershed historically identified as *L. gracilentus* were examined by the author and determined to be *L. lepidus* var. *confertus* (Kellogg) C.P. Sm., based in part on examination of original material of *L. gracilentus* collected from Tuolumne Co. by Chestnut & Drew in 1889 (NDG).

A specimen of *Salix nivalis* Hook. (*Peirson 11207*, RSA) was mislabeled with the locality of Ruby Lake. It was actually collected outside the study area in the Virginia Lakes watershed of Mono County, as evidenced by Peirson's collection notebook entry for his number 11207, and by correctly labeled duplicates in other herbaria (HSC, NY, SBBG, SD, POM). *Salix nivalis* is not likely to occur in the watershed, as it appears to be restricted to metamorphic substrates at locations elsewhere in the Sierra Nevada (Moore and Johnson 2011).

Several species have been infrequently reported from the Rock Creek watershed that unfortunately lack an herbarium voucher (CCH 2018) (e.g., *Pterospora andromedea* Nutt. [Ericaceae; Rose 2015]). The vascular plant inventory presented in this study only includes taxa based on at least one representative herbarium specimen.

Noteworthy Collections

New records for the Sierra Nevada.—According to online database collection records (SEINet 2016; CCH 2018), two taxa collected during this study are evidently the first records for the Sierra Nevada; both are special-status species listed in the CNPS Inventory of Rare and Endangered Plants (online edition, v8-03, 2018) (Table 5).

Carex stevenii (Steven's sedge; Cyperaceae) previously had only been documented from the White Mountains (the species is also found outside California, in the southern Rocky Mountains [Zika et al. 2015*b*]). In the study area there is a single known occurrence of *C. stevenii*—a small population was found in 2012 near Rock Creek Lodge (Fig. 1).

Penstemon cinicola (ash beardtongue; Plantaginaceae) was documented in 2012 and 2013 at several sites above 9800 ft (2987 m) in the study area. It was previously known to occur only on volcanic soils, at locations north of the study area such as the Glass Mountain region, Modoc Plateau, Warner Mountains and southern Cascade Range (Wetherwax and Holmgren 2012). The nearest known population is in the Glass Mountain area ca. 25 miles (40 km) to the north. There is a collection record (*Woodland 2627*, NY) (CCH 2018) of *P. cinicola* from the west slope of the Sierra Nevada in El Dorado County, a likely misidentification.

New records for Inyo and Mono counties.—A total of nine collections made during this study are evidently new county records (SEINet 2016; CCH 2018). Four plants collected within the Inyo County boundary (*Cerastium arvense* subsp. *strictum*, Caryophyllaceae; *Juncus hemiendytus* var. *hemiendytus*, Juncaceae; *Poa bolanderi*, Poaceae; *Spergularia rubra*, Caryophyllaceae, non-native) and five within Mono County (*Lathyrus lanszwertii* var. *lanszwertii*, Fabaceae; *Lonicera cauriana*, Caprifoliaceae; *Oreonana clementis*, Apiaceae; *Primula jeffreyi*, Primulaceae; *Ulmus pumila*, Ulmaceae, non-native) are the first collection records of these taxa for these counties of which I am aware.

New records from previously surveyed areas of the watershed.—Eight taxa collected during this study from areas previously surveyed by Peirson and Howell were not recorded in earlier checklists (Peirson 1938, 1942; Howell 1946). These

Table 4. Comparison of several floristic, collections-based studies in the eastern Sierra Nevada region. Taxonomy was not made uniform for these comparisons.

Study location	Reference	Air distance from Rock Creek in mi. (km)	Area in sq. mi. (sq. km)	Highest elevation in ft (m)	Elevation gain in ft (m)	Total minimum-rank taxa	% Non-native	Largest families (no. taxa)	Largest genera (no. taxa)
Upper Rock Creek Watershed, Inyo Co./Mono Co., California (37°27′N, 118°44′W)	This study	0	36.5 (94.5)	13,750 (4191)	6391 (1948)	591	4	Poaceae (76) Asteraceae (75) Cyperaceae (54) Rosaceae (33) Brassicaceae (32)	*Carex* (47) *Boechera* (16) *Eriogonum* (15) *Poa* (14) *Stipa* (12)
Glass Mountain Region, Mono Co., California (37°46′N, 118°43′W)	Honer (2001)	22 (36)	280 (725)	11,123 (3390)	4718 (1438)	489	3	Asteraceae (87) Poaceae (46) Brassicaceae (37) Polygonacae (31) Fabaceae (25)	*Eriogonum* (22) *Carex* (18) *Arabis* (14) *Astragalus* (11) *Lupinus* (11)
San Joaquin Roadless Area, Mono Co., California (37°42′N, 119°01′W)	Constantine-Shull (2000)	24 (38)	17 (44)	11,601 (3536)	3727 (1136)	446	1	Asteraceae (73) Poaceae (50) Cyperaceae (32) Scrophulariaceae (29) Brassicaceae (27) Polygonaceae (20)	*Carex* (30) *Arabis* (12) *Eriogonum* (12) *Lupinus* (11) *Epilobium* (11) *Poa* (10)
Owens Peak Eastern Watershed, Kern Co., California (35°44′N, 117°60′W)	Fraga (2008)	124 (200)	50 (130)	8400 (2600)	5906 (1800)	440	5	Asteraceae (77) Poaceae (29) Polygonaceae (29) Polemoniaceae (25) Scrophulariaceae (23) Fabaceae (21)	*Eriogonum* (25) *Mimulus* (12) *Phacelia* (12) *Cryptantha* (10) *Camissonia* (8)
Kiavah Wilderness, Kern Co., California (35°39′N, 118°06′W)	Gardner (2017)	129 (207)	137 (354)	7294 (2200)	3937 (1200)	477	6	Asteraceae (73) Poaceae (36) Polemoniaceae (35) Polygonaceae (25) Fabaceae (24)	*Gilia* (18) *Eriogonum* (17) *Phacelia* (13) *Cryptantha* (12) *Lupinus* (8)

Table 5. Special-status plants in the upper Rock Creek watershed (CNDDB 2018; CNPS 2018). Rare plants previously undocumented in the study area are indicated by a cross (†). Taxa verified from previous collections but not rediscovered during the study are also indicated by a diamond (♦).

Taxon	CNPS List[a]	California State List[b]
Agrostis humilis†	2	
Allium atrorubens var. *cristatum*†	4	
Antennaria pulchella	4	
Astragalus kentrophyta var. *danaus*†	4	
Astragalus monoensis	1B	Rare
Boechera tularensis♦	1B	
Botrychium crenulatum	2	
Calyptridium pygmaeum	1B	
Carex buxbaumii	4	
Carex congdonii	4	
Carex idahoa†	2	
Carex incurviformis♦	4	
Carex stevenii†	2	
Carex tahoensis	4	
Cryptantha glomeriflora	4	
Draba cana♦	2	
Draba praealta†	2	
Draba sierrae	1B	
Festuca minutiflora♦	2	
Fritillaria pinetorum†	4	
Jamesia americana var. *rosea*	4	
Lupinus padre-crowleyi†	1B	Rare
Minuartia obtusiloba♦	4	
Minuartia stricta	2	
Penstemon cinicola†	4	
Penstemon papillatus	4	
Podistera nevadensis†	4	
Potamogeton robbinsii†	2	
Subularia aquatica subsp. *americana*	4	
Thalictrum alpinum♦	4	
Tonestus peirsonii	4	
Triglochin palustris	2	

[a] CNPS List: 1B: Plants rare, threatened, or endangered in California or elsewhere; 2: Plants rare, threatened or endangered in California but more common elsewhere; 4: Plants of limited distribution (watch list).
[b] California State List: Plants officially designated Rare by the California Fish and Game Commission.

Table 6. Taxa of limited distribution: plants documented from the upper Rock Creek watershed with ranges limited to the High Sierra Nevada (SNH) region, or with ranges extending from the SNH to the East of Sierra Nevada region (SNE) and/or the White and Inyo mountains (W&I) (Baldwin et al. 2012). Rarity category is provided if applicable (CNPS 2018); categories are explained in Table 5. Taxa verified from previous collections but not rediscovered during the study are indicated by a diamond (♦).

Taxa endemic to SNH, or extending only to SNE and/or W&I	CNPS List
Aquilegia pubescens	
Astragalus kentrophyta var. *danaus* (+ SNE)	4
Astragalus lentiginosus var. *ineptus* (+ SNE)	
Boechera tularensis♦	1B
Calamagrostis muiriana	
Calliscirpus brachythrix	
Carex congdonii	4
Castilleja nana (+ W&I)	
Delphinium polycladon (+ W&I)	
Draba lemmonii	
Draba sierrae	1B
Drymocallis pseudorupestris var. *crumiana*♦ (+ W&I)	
Eriogonum nudum var. *scapigerum*	
Festuca brachyphylla subsp. *breviculmis* (+ SNE, W&I)	
Frasera puberulenta (+ W&I)	
Galium hypotrichium subsp. *hypotrichium* (+ SNE)	
Ivesia lycopodioides var. *megalopetala*	
Ivesia lycopodioides var. *scandularis* (+ W&I)	
Ivesia muirii	
Leptosiphon pachyphyllus (+ SNE)	
Lewisia glandulosa (+ SNE)	
Lilium kelleyanum	
Lilium parvum♦	
Lomatium torreyi♦	
Lupinus lepidus var. *ramosus*♦ (+ SNE)	
Lupinus padre-crowleyi (+ SNE)	1B
Lupinus pratensis var. *pratensis* (+ SNE)	
Luzula orestera	
Oreonana clementis	
Penstemon papillatus (+ SNE)	4
Poa keckii (+ SNE)	
Poa stebbinsii	
Polemonium eximium	
Potentilla pseudosericea (+ SNE, W&I)	
Stipa kingii	
Tonestus peirsonii (+ W&I)	4
Trichophorum clementis	

include a fern (*Athyrium distentifolium* var. *americanum*, Athyriaceae), a conifer (*Tsuga mertensiana*, Pinaceae), four perennial dicots (*Cerastium arvense* subsp. *strictum*, Caryophyllaceae; *Draba praealta*, Brassicaceae; *Micranthes tolmiei*, Saxifragaceae; *Penstemon cinicola*, Plantaginaceae) and two perennial grasses (*Agrostis humilis*, *Torreyochloa pallida* var. *pauciflora*, Poaceae). Two of these newly documented plants—*Agrostis humilis* and *Penstemon cinicola*—are special-status species (Table 5).

Herbarium searches (SEINet 2016; CCH 2018) revealed one additional perennial dicot (*Gentianopsis simplex*, Gentianaceae) not recorded in earlier checklists. Elizabeth Butler documented this species from Heart Lake in the 1930s (*s.n.*, Jul 1931, PASA187) during the same year and month that Peirson made one of his visits to Heart Lake. Butler's remains the only known collection from the watershed.

Special-Status Species and Taxa of Limited Distribution

Rare taxa.—Thirty-two taxa in the study area are listed in the CNPS Inventory of Rare and Endangered Plants (v8-03, 2018) (Table 5). The inventory employs a ranking system based on degree of rarity. Five taxa in the study area are Rank 1B: they are California endemics and rare throughout their ranges. Ten taxa are Rank 2: they are rare throughout their range in California but are more common elsewhere. Seventeen are Watch List taxa (Rank 4).

Two legumes, *Astragalus monoensis* and *Lupinus padre-crowleyi*, are officially listed as Rare under the California Endangered Species Act (CESA) (CNDDB 2018). No federally listed taxa are known from the watershed; however, as of April 2018, *Pinus albicaulis* is a candidate species (i.e., under review) for listing under the Federally Endangered Species Act (FESA) due to its rapid decline throughout its range in North America (U.S. Department of the Interior, Fish and Wildlife Service 2018).

Narrowly distributed taxa.—Thirty-seven taxa in the Rock Creek flora have relatively narrow ranges as circumscribed by Baldwin et al. (2012) (Table 6). Known distributions of these taxa are limited to the High Sierra Nevada region, or extend only to the East of Sierra Nevada region and/or the White and Inyo mountains.

Sensitive species.—Taxa recognized as sensitive by the State of California (CNDDB 2018), CNPS (2018) and/or the Inyo National Forest due to threats and/or extreme rarity warrant a brief discussion. *Botrychium crenulatum* (scalloped moonwort; Ophioglossaceae), a diminutive fern, is only known in the watershed from a single population on a wet slope along the margin of a horse pasture near Rock Creek Lodge, at ca. 9500 ft (2895 m) elevation. This species (CNPS List 2 [endangered in CA; more common elsewhere]) is listed as threatened by grazing and trampling within its range. Horses were observed in the pasture during fieldwork for this study. It is possible that *B. crenulatum* occurs in suitable habitat elsewhere in the watershed; the species is inconspicuous even to a trained botanical eye, and could be easily overlooked.

Boechera tularensis (Tulare rockcress; Brassicaceae) (CNPS List 1B [rare, threatened, or endangered in CA or elsewhere]) is possibly threatened by recreational activities and vehicles within its range. In the study area it is only known from a single historical collection (*Alexander*, *Bailey* & *Urban 847A*, *B* [NMC]). It was documented in 2008 at ca. 10,500 ft (3200 m) along the trail between Mosquito Flat and Ruby Lake. It was not rediscovered during the present study.

Calyptridium pygmaeum (Fig. 18) (pygmy pussypaws; Montiaceae) (CNPS List 1B [rare, threatened, or endangered in CA or elsewhere]) is possibly threatened by recreational activities and vehicles within its range. In the eastern Sierra Nevada, it has only been recorded from the Rock Creek and Cottonwood Creek watersheds. Statewide there are 27 collections I am aware of (although I have not verified the determinations for all), that represent ca. 15 occurrences (CCH 2018). The species was first documented in the study area at Heart Lake in the 1930s (*Peirson 13457*, RSA) but wasn't recorded again until the present study. It was found at Heart Lake and Rock Creek Lakes Resort in 2013, and at Rock Creek Lake in 2015. All sites where *C. pygmaeum* has been documented in the watershed receive considerable impact from human traffic. The latter two locations are noteworthy in that they are developed sites—at Rock Creek Lake the species was found growing in a road pavement crack and at the Resort it was found in a dirt parking area. It is likely that *C. pygmaeum* occurs elsewhere in the study area—there appears to be plenty of suitable habitat—but the plants are small, ephemeral and easily overlooked.

Lupinus padre-crowleyi (Father Crowley's lupine; Fabaceae) (CNPS List 1B [rare, threatened, or endangered in CA or elsewhere]; State List Rare) is a very rare Sierra Nevada endemic only known from Inyo, Mono and Tulare counties. This species is known in the study area from a single occurrence, found in 2013 on Wheeler Ridge at ca. 11,000 ft (3353 m). This locality is currently the northernmost known occurrence of the species (CCH 2018).

Astragalus monoensis (Mono milkvetch; Fabaceae) (CNPS List 1B; State List Rare) is threatened by road maintenance, vehicles and sheep grazing within its range. Interestingly, the Rock Creek plants are disjunct—the closest occurrence is ca. 14 air miles (22.6 air km) northwest, near Hot Creek at the edge of the species' primary area of distribution, where it occurs on volcanically derived soils. It is unclear whether the Rock Creek plants are a natural population, or perhaps arrived via human-mediated transportation, e.g., seeds mixed with gravel brought in for road work, or lodged in the cracks of automobile tire treads. The author only found the species along Rock Creek Road (ca. 13 plants observed; *England 260*, *291*) and at the Palisades day parking area (Fig. 1) (ca. 100 plants observed, *England 1647*), both sites subject to vehicular disturbance. In fact, some of the Palisades plants had clearly been driven over and damaged by vehicles (J. England & T. Columbus, pers. obs. 2016). There are two historical collections of *Astragalus monoensis* from Rock Creek in 1992 and 1994 (*Fredendall 6355*, *6413*, RSA). Both collections, annotated during the present study, were originally determined as *A. lemmonii* A. Gray). The locality data are vague for these collections; the provided elevation of 9400 ft (2865 m) would place them uproad from the Palisades population (8885 ft /2708 m).

The Palisades site was used as a staging area for road maintenance in 2014 and 2015, when Rock Creek Road was widened to accommodate a bicycle lane. Temporary negative impacts to roadside vegetation were anticipated by the planning agencies, but the long-term viability of the Palisades population of *A. monoensis* was determined not to be threatened by the project (MCCDDPD 2013). However, in June 2012, the author documented 13 plants along the road shoulder between Big Meadow and Palisades, near a pullout (*England 260*, RSA). Unfortunately, the Biological Assessment conducted in July 2012 to assess potential impacts to rare species from the planned road work reported that *A. monoensis* was not present along the roadway. The plants documented along the road during this study were growing within four feet (ca. 1 m) of the west pavement edge and the majority did not survive the bicycle lane addition—in August 2018 I resurveyed the collection site and found only three individuals.

Regional Endemism

Although no taxa were found to be restricted to the study area, 19 taxa in the Rock Creek flora are endemic to the High Sierra Nevada bioregion (Baldwin et al. 2012) (Table 6). The Sierra Nevada has been recognized as a hot spot of botanical diversity within California (Raven and Axelrod 1978; Thorne et al. 2009). Burge et al. (2016) reported 299 minimum-rank taxa endemic to the Sierra Nevada. Shevock (1996) estimated as many as 405 Sierra Nevada endemics, but his geographical boundaries for the region were broader than those of Baldwin et al. (2012), which were used by the Burge et al. (2016) study. Shevock noted that more than half of all Sierra endemics are considered rare by governmental agencies and/or conservation organizations. He also observed that among eastern Sierra Nevada river drainages, the Owens River Basin is noteworthy for its relatively high species diversity and numbers of endemic and rare taxa. Raven and Axelrod (1978) suggested that major climatic change at high elevations during the Pleistocene drastically limited the opportunities for plant speciation during that time period; therefore, endemics that occur in the high Sierra are of relatively recent origin and special interest. The Pleistocene period in the Rock Creek watershed, as in much of the Sierra Nevada, was marked by repeated glacial advances and retreats (Hildreth and Fierstein 2016).

Non-Native Taxa

Twenty-five taxa are not native to the study area (Jepson Flora Project 2018). All non-native taxa documented previously were encountered except for *Festuca myuros* (Poaceae), which was recorded from a single collection at Rock Creek Lake in 1947 (*Benson 12577*, POM). It may still be present in the study area but, if so, it is likely uncommon. The most widespread and abundant naturalized species is *Bromus tectorum* (cheat grass; Poaceae), which is common up to ca. 9500 ft (2890 m) along roadways and in frequently disturbed areas adjacent to roads. I documented *B. tectorum* as high as Rock Creek Lake (9800 ft/2990 m) and it may infrequently occur higher along the road. A collection of *B. tectorum* from Ruby Lake at 11,150 ft (3400 m) (*Peirson 11308*, RSA) is correctly identified but appears to be an anomaly; no evidence of cheat grass in the Wilderness Area was found during the present study. The Wilderness appears to be little impacted by non-natives; only two were documented: *Taraxacum officinale* (Asteraceae; fairly common, usually along trails and in small numbers) and *Phleum pratense* (Poaceae; rare). There are several historical collections of *Poa pratensis* subsp. *pratensis* (Poaceae) from the study area, all from 1946 or earlier (*Halperin 515*, CAS; *Howell 22374*, CAS; *Peirson 10817*, RSA). However, I did not encounter this species.

Perhaps most noteworthy with regard to non-natives is the unusually high elevations at which some were recorded. *Elymus ponticus* (Poaceae; 9400 ft/2865 m), *Matricaria discoidea* (Asteraceae; 9700 ft/2960 m), *Plantago lanceolata* (Plantaginaceae; 9900 ft/3020 m), *Portulaca oleracea* (Portulacaceae; 9750 ft/2970 m) and the aforementioned *B. tectorum* (9800 ft/2990 m and 11,150 ft/3400 m) have no previous collections in California from such high elevations (SEINet 2016; CCH 2018). All of these records except for Peirson's are along Rock Creek Road, apparently the highest paved road (10,240 ft/3121 m) in the Sierra Nevada and undoubtedly a corridor for plant dispersal, natives and non-natives alike. Undocumented weeds probably exist in the campgrounds along Rock Creek Road (I was not permitted to make collections within campgrounds). Trails presumably are also natural corridors for dispersal of non-natives such as *Taraxacum officinale*.

Taxa Not Rediscovered

Eighty-one taxa vouchered by previous collections were not rediscovered. There are several possible explanations for this. First, below-average precipitation was recorded in all years the author conducted fieldwork. Some taxa not rediscovered may be more abundant in wetter years. Second, although I attempted to achieve excellent geographic coverage during field surveys, it was not possible to search the entire area. Evanescent plants or those that were present in only one year may have been missed. Some taxa may have been present but were overlooked, particularly those very small in stature, and those such as sedges, rushes and grasses that tend to "blend in" with similar-looking species. Lastly, some taxa present historically in the watershed may no longer be present; taxa that were rare in the 1930s would have been especially vulnerable. Many of the taxa not rediscovered are known from a single historical collection, which suggests that they may have been uncommon in the watershed when they were collected. A question is whether or not climate change, recreational activities, and/or other impacts have led to the disappearance of previously documented species.

Noteworthy Absences

Red fir, *Abies magnifica* A. Murray var. *magnifica* (Pinaceae) and white fir, *A. concolor* (Gordon & Glend.) Lindl. ex Hildebr., have not been recorded in the study area to my knowledge. Collections of *Abies* on the east slope of the central Sierra Nevada are relatively sparse (CCH 2018); many records of *A. magnifica* exist from the east slope of the northern Sierra and for *A. concolor* on the east slope of the northern and southern Sierra. However, *A. magnifica* is a common forest species on the slopes of Mammoth Mountain, ca. 15 air miles (24 km) northwest of Rock Creek, and *Abies concolor* has also been documented both in the Mammoth area (Howald 2000) and at several sites in the Glass Mountain region ca. 22 air mi. (36 km) north of Rock Creek (Honer 2001). The presence of *Abies* in the Mammoth region might be attributed in part to the relatively wetter conditions around Mammoth Pass (ca. 9370 ft/2866 m) which sits low on the Sierra crest, allowing more moisture from winter storms to reach the east slopes (Sawyer and Keeler-Wolf 2007).

Threats to the Flora

Climate change.—Warming annual temperatures are likely the greatest medium- to long-term threat to the flora, especially to taxa that grow on mountaintops as they have "nowhere to go" (Loarie et al. 2009). *Podistera nevadensis* (Apiaceae), *Draba sierrae* (Fig. 22) (Brassicaceae), *Astragalus kentrophyta* var. *danaus* and *Lupinus padre-crowleyi* (Fabaceae) are rare, narrow-ranging taxa that are uncommon and limited to ridgetops within the watershed. Suitable habitat for these species may contract in the future if climate change projections come to pass. A century ago, the alpine region of the Sierra Nevada was observed by Smiley (1921) to be fragmentary in its distribution. One could postulate that alpine-restricted species such as *Hulsea algida* (Asteraceae) and *Polemonium eximium* (Fig. 13, 27) (Polemoniaceae) will suffer population decline if alpine habitats are altered by warming. The topographic and micro-climatic heterogeneity within the watershed, however, could provide refugia for some taxa (Loarie et al. 2009). Warming temperatures may increase the amount of suitable habitat for some natives and also for non-natives, leading to potential range shifts if other climatic variables are relatively stable. *Bromus tectorum*, well established along Rock Creek Road below 9500 ft (2895 m), could potentially advance farther up the canyon if present temperature barriers are relaxed (Griffith and Loik 2010). Many non-native species from lower areas in California have already moved higher in elevation over the past century in response to climate change, with ca. 27% of non-native taxa exhibiting significant range shifts toward higher elevations (compared to ca. 12% of endemic taxa showing a similar pattern) (Wolf et al. 2016).

Drought and wildfire.—A span of dry years in the past decade has resulted in significant impacts to the forests (Inyo National Forest 2014). I observed significant mortality of *Pinus albicaulis* (Pinaceae) at its lower elevations, particularly in the Tamarack Bench and Hilton Bench areas. Millar et al. (2012) conducted surveys of *P. albicaulis* stands in the Rock Creek watershed containing dead trees, and attributed high mortality rates in the plot sites to mountain pine beetle (*Dendroctonus ponderosae*) infestations associated with successive years of drought during the first decade of the current century. Large wildfires such as the 2002 Birch Fire that burned part of the study area are potentially grave threats to the flora. Conversely, the practice of fire suppression in the more accessible areas of the watershed, especially near the resorts and campgrounds, has potentially changed forest composition and fuel structure in those areas, perhaps increasing the risk of catastrophic fire (Inyo National Forest 2014).

Recreation.—Increased recreational use on the Inyo National Forest is projected, based on rising urban populations in southern California (Inyo National Forest 2014). This is a matter of concern for sensitive ecosystems in the study area such as wetlands and meadows adjacent to hiking trails and campgrounds. Overnight camping in the John Muir Wilderness is restricted by a limited number of Wilderness entry permits per day. However, day hiking in the Wilderness is not presently regulated by permit nor limited to maximum number of visitors per day.

I observed some habitat degradation along the edges of trails and lakes due to trampling from foot traffic, horses and mules. The most popular destinations in Little Lakes Valley are the easily accessible lakes such as Heart Lake, Long Lake and Gem Lakes. Shorelines and meadow areas along these and other lakes have already received a moderate level of disturbance. The Inyo Forest has attempted to dissuade repeated trampling of some meadow areas by posting signage such as "Restoration Area" at a few sites. Streamside vegetation in the riparian zone near campgrounds was also observed to have received a significant amount of disturbance from fishermen and campers. It is recommended that the Inyo National Forest monitor these impacts toward control, reduction and mitigation.

ACKNOWLEDGEMENTS

This study is based on a master's thesis submitted by the author to Claremont Graduate University (CGU) in 2017. Funding for this research was provided by CGU, Rancho Santa Ana Botanic Garden, Valentine Eastern Sierra Reserve, the California Native Plant Society Bristlecone Chapter, Southern California Botanists, and Ann Howald. I thank J. Mark Porter, Lucinda McDade and J. Travis Columbus for their guidance and academic oversight. I am indebted to numerous friends and colleagues who generously volunteered their time to assist with fieldwork. Sue Weis and Michèle Slaton of the Inyo National Forest Bishop Office facilitated collection permits and provided information for some species occurrences. I gratefully acknowledge the following herbaria for access to and/or loan of specimens: ASC, CAS/DS, CDA, GH, LA, NMC, NY, PASA, RSA/POM, SBBG, SD, UC/JEPS, UCD and UCR. Sincere thanks to Mare Nazaire, Administrative Curator at RSA, for facilitating specimen loans. Dean W. Taylor sent me useful information on early botanical work in Rock Creek. Special recognition to Cathy Rose, Stephen Ingram and Jim King for sharing their knowledge of the local flora. I gratefully acknowledge the following people for their help with identifications: Travis Columbus (Poaceae), Naomi Fraga (Phrymaceae), Carolyn Ferguson and Mark Mayfield (*Phlox*), LeRoy Gross (various taxa), Matt Guilliams (*Calyptridium*), Noel Holmgren (*Penstemon*), Diana Jolles (*Pyrola*), Jason Koontz (*Delphinium*), Mark Porter (Polemoniaceae), Tommy Stoughton and Michael Windham (*Boechera*), Debra Trock (*Packera*) and Peter Zika (*Carex* and *Luzula*). Many thanks to Ann Howald, Travis Columbus, Vanessa Ashworth and an anonymous reviewer for their input and assistance with the manuscript. Lastly, I thank Gary Wallace for drawing my attention to the need of an updated plant checklist for Rock Creek Canyon.

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APPENDIX 1

ANNOTATED CATALOG OF THE VASCULAR FLORA

The following 591 minimum-rank vascular plant taxa were documented from the upper Rock Creek watershed. This catalog is a result of intensive fieldwork conducted from 2012 through 2016 (two collections were made during a one-day visit in 2018), and herbarium searches using the Consortium of California Herbaria (CCH) and SEINet Portal Network databases (accessed on multiple occasions 2012–2018). A full set of specimens collected during this study is housed at Rancho Santa Ana Botanic Garden (RSA). Specimens cited are housed at RSA unless otherwise indicated. More than 1000 pre-existing collections were examined, verified, and annotated from the following herbaria: ASC, CAS/DS, CDA, GH, LA, NMC, NY, PASA, RSA/POM, SBBG, SD, UC/JEPS, UCD and UCR. Identifications were made by the author or by an expert in the taxonomic group. For each taxon, the catalog cites at least one collection and indicates the vegetation type(s) where it has been documented and its abundance in the watershed.

Family classification for Boraginales is according to the Boraginales Working Group (2016); other authorities followed include recent treatments in *Cryptantha* (Hasenstab-Lehman and Simpson 2012) and *Luzula* (Zika et al. 2015*a*). All other taxonomy follows the Jepson Flora Project (2018).

Abundance terms are defined typically as follows: rare = a single collection site, not observed elsewhere; uncommon = narrowly distributed, seldom observed; occasional = variably distributed, infrequently observed; locally common = narrowly distributed, commonly observed within its range; common = broadly distributed, commonly observed.

Non-native taxa are denoted by an asterisk (*) and may include waif occurrences of California natives. Special-status taxa listed in the CNPS Inventory of Rare and Endangered Plants (online edition, v8-03) and State Listed taxa are denoted by a dagger (†). CNPS rarity ranks: 1B: Plants rare, threatened, or endangered in California or elsewhere; 2: Plants rare, threatened or endangered in California but more common elsewhere; 4: Plants of limited distribution (watch list). Plants designated Rare by the California Fish and Game Commission (CNDDB 2018): CA-Rare.

Taxa identified from previous collections but not rediscovered during fieldwork for this study are denoted by a diamond (♦). New collections from areas previously surveyed by Peirson (1938; 1942) and/or Howell (1946) but not recorded in those checklists are noted. See Fig. 1 for place name locations.

FERNS AND FERN ALLIES

LYCOPHYTES

Isoetaceae

Isoetes bolanderi Engelm. Lodgepole and whitebark pine forests. In water of ephemeral pools, lakes. Locally common >9500 ft (2895 m). *England 356*.

Isoetes occidentalis L.F. Hend. Whitebark pine forest. In lake shallows. Uncommon. Hidden Lakes, *Freund 6*. *Isoetes* collections from Rock Creek exhibit significant character overlap (e.g., leaf shape and size of female spores) between *I. bolanderi* and *I. occidentalis*, which are known to hybridize, according to the descriptions by Taylor and Keeley (2012). A hybrid specimen was collected from the Hidden Lakes during the present study (*Freund 7*).

Selaginellaceae

Selaginella watsonii Underw. Whitebark pine forest, alpine. Rock outcrops. Locally common. *England 514*.

FERNS

Athyriaceae

Athyrium distentifolium Opiz var. americanum (Butters) Cronquist. Alpine. Rock outcrops. Rare. Not recorded by Peirson (1938, 1942) or Howell (1946). Along trail below Mono Pass, *England 1036*.

Cystopteridaceae

Cystopteris fragilis (L.) Bernh. Lodgepole and whitebark pine forests, alpine. Rock crevices. Common. *England 381*.

Dennstaedtiaceae

Pteridium aquilinum (L.) Kuhn var. pubescens Underw. Jeffrey and lodgepole pine forests. Moist, partially shaded sites. Uncommon. Along W side of Rock Creek Road between East Fork and Pine Grove campgrounds, *England 927*.

Equisetaceae

Equisetum arvense L. Riparian woodland, lodgepole pine forest. Moist, partially shaded sites. Locally common. *England 409*.

Ophioglossaceae

†Botrychium crenulatum W.H. Wagner. CNPS List 2. Lodgepole pine forest. Seeps, springs. Rare. Rock Creek Lodge corrals along E margin of horse pasture at base of slope, *England 1316*.

Botrychium simplex E. Hitchc. var. compositum (Lasch) Milde. Lodgepole and whitebark pine forests, alpine. Moist meadows, other mesic sites, often around lake edges. Locally common but cryptic. *England 1416*.

Pteridaceae

♦Adiantum aleuticum (Rupr.) C.A. Paris. Whitebark pine forest. Rare. "West shore Long Lake; along stream but in full sunlight. The only colony found in region." *Peirson s.n.* 18 Aug 1933 (UC).

Cryptogramma acrostichoides R. Br. Whitebark pine forest, alpine. Rock outcrops. Occasional. *England 1233*.

Pellaea breweri D.C. Eaton. Whitebark pine forest, alpine. Talus-covered slopes, rock outcrops. Locally common. *England 1508*.

Woodsiaceae

Woodsia scopulina D.C. Eaton. Whitebark pine forest. Rock crevices. Occasional. *England 1256*.

GYMNOSPERMS

Cupressaceae

Juniperus grandis R.P. Adams. Pinyon pine woodland, Jeffrey and lodgepole pine forests. Dry canyon slopes. Common <10,000 ft (3048 m), often dominant on steep slopes. *England 221*.

Pinaceae

Pinus albicaulis Engelm. Lodgepole and whitebark pine forests, alpine. Dry rocky areas. Common, the dominant tree species >10,200 ft (3109 m). Many dead trees observed near the lower elevational range for this species were casualties of pine beetle infestation coupled with drought. *England 398*.

Pinus contorta Loudon subsp. murrayana (Grev. & Balf.) Critchf. Riparian woodland, Jeffrey, lodgepole and whitebark pine forests. Mesic sites, often at meadow margins. Common, the dominant tree species at 8000–10,200 ft (2438–3109 m). *England 174*.

Pinus flexilis E. James. Lodgepole pine forest. Dry rocky slopes, open areas with well-drained soils. Occasional, never dominant, usually found among other conifers. *England 282*.

Pinus jeffreyi Grev. & Balf. Pinyon pine woodland, Jeffrey and lodgepole pine forests. Canyon bottom. Locally common in a narrow belt below 8000 ft (2438 m), scattered elsewhere. *England 135*.

Pinus monophylla Torr. & Frém. Pinyon pine woodland, Jeffrey pine forest. Dry slopes and flats. Common <9000 ft (2743 m). *England 113*.

Pinus monticola Douglas ex D. Don. Lodgepole pine forest. Rocky slopes. Rare. Along trail to Hilton Lakes near jct. with trail to Pine Grove campgrounds, *England 395*.

Tsuga mertensiana (Bong.) Carrière. Whitebark pine forest. Rocky slopes in cool, seasonally moist drainages. Uncommon. A juvenile found at SW end of Long Lake; small group of mature trees found in drainage below Half Moon Pass, *England 708*. Not recorded by Peirson (1938, 1942) or Howell (1946).

ANGIOSPERMS

EUDICOTS

Adoxaceae

Sambucus racemosa L. var. racemosa. Lodgepole and whitebark pine forests. Seasonally moist drainages in partial shade. Uncommon. Drainage SE of Wheeler Ridge Mine Road, *England 871*. Varietal determination tentative: specimen has flowers but no fruits (mature fruit color needed for confident identification to variety). Flowers of this collection yellowish when dried. Munz and Keck (1959) note that flowers of var. *melanocarpa* (A. Gray) McMinn turn brown when dry.

Apiaceae

Angelica lineariloba A. Gray. Jeffrey, lodgepole and whitebark pine forests. Dry slopes. Common. *England 1470*.

Cymopterus terebinthinus (Hook.) Torr. & A. Gray var. petraeus (M.E. Jones) Goodrich. Whitebark pine forest. Rocky sites. Uncommon. *England 560*.

Heracleum maximum W. Bartram. Riparian woodland. Wet shady areas. Uncommon. Along creek SE of East Fork campground, *England 407*.

Lomatium dissectum (Nutt.) Mathias & Constance var. multifidum (Nutt.) Mathias & Constance. Jeffrey pine forest. Sites with filtered sunlight. Uncommon. *England 1516*.

♦Lomatium torreyi (J.M. Coult. & Rose) J.M. Coult. & Rose. Whitebark pine forest. Uncommon. Gem Lakes, *Howell 22822*; W of Long Lake, *Peirson 10771*.

Oreonana clementis (M.E. Jones) Jeps. Whitebark pine forest. Rocky, exposed slopes. Rare. Wheeler Crest, *England 820*. Evidently the only record for Mono County (CCH 2016; SEINet 2016); a range extension of ca. 39 air miles (63 air km) N of the known distribution for the eastern Sierra Nevada.

Osmorhiza berteroi DC. Lodgepole pine forest. Beneath tree canopy. Locally common. *England 1430*.

Perideridia parishii (J.M. Coult. & Rose) A. Nelson & J.F. Macbr. subsp. latifolia (A. Gray) T.I. Chuang & Constance. Lodgepole and whitebark pine forests. Moist meadows. Occasional. *England 1458*.

†Podistera nevadensis (A. Gray) S. Watson. CNPS List 4. Alpine. Rocky exposed slopes. Uncommon. Wheeler Crest, *England 849*; summit of Red Mountain, *England 877*. Evidently the southernmost occurrences in the Sierra Nevada (CCH 2016; SEINet 2016).

Sphenosciadium capitellatum A. Gray. Lodgepole and whitebark pine forests. Mesic sites. Common. *England 405*.

Apocynaceae

Apocynum androsaemifolium L. Sagebrush scrub, lodgepole pine forest. Dry rocky slopes. Locally common. *England 319*.

Asteraceae

Achillea millefolium L. Lodgepole and whitebark pine forests. Meadows and other moist sunny habitats. Common. *England 286*.

AGERATINA OCCIDENTALIS (Hook.) R.M. King & H. Rob. Lodgepole and whitebark pine forests. Rock outcrops. Uncommon. Near springs above NW end of Long Lake, *England 1254*.

♦AGOSERIS AURANTIACA (Hook.) Greene var. AURANTIACA. Whitebark pine forest. Rare. Full locality data not provided: "Rock Creek Lake Basin. 10,750 ft." *Peirson 9164*.

AGOSERIS MONTICOLA Greene. Lodgepole and whitebark pine forests. Open sites. Uncommon. Intermediates between *A. monticola* and *A. parviflora* (Nutt.) D. Dietr. have been found. *England 700*, *Peirson 12772*.

ANTENNARIA CORYMBOSA E.E. Nelson. Lodgepole and whitebark pine forests. Moist meadows, small openings in understory. Occasional. *England 775*.

†ANTENNARIA PULCHELLA Greene. CNPS List 4. Whitebark pine forest, alpine. Seasonally moist depressions in rocky areas. Occasional. Mono Pass trail above Ruby Lake, *England 194*.

ANTENNARIA ROSEA Greene subsp. CONFINIS (Greene) R.J. Bayer. Lodgepole and whitebark pine forests, alpine. Meadows, various habitats. Common. *England 882*.

ARNICA CHAMISSONIS Less. Lodgepole and whitebark pine forests. Meadow margins. Locally common. *England 1097*.

ARNICA LANCEOLATA Nutt. subsp. PRIMA (Maguire) Strother & S.J. Wolf. Lodgepole and whitebark pine forests. Stream edges. Occasional. *England 706*.

ARNICA LONGIFOLIA D.C. Eaton. Whitebark pine forest. Edge of seasonally wet depression, among rocks. Rare. Patricia Lake area, *England 1246*.

ARNICA MOLLIS Hook. Whitebark pine forest. Moist banks of lakes. Uncommon. Heart Lake, *England 914*.

ARNICA NEVADENSIS A. Gray. Whitebark pine forest. Rocky slopes. Uncommon. Long Lake, *England 350*; Heart Lake, *Peirson 9596*.

ARNICA OVATA Greene. Whitebark pine forest, alpine. Rocky slopes. Occasional. *England 908*.

♦ARNICA PARRYI A. Gray. Lodgepole pine forest. Rare. Near Rock Creek Lake, *Robinson b83*.

ARTEMISIA CANA Pursh subsp. BOLANDERI (A. Gray) G.H. Ward. Lodgepole and whitebark pine forests. Meadows, moist drainages. Locally common. *England 464*.

ARTEMISIA DOUGLASIANA Besser. Riparian woodland. Mesic sites. Locally common. *England 701*.

ARTEMISIA DRACUNCULUS L. Alpine. Fellfield on moderately steep slope. Rare. Wheeler Crest, NW flank of Sherwin Peak, *England 857*.

ARTEMISIA LUDOVICIANA Nutt. subsp. INCOMPTA (Nutt.) D.D. Keck. Lodgepole and whitebark pine forests, alpine. Moist places in various habitats. Common. *England 1186*.

ARTEMISIA TRIDENTATA Nutt. subsp. VASEYANA (Rydb.) Beetle. Pinyon pine woodland, sagebrush scrub, Jeffrey, lodgepole and whitebark pine forests. Dry benches, slopes, various habitats. Common, often dominant. *England 562*.

CHAENACTIS ALPIGENA Sharsm. Whitebark pine forest, alpine. Rocky slopes. Occasional. *England 944*.

CHAENACTIS DOUGLASII (Hook.) Hook. & Arn. var. DOUGLASII. Pinyon pine woodland, Jeffrey, lodgepole and whitebark pine forests. Road edges, gravelly slopes. Common. *England 1340*.

CHRYSOTHAMNUS VISCIDIFLORUS (Hook.) Nutt. subsp. PUBERULUS (D.C. Eaton) H.M. Hall & Clem. Pinyon pine woodland, sagebrush scrub, Jeffrey and lodgepole pine forests. Open areas. Common. *England 1389*.

CIRSIUM ANDERSONII (A. Gray) Petr. Lodgepole pine forest. Uncommon. Along trail from Pine Grove Campground to Rock Creek Lake, *England 2194*.

CIRSIUM SCARIOSUM Nutt. var. AMERICANUM (A. Gray) D.J. Keil. Lodgepole and whitebark pine forests. Sandy/gravelly areas. Uncommon. Mosquito Flat, *Halperin 585B*; Hidden Lakes, *England 1384*.

CIRSIUM SCARIOSUM Nutt. var. CONGDONII (R.J. Moore & Frankton) D.J. Keil. Lodgepole and whitebark pine forests. Meadows, openings. Occasional. *England 1439*.

♦CREPIS ACUMINATA Nutt. Whitebark pine forest. Rare. Long Lake vicinity, *Peirson 9514*.

CREPIS NANA Richardson. Alpine. Rock crevices on talus slope. Rare. N base of Mount Morgan, *England 1053*.

DIETERIA CANESCENS (Pursh) Nutt. var. CANESCENS. Jeffrey, lodgepole and whitebark pine forests. Road edges, gravelly slopes. Common. *England 656*.

ERICAMERIA DISCOIDEA (Nutt.) G.L. Nesom. Sagebrush scrub, lodgepole and whitebark pine forests, alpine. Rocky slopes. Occasional. *England 1110*.

ERICAMERIA NAUSEOSA (Pursh) G.L. Nesom & G.I. Baird var. SPECIOSA (Nutt.) G.L. Nesom & G.I. Baird. Pinyon pine woodland, sagebrush scrub, Jeffrey and lodgepole pine forests. Roadsides, forest edges. Uncommon. Rock Creek Road at third creek crossing, *England 563*.

ERICAMERIA SUFFRUTICOSA (Nutt.) G.L. Nesom. Lodgepole and whitebark pine forests, alpine. Open sites. Locally common >9000 ft (2743 m). *England 1240*.

ERIGERON ALGIDUS Jeps. Whitebark pine forest, alpine. Rocky areas. Locally common. *England 686*.

ERIGERON BREWERI A. Gray var. BREWERI. Jeffrey and lodgepole pine forests. Dry rocky slopes. Uncommon. Rock Creek Road at second creek crossing, *England 420*.

ERIGERON CLOKEYI Cronquist var. PINZLIAE G.L. Nesom. Whitebark pine forest, alpine. Rocky areas. Occasional. *England 1040*.

ERIGERON COMPOSITUS Pursh. Lodgepole and whitebark pine forests, alpine. Rocky gravelly sites. Locally common >9000 ft (2743 m). *England 1000*.

ERIGERON COULTERI Porter. Lodgepole and whitebark pine forests. Stream margins, other wet areas. Locally common. *England 401*.

ERIGERON GLACIALIS (Nutt.) A. Nelson var. GLACIALIS. Lodgepole and whitebark pine forests. Moist sites. Locally common. *England 1237*.

ERIGERON LONCHOPHYLLUS Hook. Lodgepole and whitebark pine forests. Stream margins, moist areas. Uncommon. Francis Lake, *England 1126*.

ERIGERON PYGMAEUS (A. Gray) Greene. Whitebark pine forest, alpine. Rocky areas. Locally common. *England 831*.

♦ERIGERON TENER (A. Gray) A. Gray. Whitebark pine forest. Rare. S slope of Transverse Ridge, *Peirson 11289*.

ERIGERON VAGUS Payson. Alpine. Steep talus-covered slopes. Rare. Mount Morgan, *England 1060*.

ERIOPHYLLUM LANATUM (Pursh) J. Forbes var. INTEGRIFOLIUM (Hook.) Smiley. Whitebark pine forest, alpine. Rocky slopes where reddish granite dominates. Uncommon. Summit of Red Mountain, *England 883*; Tamarack Bench E of Dorothy Lake at base of Wheeler Ridge, *England 1506*.

EUCEPHALUS BREWERI (A. Gray) G.L. Nesom. Lodgepole pine forest. Beneath tree canopy in partial sunlight. Rare. Trail from Rock Creek Lake to Upper Pine Grove Campground, *England 436*.

*GAILLARDIA ARISTATA Pursh. Lodgepole pine forest. Road edges. Uncommon. Below East Fork day parking area, *England 1312*; near Aspen Campground, *Taylor 16896* (JEPS). Waif, possibly introduced at the same time as *Penstemon eatonii* var. *eatonii* (Plantaginaceae). Possibly escaped from cultivation or seeds brought in with gravel/soil used for road maintenance.

GNAPHALIUM PALUSTRE Nutt. Lodgepole pine forest. Moist areas, often in disturbed ground. Locally common. *England 1349*.

HIERACIUM HORRIDUM Fr. Whitebark pine forest. Rocky slopes. Occasional. *England 1282*.

♦HIERACIUM TRISTE Willd. ex Spreng. Whitebark pine forest. Rare. Gem Lakes area, *Peirson 10801*; Gem Lakes, *Howell 22819* (CAS).

HULSEA ALGIDA A. Gray. Alpine. Talus slopes, fellfields. Occasional. *England 936*.

MATRICARIA DISCOIDEA DC. Lodgepole pine forest. Gravelly areas disturbed by vehicle traffic. Uncommon. Rock Creek Lakes Resort, *England 925*. The location of *England 925* at ca. 9700 ft (2957 m) is >1000 ft (305 m) higher than previously documented for the state (Kern Plateau, Kern County [CCH 2016]).

♦MICROSERIS NUTANS (Hook.) Sch. Bip. Whitebark pine forest. Dry sandy rocky hillside. Rare. Ruby Lake, *Crafts 647* (UCD).

OREOSTEMMA ALPIGENUM (Torr. & A. Gray) Greene var. ANDERSONII (A. Gray) G.L. Nesom. Lodgepole and whitebark pine forests, alpine. Moist meadows, lake shores, wet depressions. Locally common. *England 1532*.

PACKERA CANA (Hook.) W.A. Weber & Á. Löve. Pinyon pine woodland, whitebark pine forest (likely also lodgepole pine forest). +/- steep dry rocky slopes. Occasional. *England 1507*.

PACKERA PAUCIFLORA (Pursh) Á. Löve & D. Löve. Whitebark pine forest. Moist meadows. Occasional. *England 1257*.

PACKERA WERNERIIFOLIA (A. Gray) W.A. Weber & Á. Löve. Alpine. Fell-fields. Uncommon. Mount Starr, *England 1035*.

PLEIACANTHUS SPINOSUS (Nutt.) Rydb. Jeffrey pine forest. Dry rocky slopes. Rare. W side of Rock Creek Road near second creek crossing, *England 422*.

PYRROCOMA APARGIOIDES (A. Gray) Greene. Lodgepole and whitebark pine forests, alpine. Open, +/- dry sites. Common. *England 1143*.

RAILLARDELLA ARGENTEA (A. Gray) A. Gray. Whitebark pine forest, alpine. Rocky gravelly sites. Locally common. *England 368*.

RAILLARDELLA SCAPOSA (A. Gray) A. Gray. Whitebark pine forest. Rocky gravelly sites. Uncommon. Ruby Lake area, *England 1309*.

SENECIO FREMONTII Torr. & A. Gray var. OCCIDENTALIS A. Gray. Alpine. Sheltered places among rocks. Uncommon. Mono Pass area, *England 943*.

SENECIO INTEGERRIMUS Nutt. var. EXALTATUS (Nutt.) Cronquist. Lodgepole and whitebark pine forests. Open sites. Occasional. *England 802*.

SENECIO SCORZONELLA Greene. Whitebark pine forest, alpine. Moist sites. Occasional. *England 636*.

SENECIO TRIANGULARIS Hook. Lodgepole and whitebark pine forest. Moist, partially shaded areas. Uncommon. Pools above and NW of Rock Creek Pack Station, *England 1524*.

SOLIDAGO ELONGATA Nutt. Lodgepole pine forest. Moist drainages. Uncommon. W side of road above East Fork Campground, *England 1437*.

SOLIDAGO MULTIRADIATA Aiton. Lodgepole and whitebark pine forests, alpine. Meadows, lake edges. Common. *England 313*.

SPHAEROMERIA CANA (D.C. Eaton) A. Heller. Whitebark pine forest, alpine. Rock outcrops. Occasional. *England 1148*.

STENOTUS ACAULIS (Nutt.) Nutt. Pinyon pine woodland. Rocky slopes. Rare. Along Sand Canyon Road, *England 750*.

STEPHANOMERIA EXIGUA Nutt. subsp. CORONARIA (Greene) Gottlieb. Pinyon pine woodland, Jeffrey pine forest. Dry slopes. Occasional. *England 660*.

STEPHANOMERIA TENUIFOLIA (Raf.) H.M. Hall. Lodgepole and whitebark pine forests. Dry rocky slopes. Uncommon. Along trail from Rock Creek Lodge to jct. with Hilton Lakes trail, *England 392*.

SYMPHYOTRICHUM CAMPESTRE (Nutt.) G.L. Nesom. Lodgepole pine forest. Meadow margins. Rare. Iris Meadow area, *England 576*.

SYMPHYOTRICHUM FOLIACEUM (Lindl. ex DC.) G.L. Nesom var. APRICUM (A. Gray) G.L. Nesom. Lodgepole and whitebark pine forests. Moist sites. Uncommon. Hilton Lakes trailhead parking area, *England 1345*.

SYMPHYOTRICHUM SPATHULATUM (Lindl.) G.L. Nesom var. SPATHULATUM. Lodgepole and whitebark pine forests. Meadows, seeps. Occasional. *England 577*.

*TARAXACUM OFFICINALE F.H. Wigg. Lodgepole and whitebark pine forests. Moist sites, trail edges, routes traversed by pack animals. Common. *England 749*.

†TONESTUS PEIRSONII (D.D. Keck) G.L. Nesom & D.R. Morgan. CNPS List 4. Whitebark pine forest, alpine. Rock crevices in outcrops. Uncommon. E side of Long Lake; Tamarack Lakes, *England 1195*. Type locality: "On Transverse Ridge," *Peirson s.n.* 5 Aug 1933 (UC).

*TRAGOPOGON DUBIUS Scop. Lodgepole pine forest. Road edges, creek banks. Uncommon. Iris Meadow area, *England 606*.

WYETHIA MOLLIS A. Gray. Jeffrey and lodgepole pine forests. Sunny openings. Occasional. *England 136*.

BETULACEAE

BETULA OCCIDENTALIS Hook. Riparian woodland. Mesic sites. Locally common <8500 ft (2591 m), often co-dominant with other riparian tree spp. *England 137*.

BORAGINACEAE

CRYPTANTHA ECHINELLA Greene. Pinyon pine woodland. Disturbed roadside. Rare. Along Rock Creek Road at first creek crossing, *England 739*.

†CRYPTANTHA GLOMERIFLORA Greene. CNPS List 4. Lodgepole and whitebark pine forests. Gravelly sites. Uncommon. Mosquito Flat along road below main parking lot, *England 1311*.

CRYPTANTHA MURICATA (Hook. & Arn.) A. Nelson & J.F. Macbr. var. DENTICULATA (Greene) I.M. Johnst. Pinyon pine woodland, Lodgepole pine forest. Roadsides. Uncommon. Construction staging area opposite Big Meadow Campground, *England 608*.

GREENEOCHARIS CIRCUMSCISSA (Hook. & Arn.) Rydb. var. CIRCUMSCISSA [*Cryptantha circumscissa* (Hook. & Arn.) I.M. Johnst. var. *circumscissa*]. Pinyon pine woodland, whitebark pine forest. Roadsides. Uncommon. Heart Lake area, *Peirson 10400*; along Rock Creek Road at first creek crossing, *England 247*.

HACKELIA FLORIBUNDA (Lehm.) I.M. Johnst. Lodgepole pine forest. Moist meadow. Rare. Big Meadow Campground vicinity, *England 613*.

♦HACKELIA MICRANTHA (Eastw.) J.L. Gentry. Whitebark pine forest. Rare. Shore of Ruby Lake, *Peirson 9132*.

LAPPULA REDOWSKII (Hornem.) Greene var. REDOWSKII. Lodgepole pine forest. Moist banks. Uncommon. Iris Meadow area, *England 604*.

OREOCARYA CONFERTIFLORA Greene [*Cryptantha confertiflora* (Greene) Payson]. Pinyon pine woodland. +/- steep rocky slopes. Uncommon. Along Rock Creek Road at first creek crossing, *England 164*.

OREOCARYA NUBIGENA Greene [*Cryptantha nubigena* (Greene) Payson]. Whitebark pine forest, alpine. Xeric, rocky exposed sites with coarse sandy/gravelly soils. Occasional. *England 1121*.

PLAGIOBOTHRYS COGNATUS (Greene) I.M. Johnst. Lodgepole pine forest. Gravelly parking area. Rare. Rock Creek Lakes Resort, *England 923*.

PLAGIOBOTHRYS HISPIDULUS (Greene) I.M. Johnst. Lodgepole pine forest. Open sunny meadows. Uncommon. Mosquito Flat, *Howell 22426* (CAS); along creek upstream from East Fork Campground area, *England 449*.

PLAGIOBOTHRYS KINGII (S. Watson) A. Gray var. HARKNESSII (Greene) Jeps. Pinyon pine woodland. Steep, unstable slope covered with loose talus. Rare. W of Rock Creek Road at third creek crossing, *England 257*.

BRASSICACEAE

BOECHERA DEPAUPERATA (A. Nelson & P.B. Kenn.) Windham & Al-Shehbaz. Lodgepole and whitebark pine forests, alpine. Open sites. Uncommon. On ridge dividing Tamarack Lakes and Buck Lake, *England 1208*.

♦BOECHERA DIVARICARPA (A. Nelson) Á. Löve & D. Löve. Whitebark pine forest. Rare. Heart Lake vicinity, *Peirson 9456*.

BOECHERA HOWELLII (S. Watson) Windham & Al-Shehbaz. Whitebark pine forest, alpine. +/- dry rocky areas. Locally common. *England 232*.

BOECHERA INYOENSIS (Rollins) Al-Shehbaz. Pinyon pine woodland, lodgepole and whitebark pine forests. Rock outcrops. Uncommon. Slope W of Heart Lake, *Peirson 12975*; near mouth of Rock Creek Canyon on steep W-facing slope, *England 130*.

♦BOECHERA LEMMONII (S. Watson) W.A. Weber. Whitebark pine forest, alpine. Uncommon. Shore of Ruby Lake near outlet, *Peirson 12976*; W slope of Mount Morgan, *Sharsmith 3014* (UC).

♦BOECHERA LYALLII (S. Watson) Dorn. Alpine. Rare. Morgan Pass, *Lorraine & Ferris 9295* (DS; determined by I. Al-Shehbaz in 2010).

♦BOECHERA PAUCIFLORA (Nutt.) Windham & Al-Shehbaz. Lodgepole pine forest. Rare. Along road near Rock Creek Lodge, *Halperin & Crafts 463* (UCD).

♦BOECHERA PAUPERCULA (Greene) Windham & Al-Shehbaz. Whitebark pine forest. Rare. Recess on E slope of Little Lakes Valley basin, *Peirson 10767*.

♦BOECHERA PENDULOCARPA (A. Nelson) Windham & Al-Shehbaz. Lodgepole pine forest. Rare. Mosquito Flat, *Howell 22368* (CAS; determined as "*Boechera pendulocarpa* × ?" by I. Al-Shehbaz in 2010).

♦Boechera pinetorum (Tidestr.) Windham & Al-Shehbaz. Lodgepole pine forest. Rare. Mosquito Flat, *Halperin 582A* (CAS).

♦Boechera platysperma (A. Gray) Al-Shehbaz. Whitebark pine forest. Rare. Between Box Lake and Long Lake, *Butler* & *Halperin 428* (CAS).

Boechera puberula (Nutt.) Dorn. Pinyon pine woodland. Dry rocky slopes. Rare. Along Sand Canyon Road, *England 753*.

Boechera repanda (S. Watson) Al-Shehbaz. Jeffrey pine and whitebark pine forests. Dry rocky slopes. Uncommon. Slope W of Heart Lake, *Peirson 10768*; Wheeler Ridge, *England 816*.

Boechera retrofracta (Graham) Á. Löve & D. Löve. Whitebark pine forest. Rocky slopes. Uncommon. S base of Transverse Ridge, *Peirson 12183* (JEPS); Ruby Lake, *England 1280.*

Boechera stricta (Graham) Al-Shehbaz. Lodgepole and whitebark pine forests. Moist partially shaded sites. Uncommon. W of Heart Lake along inlet stream from Ruby Lake, *England 1475*; near Hilton Lakes trailhead parking lot, *England 1347.*

†♦Boechera tularensis Windham & Al-Shehbaz. CNPS List 1B. Whitebark pine forest. Rare. Trail from Mosquito Flat to Ruby Lake, *Alexander*, *Bailey* & *Urban 847A*, *B* (NMC).

*Capsella bursa-pastoris (L.) Medik. Lodgepole pine forest. Disturbed road edge. Rare. Above Rock Creek Lake just below pack station, *England 1356*.

Caulanthus sp. ("*Caulanthus sierrae*" R.E. Buck ined.). Pinyon pine woodland. Dry rocky sites. Uncommon. Rock Creek Road, 0.25 mile S of jct. with U.S. Hwy 395, *Bacigalupi 3809*; W side of Rock Creek Road at canyon mouth, *England 118*. This *Caulanthus* is easily mistaken for *C. pilosus* S. Watson. Roy E. Buck in the 1993 Jepson Manual treatment includes a remark under *C. pilosus*: "Pls from c&s SNH with dark purple sepals and seeds > 2 mm are an undescribed sp."

Descurainia californica (A. Gray) O.E. Schulz. Lodgepole and whitebark pine forests. Open areas, +/- dry. Occasional. *England 285*.

Draba albertina Greene. Whitebark pine forest, alpine. Moist banks, damp areas with other herbaceous spp. Occasional. *England 149*.

Draba breweri S. Watson. Whitebark pine forest, alpine. Rock outcrops with pockets of sandy/gravelly soil. Locally common. *England 180*.

†♦Draba cana Rydb. CNPS List 2. Whitebark pine forest. Rare. Heart Lake area, *Peirson 13523*.

Draba densifolia Nutt. Alpine. Fellfields. Uncommon. Mono Mesa, *Howell 22696a* (CAS); Wheeler Crest, *England 841a*.

Draba lemmonii S. Watson. Whitebark pine forest, alpine. Crevices in rock outcrops, fell-fields. Occasional >11,000 ft (3353 m). *England 512*.

♦Draba novolympica Payson & H. St. John. Alpine. Fellfields on unglaciated plateau. Rare. Mono Mesa, *Thomas 9731* (DS). Collected in 1961, determined by I. Al-Shehbaz in 2007. Possibly the most southerly occurrence in North America (CCH 2016; SEINet 2016).

Draba oligosperma Hook. Whitebark pine forest, alpine. Rock outcrops, talus slopes, fellfields. Occasional >11,000 ft (3353 m). *England 764a*.

†Draba praealta Greene. CNPS List 2. Whitebark pine forest. Rocky slope. Rare. Trail to Ruby Lake/Mono Pass, ca. 10,650 ft (3246 m). Not recorded by Peirson (1938, 1942) or Howell (1946). *England 146*.

†Draba sierrae Sharsm. CNPS List 1B. Alpine. Occasional. Crevices in rock outcrops. Type locality: summit of divide leading from Mono Pass to Mount Mills, *Sharsmith 3058* (UC); Mono Pass Trail N of Ruby Lake, *England 189*.

Erysimum perenne (S. Watson ex Coville) Abrams. Lodgepole pine forest transition to whitebark pine forest, alpine. Rocky areas. Occasional. *England 1614*.

Lepidium virginicum L. subsp. virginicum. Jeffrey and lodgepole pine forests. Road edges on compacted/disturbed soils. Occasional. *England 276*.

Rorippa curvisiliqua (Hook.) Bessey ex Britton. Whitebark pine forest, alpine. Moist depressions, lake shores, pool margins. Occasional. *England 347*.

†Subularia aquatica L. subsp. americana G.A. Mulligan & Calder. CNPS List 4. Riparian woodland, whitebark pine forest. Calm waters of streams and lakes. Uncommon. Heart Lake, *Grossenbacher* & *Smith 1112* (UCD); along creek upstream of Rock Creek Lodge, *England 690*. Heart Lake collection evidently the only record for Inyo County (CCH 2016; SEINet 2016).

Cactaceae

Opuntia polyacantha Haw. var. hystricina (Engelm. & J.M. Bigelow) B.D. Parfitt. Jeffrey pine forest. Dry slopes. Uncommon. Rock Creek Road below third creek crossing, *England 929*.

Caprifoliaceae

Lonicera cauriana Fernald. Lodgepole pine forest. Wet meadow. Rare. Between upper and lower Pine Grove campgrounds, *England 778*. Evidently the only record for Mono County and the eastern Sierra Nevada (CCH 2016; SEINet 2016).

♦Lonicera conjugialis Kellogg. Lodgepole pine forest transition to whitebark pine forest. Rare. Mosquito Flat, *Bowers 701*. Evidently the only record for Inyo County (CCH 2016; SEINet 2016).

Lonicera involucrata (Richardson) Spreng. var. involucrata. Riparian woodland. Moist slopes beneath tree canopy, near water. Uncommon. Trail from Rock Creek Lake downstream to Rock Creek Lodge, *England 326*.

Symphoricarpos rotundifolius A. Gray var. rotundifolius. Aspen groves, Jeffrey, lodgepole and whitebark pine forests. Rocky slopes. Common. *England 328*.

Caryophyllaceae

Cerastium arvense L. subsp. strictum Gaudin. Whitebark pine forest. Wet area in shelter of rocks. Rare. Along trail at Heart Lake foot bridge. Not recorded by Peirson (1938, 1942) or Howell (1946). *England 1499*. Evidently the only record for *C. arvense* in Inyo County and in the eastern Sierra Nevada. There are few collection records from the mountain range (CCH 2016; SEINet 2016).

Eremogone ferrisiae (Abrams) R.L. Hartm. & Rabeler. Pinyon pine woodland. Dry rocky slopes. Uncommon. Along Sand Canyon Road, *England 785*.

Eremogone kingii (S. Watson) Ikonn. var. glabrescens (S. Watson) Dorn. Whitebark pine forest, alpine. Rocky slopes. Occasional. *England 1505*.

Minuartia nuttallii (Pax) Briq. var. gracilis (B.L. Rob.) Rabeler & R.L. Hartm. Whitebark pine forest, alpine. Rock outcrops, fellfields. Occasional. *England 366*.

†♦Minuartia obtusiloba (Rydb.) House. CNPS List 4. Alpine. Fellfields on unglaciated plateau. Rare. Mono Mesa, *Howell 22724* (NY).

Minuartia rubella (Wahlenb.) Hiern. Alpine. Talus slopes, fellfields. Uncommon, only recorded >11,900 ft (3627 m). Mono Mesa, *Howell 22774* (DS); Mount Morgan, *England 1067a*.

†Minuartia stricta (Sw.) Hiern. CNPS List 2. Alpine. Talus slopes, fellfields. Uncommon, only recorded >11,900 ft (3627 m). Mono Mesa, *Howell 22773* (NY); Mount Morgan, *England 1067b*.

Sagina saginoides (L.) H. Karst. Whitebark pine forest, alpine. Moist sandy/gravelly areas, among rocks. Occasional. *England 1177*.

Silene bernardina S. Watson. Sagebrush scrub, lodgepole and whitebark pine forests. Rocky slopes. Occasional. *England 1467*.

Silene menziesii Hook. Whitebark pine forest. Rocky slopes. Uncommon. Below Ruby Lake, *Peirson 9448*; NW corner of Long Lake, *England 1414*.

Silene sargentii S. Watson. Whitebark pine forest, alpine. Rocky slopes, fellfields. Occasional. *England 884*.

*Spergularia rubra (L.) J. Presl & C. Presl. Lodgepole pine forest. Road shoulders. Occasional. Rock Creek Road near Pine Grove Campground, *Barbe 3482* (UC); road between Mosquito Flat and pack station, *England 688*. The latter evidently the only record for Inyo County; there is a collection from Red Rock Canyon, Kern County, that was mislabeled as Inyo County (*Taylor 114*, MO) (CCH 2016; SEINet 2016).

STELLARIA CALYCANTHA (Ledeb.) Bong. Lodgepole and whitebark pine forests. Mesic sites. Uncommon. Hilton Lakes trail at Wilderness boundary, *England 307*.

STELLARIA LONGIPES Goldie subsp. LONGIPES. Lodgepole and whitebark pine forests. Lake edges, springs, other wet areas. Occasional. *England 746*.

♦STELLARIA UMBELLATA Turcz. ex Kar. & Kir. Lodgepole pine forest transition to whitebark pine forest. Rare. Mosquito Flat, *Howell 22335* (CAS).

CHENOPODIACEAE

CHENOPODIUM ATROVIRENS Rydb. Lodgepole and whitebark pine forests. Open places, often on disturbed soils. Uncommon. Big Meadow Campground vicinity, *England 615*.

CHENOPODIUM DESSICATUM A. Nelson. Lodgepole pine forest. Road edges. Rare. Parking area above Hilton Lakes trailhead, *England 1352*.

CHENOPODIUM FREMONTII S. Watson. Pinyon pine woodland. Dry slopes. Rare. Along Rock Creek Road at first creek crossing, *England 416*.

MONOLEPIS NUTTALLIANA (Schult.) Greene. Lodgepole pine forest. Disturbed ground in horse pasture. Rare. Rock Creek Lodge at the corrals, *England 565*.

*SALSOLA GOBICOLA Iljin. Lodgepole pine forest. Gravelly disturbed sites. Rare. Construction staging area opposite Big Meadow Campground, *England 610*. Tentative identification (immature specimen).

CORNACEAE

CORNUS SERICEA L. subsp. SERICEA. Riparian woodland. Streambanks. Occasional <8500 ft (2591 m). Rock Creek Road at first creek crossing, *England 251*.

CRASSULACEAE

RHODIOLA INTEGRIFOLIA Raf. subsp. INTEGRIFOLIA. Whitebark pine forest, alpine. Lake margins, talus slopes. Occasional. *England 345*.

SEDUM LANCEOLATUM Torr. Whitebark pine forest. Rocky slopes. Uncommon. Above S shore Ruby Lake (*Peirson 9459*); above NE shore Box Lake, *England 1519*.

EHRETIACEAE

♦TIQUILIA NUTTALLII (Hook.) A.T. Richardson. Lodgepole pine forest. Uncommon. Iris Meadow, *Howell*, *Fuller* & *Barbe 54493* (CAS).

ERICACEAE

ARCTOSTAPHYLOS PATULA Greene. Lodgepole pine forest transition to whitebark pine forest. E-facing rocky slopes. Occasional. Along trail to Hilton Lakes, *England 768*.

CASSIOPE MERTENSIANA (Bong.) G. Don (these plants can be ascribed to subsp. *californica* Piper). Whitebark pine forest, alpine. Rock outcrops. Occasional. *England 1590*.

♦GAULTHERIA HUMIFUSA (Graham) Rydb. Whitebark pine forest. Rare. Gem Lakes, *Howell 22824* (DS).

KALMIA POLIFOLIA Wangenh. Whitebark pine forest, alpine. Moist meadows, lake shores, boggy sites. Locally common. *England 145*.

ORTHILIA SECUNDA (L.) House. Lodgepole and whitebark pine forests. Shaded sites beneath tree canopy. Uncommon. Shore of Heart Lake, *Peirson 11294*; Rock Creek Lake inlet along stream, *England 1476a*.

PHYLLODOCE BREWERI (A. Gray) Maxim. Whitebark pine forest, alpine. Moist rocky slopes, meadow margins. Locally common. *England 210*.

PYROLA DENTATA Sm. Whitebark pine forest. Sheltered places on dry rocky slopes. Uncommon. Wheeler Ridge, *England 824*; S slope of Red Mountain, *England 892*.

PYROLA MINOR L. Lodgepole pine forest. Moist sites beneath tree canopy. Uncommon. Trail from Rock Creek Lake to Upper Pine Grove Campground, *England 434*.

RHODODENDRON COLUMBIANUM (Piper) Harmaja. Lodgepole and whitebark pine forests, alpine. Lake shores, moist rocky slopes. Locally common >9000 ft (2743 m). *England 905*.

VACCINIUM CESPITOSUM Michx. Whitebark pine forest. Meadow margins, moist rocky areas. Locally common. *England 727*.

VACCINIUM ULIGINOSUM L. subsp. OCCIDENTALE (A. Gray) Hultén. Lodgepole and whitebark pine forests. Lake shores, wet boggy sites. Locally common. *England 573*.

FABACEAE

†ASTRAGALUS KENTROPHYTA A. Gray var. DANAUS (Barneby) Barneby. CNPS List 4. Alpine. Fellfields. Rare. Wheeler Crest, W flank of Sherwin Peak, *England 862*.

ASTRAGALUS LENTIGINOSUS Douglas var. INEPTUS (A. Gray) M.E. Jones. Whitebark pine forest. Rocky slopes. Uncommon. Heart Lake, *Peirson 9155*; Francis Lake, *England 1050*.

†ASTRAGALUS MONOENSIS Barneby. CNPS List 1B; CA-Rare. Lodgepole pine forest. Road shoulders, +/- disturbed sites with coarse, dry gravelly soils. Uncommon. Palisade day parking area, *England 1647*; along Rock Creek Road between Big Meadow and Palisade campgrounds, *England 291*. The latter occurrence on the W road shoulder near pavement edge, collected prior to 2015 construction of bicycle lane. This locality was revisited in Aug 2018 and only three individuals were located (13 plants were recorded prior to the road work).

ASTRAGALUS PURSHII Douglas var. LECTULUS (S. Watson) M.E. Jones. Pinyon pine woodland, Jeffrey, lodgepole and whitebark pine forests, alpine. Road shoulders, dry rocky slopes. Occasional. *England 114*.

ASTRAGALUS WHITNEYI A. Gray var. WHITNEYI. Pinyon pine woodland, alpine. Dry rocky slopes. Uncommon. Red Mountain summit, *England 875*; along Sand Canyon Road, *England 783*.

LATHYRUS LANSZWERTII Kellogg var. LANSZWERTII. Jeffrey and lodgepole pine forests. Damp sites. Uncommon. Rock Creek Road near third creek crossing, *England 741*; Big Meadow area, *England 287*. Evidently the only record for Mono County (CCH 2016; SEINet 2016).

LUPINUS ARGENTEUS Pursh var. HETERANTHUS (S. Watson) Barneby. Pinyon pine woodland. Dry slopes. Uncommon. W side of Rock Creek Road at first creek crossing, *England 248*.

LUPINUS ARGENTEUS Pursh var. MONTIGENUS (A. Heller) Barneby. Lodgepole and whitebark pine forests. Dry slopes. Occasional. *England 1102*. Some specimens with spreading hairs on stem approach var. *palmeri* (S. Watson) Barneby.

LUPINUS LEPIDUS Douglas ex Lindl. var. CONFERTUS (Kellogg) C.P. Sm. Lodgepole and whitebark pine forests. Meadows, moist areas. Locally common, ubiquitous in Little Lakes Valley. *England 553*. Collections from the watershed that were historically identified as *L. gracilentus* Greene (a CNPS List 1B species [2018]) are *L. lepidus* var. *confertus*. My determinations are based in part on examination of the original material of *L. gracilentus* collected from Tuolumne County by Chestnut & Drew in 1889.

♦LUPINUS LEPIDUS Douglas ex Lindl. var. RAMOSUS Jeps. Lodgepole pine forest. Rare. Rock Creek Lake, *Crafts* & *Halperin 445* (UCD).

†LUPINUS PADRE-CROWLEYI C.P. Sm. CNPS List 1B; CA-Rare. Whitebark pine forest. Dry slopes. Rare. Top of Wheeler Ridge ca. 150 m N of Wheeler Ridge Mine Road, *England 809*.

LUPINUS PRATENSIS A. Heller var. PRATENSIS. Lodgepole pine forest. Moist sites. Occasional. *England 1426*.

TRIFOLIUM LONGIPES Nutt. subsp. HANSENII (Greene) J.M. Gillett. Lodgepole pine forest. Moist sites in understory. Occasional. *England 748*.

TRIFOLIUM MONANTHUM A. Gray subsp. MONANTHUM. Lodgepole and whitebark pine forests, alpine. Margins of lakes and streamlets, moist banks. Common. *England 1127*.

*TRIFOLIUM REPENS L. Lodgepole pine forest. Road shoulders. Rare. Near Rock Creek Pack Station, *England 1346*.

TRIFOLIUM WORMSKIOLDII Lehm. Lodgepole pine forest. Wet drainage. Rare. Along Rock Creek Road just S of Inyo/Mono county line, *England 1424*.

FAGACEAE

CHRYSOLEPIS SEMPERVIRENS (Kellogg) Hjelmq. Lodgepole and whitebark pine forests. Steep dry rocky E-facing slopes. Occasional >9000 ft (2743 m). *England 390.*

GENTIANACEAE

♦COMASTOMA TENELLUM (Rottb.) Toyok. Whitebark pine forest. Uncommon. Mosquito Flat, *Howell 22486* (CAS); Heart Lake meadow, *Peirson 9482*.

FRASERA PUBERULENTA Davidson. Lodgepole and whitebark pine forests. Open areas with decomposing granite soils. Uncommon. Palisade day parking area, *England 320*; W slope of Wheeler Ridge, *England 868.*

FRASERA SPECIOSA Douglas ex Griseb. Lodgepole and whitebark pine forests. Moist sites on slopes. Uncommon. Spring-fed pools above and NW of Rock Creek Pack Station, *England 1523.*

GENTIANA NEWBERRYI A. Gray var. TIOGANA (A. Heller) J.S. Pringle. Whitebark pine forest, alpine. Moist meadows. Locally common. *England 371*.

GENTIANELLA AMARELLA (L.) Börner subsp. ACUTA (Michx.) J.M. Gillett. Whitebark pine forest. Moist, open sites. Uncommon. W of Heart Lake, *Peirson 9142*; NW shore Long Lake, *England 1226*.

GENTIANOPSIS HOLOPETALA (A. Gray) H.H. Iltis. Lodgepole and whitebark pine forests, alpine. Moist meadows. Locally common >9000 ft (2743 m). *England 442*.

♦GENTIANOPSIS SIMPLEX (A. Gray) H.H. Iltis. Whitebark pine forest. Rare. Not recorded by Peirson (1938, 1942) or Howell (1946). Heart Lake, *Butler s.n.* Jul 1931 (PASA).

GERANIACEAE

GERANIUM RICHARDSONII Fisch. & Trautv. Lodgepole and whitebark pine forests. Stream margins, wet sites. Occasional. *England 225*.

GROSSULARIACEAE

RIBES CEREUM Douglas var. CEREUM. Aspen groves, lodgepole and whitebark pine forests, alpine. Rocky slopes. Common. *England 125*.

♦RIBES INERME Rydb. var. INERME. Whitebark pine forest. Rare. W of Heart Lake, *Peirson 9136*.

RIBES MONTIGENUM McClatchie. Lodgepole and whitebark pine forests, alpine. Damp +/- sheltered sites. Common. *England 263*.

HYDRANGEACEAE

†JAMESIA AMERICANA Torr. & A. Gray var. ROSEA Purpus ex C.K. Schneid. CNPS List 4. Whitebark pine forest, alpine. Rock outcrops. Uncommon. Trail to Mono Pass/Ruby Lake, *England 933*; Tamarack Lakes, *England 1181*.

HYDROPHYLLACEAE

NEMOPHILA SPATULATA Coville. Jeffrey and lodgepole pine forests. Roadsides on sandy/gravelly soils. Uncommon. Along Rock Creek Road, *Bacigalupi & Constance 3806* (JEPS); Rock Creek Lakes Resort parking area, *England 1486*.

PHACELIA BICOLOR Torr. ex S. Watson. Pinyon pine woodland, Jeffrey and lodgepole pine forests. Open sites with sandy/gravelly soils. Occasional. *England 119*.

PHACELIA HASTATA Douglas ex Lehm. var. COMPACTA (Brand) Cronquist. Whitebark pine forest, alpine. Dry slopes. Locally common. *England 1172*.

PHACELIA HUMILIS Torr. & A. Gray var. HUMILIS. Lodgepole pine forest. Disturbed road shoulder. Rare. Along Rock Creek Road near Big Meadow Campground, *England 1481*.

PHACELIA RAMOSISSIMA Douglas ex Lehm. Pinyon pine woodland, lodgepole pine forest. Partially shaded areas on dry slopes, road shoulders. Uncommon. Rock Creek Road just above Big Meadow Campground entrance, *England 1464*.

HYPERICACEAE

HYPERICUM ANAGALLOIDES Cham. & Schltdl. Lodgepole and whitebark pine forests. Seeps, moist lake edges. Occasional. Heart Lake, *Peirson 9464*; W edge of Rock Creek Road just above Inyo/Mono county line, *England 1452*.

LAMIACEAE

MONARDELLA ODORATISSIMA Benth. subsp. GLAUCA (Greene) Epling. Sagebrush scrub, lodgepole and whitebark pine forests, alpine. Dry rocky slopes. Common. *England 283*.

MONARDELLA ODORATISSIMA Benth. subsp. PALLIDA (A. Heller) Epling. Lodgepole pine forest. Beneath tree canopy in partial sunlight. Rare. Trail from Rock Creek Lake to Upper Pine Grove Campground. *England 437*.

LINACEAE

LINUM LEWISII Pursh var. LEWISII. Lodgepole pine forest. Roadside in damp site. Rare. Rock Creek Road below East Fork day parking area, *England 1250*.

LOASACEAE

MENTZELIA CONGESTA Torr. & A. Gray. Pinyon pine woodland. Dry rocky slopes. Uncommon. W of Rock Creek Road at third creek crossing, *England 155*.

MALVACEAE

*MALVA NEGLECTA Wallr. Lodgepole pine forest. Road shoulder. Rare. Near Rock Creek Pack Station, *England 1354*.

MENYANTHACEAE

♦MENYANTHES TRIFOLIATA L. Whitebark pine forest. Rare. Heart Lake area, *Peirson s.n.* 22 Aug 1933.

Montiaceae

†Calyptridium pygmaeum Parish ex Rydb. CNPS List 1B. Lodgepole and whitebark pine forests. Open sites with loosely compacted, sometimes disturbed sandy-gravelly soils. Uncommon, 9700–10,450 ft (2957–3185 m). Heart Lake, *Peirson 13457*, *England 1490* & *1518*; Rock Creek Lakes Resort, *England 921*; Rock Creek Lake along road to campground, *England 1645a*.

Calyptridium roseum S. Watson. Lodgepole and whitebark pine forests. Gentle slopes, open sites with +/- dry sandy/gravelly soils. Uncommon. Heart Lake, *Peirson 11269*; W slope of Wheeler Ridge along Sand Canyon Road, *England 758*.

Calyptridium umbellatum (Torr.) Greene. Lodgepole and whitebark pine forests, alpine. Open sandy/gravelly flats. Common. *England 179*.

Lewisia glandulosa (Rydb.) S. Clay. Alpine. Moist gravelly flats and depressions. Uncommon. Mono Pass, *Peirson 9440*; Red Mountain summit, *England 885*.

♦Lewisia nevadensis (A. Gray) B.L. Rob. Whitebark pine forest. Uncommon. Mono Pass Trail above Ruby Lake, *Howell 22802* (CAS); meadows W of Long Lake, *Papenhagen 791* (CAS).

Lewisia pygmaea (A. Gray) B.L. Rob. Lodgepole and whitebark pine forests. Moist gravelly flats and depressions. Occasional. *England 723*.

Montia chamissoi (Spreng.) Greene. Lodgepole and whitebark pine forests. Wet edges of seeps and streamlets, moist drainages. Occasional. *England 712*.

Namaceae

Nama densa Lemmon var. densa. Lodgepole pine forest. Dry sandy/gravelly site on disturbed soils. Rare. East Fork day parking area, *England 322*.

Nyctaginaceae

Abronia turbinata S. Watson. Pinyon pine woodland. Dry gravelly slopes. Uncommon. Rock Creek Road at first creek crossing, *England 735*.

Onagraceae

Camissonia pubens (S. Watson) P.H. Raven. Pinyon pine woodland. Steep, dry rocky slope. Rare. Rock Creek Road pullout just above third creek crossing, *England 157*.

Chamerion angustifolium (L.) Holub subsp. circumvagum (Mosquin) Hoch. Jeffrey, lodgepole and whitebark pine forests. Rocky places in partial shade. Common. *England 1235*.

Chylismia claviformis (Torr. & Frém.) A. Heller subsp. lancifolia (A. Heller) W.L. Wagner & Hoch. Pinyon pine woodland. Dry rocky slopes. Uncommon. Rock Creek Road at first creek crossing, *England 736*.

Epilobium anagallidifolium Lam. Lodgepole and whitebark pine forests, alpine. Moist sites. Common. *England 680*.

Epilobium ciliatum Raf. subsp. ciliatum. Lodgepole and whitebark pine forests. Moist sites. Uncommon. Big Meadow Campground vicinity, *England 612*.

♦Epilobium ciliatum Raf. subsp. glandulosum (Lehm.) Hoch & P.H. Raven. Lodgepole pine forest. Rare. Along creek N of Rock Creek Lake, *Robinson b121*.

♦Epilobium glaberrimum Barbey subsp. fastigiatum (Nutt.) Hoch & P.H. Raven. Whitebark pine forest. Uncommon. Between Ruby Lake and Mosquito Flat, *Howell 22808*; W shore Ruby Lake, *Peirson 9130*.

♦Epilobium glaberrimum Barbey subsp. glaberrimum. Lodgepole pine forest. Rare. Rock Creek Lodge, *H. & M. Lewis 1234*.

Epilobium hornemannii Reichb. subsp. hornemannii. Lodgepole and whitebark pine forests. Moist sites. Uncommon. Below Ruby Lake, *Peirson 9597*; trail to Hilton Lakes at Wilderness boundary, *England 305*.

♦Epilobium lactiflorum Hausskn. Lodgepole pine forest transition to whitebark pine forest. Rare. Mosquito Flat, *Howell 22233*.

Epilobium obcordatum A. Gray. Whitebark pine forest, alpine. Rock outcrops. Occasional. *England 1171*.

Epilobium oregonense Hausskn. Whitebark pine forest. Uncommon. Moist sites. Near Gem Lakes, *Howell 22816*; below Ruby Lake, *Peirson 9662*, *England 931*.

♦Epilobium saximontanum Hausskn. Lodgepole pine forest transition to whitebark pine forest. Rare. Mosquito Flat, *Howell 22234*.

Gayophytum decipiens H. Lewis & Szweyk. Whitebark pine forest. Sandy flats. Uncommon. Heart Lake area, *Peirson 12176*; near Hidden Lakes, *England 1380*.

Gayophytum diffusum Torr. & A. Gray subsp. parviflorum H. Lewis & Szweyk. Jeffrey, lodgepole and whitebark pine forests. +/- dry open areas. Uncommon. W shore Ruby Lake, *Peirson 9127*; along Rock Creek Road at second creek crossing, *England 277*.

Gayophytum heterozygum H. Lewis & Szweyk. Lodgepole pine forest. Dry slopes. Uncommon. Rock Creek Lodge area, *Crafts & Halperin 418*; W slope of Wheeler Ridge above Sand Canyon Road, *England 526*.

Gayophytum racemosum Torr. & A. Gray. Whitebark pine forest. Dry sandy/gravelly areas. Uncommon. Heart Lake area, *Peirson 12176* (JEPS); W slope of Wheeler Ridge above Sand Canyon Road, *England 804*.

Oenothera elata Kunth subsp. hirsutissima (S. Watson) W. Dietr. Lodgepole pine forest. Roadsides. Uncommon. Rock Creek Road below Aspen Campground, *England 425*.

Orobanchaceae

Aphyllon fasciculatum (Nutt.) Torr. & A. Gray. Jeffrey, lodgepole and whitebark pine forests. Dry rocky slopes. Uncommon. Heart Lake, *Peirson 11281*; N of Rock Creek Road at third creek crossing, *England 1517*.

Castilleja applegatei Fernald subsp. pallida (Eastw.) T.I. Chuang & Heckard. Whitebark pine forest. Dry rocky slopes. Locally common. *England 1260*.

Castilleja chromosa A. Nelson. Pinyon pine woodland. Dry rocky slopes. Rare. Ridgetop above and W of Rock Creek Road, SW of French Campground, *England 780*.

Castilleja lemmonii A. Gray. Whitebark pine forest, alpine. Moist meadows, stream banks. Occasional. *England 1290*.

Castilleja linariifolia Benth. Sagebrush scrub, lodgepole and whitebark pine forests. Dry rocky slopes. Locally common to ca. 10,000 ft (3048 m). *England 1406*.

Castilleja miniata Douglas ex Hook. subsp. miniata. Lodgepole and whitebark pine forests. Moist sites. Locally common. *England 1086*.

Castilleja nana Eastw. Whitebark pine forest, alpine. Gravelly flats, fellfields. Locally common. *England 881*.

Castilleja peirsonii Eastw. Whitebark pine forest. Moist meadows. Uncommon, found >10,500 ft (3200 m). Type locality: Chickenfoot Lake area, *Peirson 9078*; Long Lake, *England 353*.

Cordylanthus kingii S. Watson subsp. helleri (Ferris) T.I. Chuang & Heckard. Pinyon pine woodland, sagebrush scrub. Dry slopes, open areas. Uncommon. Along Sand Canyon Road, *England 787*.

Pedicularis attollens A. Gray. Whitebark pine forest, alpine. Moist meadows, wet depressions in fellfields. Locally common. *England 1175*.

Pedicularis groenlandica Retz. Lodgepole and whitebark pine forests. Mesic to very wet sites. Occasional. *England 896*.

Pedicularis semibarbata A. Gray. Lodgepole pine forest. Partly shaded sites beneath tree canopy. Uncommon. Mosquito Flat, *Howell 22362*; drainage N of Serene Lake, *England 1487*.

Papaveraceae

Argemone munita Durand & Hilg. Pinyon pine woodland, Jeffrey pine forest. Dry slopes, roadsides. Occasional. *England 256*.

Parnassiaceae

Parnassia palustris L. Whitebark pine forest. Wet stream banks. Uncommon. Heart Lake area, *Peirson 9148*; Gem Lakes, *England 519*.

Phrymaceae

Diplacus leptaleus (A. Gray) G.L. Nesom. Whitebark pine forest. Meadow edges, damp sites with loosely compacted soils. Occasional. Along trail between Marsh Lake and Heart Lake, *England 915*.

Diplacus mephiticus (Greene) G.L. Nesom. Lodgepole and whitebark pine forests. Dry rocky slopes. Uncommon. W slope of Wheeler Ridge above Sand Canyon Road, *England 814*.

Erythranthe breweri (Greene) G.L. Nesom & N.S. Fraga. Whitebark pine forest. Meadow edges, damp sites with loosely compacted soils. Occasional. Serene Lake, *England 488*.

Erythranthe guttata (Fisch. ex DC.) G.L. Nesom. Riparian woodland, lodgepole pine forest. Stream banks, seeps. Occasional. *England 433*.

♦Erythranthe lewisii (Pursh) G.L. Nesom & N.S. Fraga. Lodgepole pine forest. Seeps and other moist sites. Uncommon. "Rock Creek from Tom's Place to 11,000 ft," *Woglum 850*; Rock Creek Road just below Mono/Inyo county line, *Barbe*, *Howell & Fuller 3534* (CDA).

Erythranthe primuloides (Benth.) G.L. Nesom & N.S. Fraga. Whitebark pine forest, alpine. Moist meadows, wet depressions. Locally common. *England 200*.

Erythranthe suksdorfii (A. Gray) N.S. Fraga. Whitebark pine forest. Damp sites with loosely compacted soils. Occasional. *England 204*.

Erythranthe tilingii (Regel) G.L. Nesom. Lodgepole and whitebark pine forests, alpine. Stream banks, seeps, wet depressions. Locally common >9000 ft (2743 m). *England 1533*.

Plantaginaceae

Callitriche heterophylla Pursh var. bolanderi (Hegelm.) Fassett. Lodgepole and whitebark pine forests. Pools, streams. Partially to fully submerged. Uncommon. Below Heart Lake, *Peirson 10789*; Tamarack Bench at terminus of Sand Canyon Road, *England 541*.

Collinsia parviflora Lindl. Lodgepole and whitebark pine forests. Moist banks. Occasional. *England 874*.

Hippuris vulgaris L. Lodgepole pine forest. Pools. Partially submerged. Rare. Robust colony in large pool ca. 2–3 ft (0.6–0.9 m) deep. Tamarack Bench at terminus of Sand Canyon Road, *England 538*.

†Penstemon cinicola D.D. Keck. CNPS List 4. Lodgepole and whitebark pine forests. Meadows. Uncommon. Near jct. of Sand Canyon Road and Wheeler Ridge Mine Road, *England 1401*. Also documented from Francis Lake, Hidden Lakes and Red Mountain vicinity by England. Determinations confirmed by N. Holmgren. Evidently first records for the eastern Sierra Nevada (CCH 2016; SEINet 2016).

Penstemon davidsonii Greene var. davidsonii. Whitebark pine forest, alpine. Rock outcrops. Occasional. *England 859*. Intermediates between *P. newberryi* var. *newberryi* and *P. davidsonii* var. *davidsonii* have also been documented (*England 355*, *1583; Holmgren 2932* [UC]).

*Penstemon eatonii A. Gray var. eatonii. Lodgepole pine forest. Uncommon. Roadsides. Along Rock Creek Road near Aspen Campground, *Taylor 16893* (JEPS); along Rock Creek Road near Iris Meadow Campground entrance, *England 1482*. Waif, possibly introduced along with *Gaillardia aristata* (Asteraceae). Possibly escaped from cultivation or sown from wildflower seed mix. *Penstemon eatonii* var. *eatonii* is native to the Mojave Desert mountains in California, and is also known from Idaho, Wyoming and New Mexico (Wetherwax and Holmgren 2012).

Penstemon heterodoxus A. Gray var. heterodoxus. Lodgepole and whitebark pine forests, alpine. Dry slopes, meadow edges. Common. *England 297*.

Penstemon newberryi A. Gray var. newberryi. Whitebark pine forest. Rock outcrops. Locally common. *England 1261*.

†Penstemon papillatus J.T. Howell. CNPS List 4. Pinyon pine woodland, lodgepole and whitebark pine forests. Dry rocky slopes. Uncommon. W slope of Wheeler Ridge, *England 782*. Also observed in East Fork Campground vicinity and along switchbacks of trail between Pine Grove Campground and Hilton Lakes trail.

Penstemon patens (M.E. Jones) N.H. Holmgren. Pinyon pine woodland. Dry slopes and flats. Uncommon. Canyon mouth on steep slope above Rock Creek Road, *England 128*.

♦Penstemon procerus Graham var. formosus (A. Nelson) Cronquist. Whitebark pine forest. Rare. Mosquito Flat, *Howell 22425* (CAS).

Penstemon roezlii Regel. Pinyon pine woodland. Dry rocky slopes. Rare. Ridgeline NE of Red Mountain just outside Wilderness boundary, *England 781*.

Penstemon rostriflorus Kellogg. Sagebrush scrub, lodgepole and whitebark pine forests. Dry rocky slopes. Locally common <10,350 ft (3155 m). *England 1322*.

Penstemon speciosus Lindl. Lodgepole and whitebark pine forests. Dry slopes. Occasional. *England 812*.

*Plantago lanceolata L. Lodgepole pine forest. Roadside. Rare. Near Rock Creek Pack Station, *England 1353*. At ca. 9900 ft (3018 m) elevation, evidently the highest occurrence on record in the state (CCH 2016; SEINet 2016).

Veronica americana Schwein. ex Benth. Lodgepole and whitebark pine forests. Streams, seeps. Occasional. *England 441*.

Veronica serpyllifolia L. subsp. humifusa (Dicks.) Syme. Lodgepole pine forest. Streams, seeps. Uncommon. S of East Fork Campground, *England 268*.

Veronica wormskjoldii Roem. & Schult. Whitebark pine forest, alpine. Streams, lake margins. Locally common. *England 375*.

Polemoniaceae

Collomia linearis Nutt. Lodgepole pine forest. Moist sites. Occasional. *England 1313*.

Eriastrum wilcoxii (A. Nelson) H. Mason. Jeffrey and lodgepole pine forests. Roadsides. Locally common. *England 278*.

Gilia cana (M.E. Jones) A. Heller subsp. cana. Pinyon pine woodland, lodgepole and whitebark pine forests. Dry gravelly slopes, flats. Uncommon. Kenneth Lake, *Wallace 2419*; Rock Creek Road near third creek crossing, *England 156*.

Ipomopsis aggregata (Pursh) V.E. Grant subsp. aggregata. Aspen groves, lodgepole and whitebark pine forests. Sandy/gravelly slopes. Locally common. *England 1344*.

Ipomopsis congesta (Hook.) V.E. Grant subsp. montana (A. Nelson & P.B. Kenn.) V.E. Grant. Alpine. Fellfields. Uncommon. Sherwin Peak on Wheeler Crest, *England 856*; Red Mountain summit, *England 886*.

Ipomopsis tenuituba (Rydb.) V.E. Grant. Aspen groves. Dry slopes in openings among *Populus tremuloides*. Rare. W slope of Wheeler Ridge along Sand Canyon Road, *England 531*.

Leptosiphon nuttallii (A. Gray) J.M. Porter & L.A. Johnson subsp. pubescens (R. Patt.) J.M. Porter & L.A. Johnson. Sagebrush scrub, lodgepole and whitebark pine forests, alpine. Dry slopes, forest openings. Common. *England 1279*.

Leptosiphon pachyphyllus (R. Patt.) J.M. Porter & L.A. Johnson. Whitebark pine forest, alpine. Dry slopes. Occasional. *England 793*.

Linanthus pungens (Torr.) J.M. Porter & L.A. Johnson. Pinyon pine woodland, lodgepole and whitebark pine forests, alpine. Dry rocky sites. Common. *England 811*.

Phlox condensata (A. Gray) E.E. Nelson. Whitebark pine forest, alpine. Dry rocky sites. Locally common. *England 954*.

Phlox stansburyi (Torr.) A. Heller var. brevifolia (A. Gray) E.E. Nelson. Pinyon pine woodland, sagebrush scrub. Dry slopes. Uncommon. Along Rock Creek Road below Aspen Campground, *England 123*.

Polemonium eximium Greene. Alpine. Ridgetops, barrens. Locally common >12,000 ft (3658 m). *England 935*.

POLEMONIUM OCCIDENTALE Greene. Lodgepole and whitebark pine forests. Mesic sites. Uncommon. Along trail from Rock Creek Lake to Pine Grove Campground, *England 327*.

POLYGONACEAE

ERIOGONUM BAILEYI S. Watson var. BAILEYI. Pinyon pine woodland, lodgepole pine forest. Open sandy/gravelly sites. Occasional. *England 607*.

♦ERIOGONUM CERNUUM Nutt. Lodgepole pine forest. Rare. Rock Creek Road at Iris Meadow Campground, *Barbe, Howell & Fuller 3470* (UC).

ERIOGONUM ELATUM Benth. var. ELATUM. Pinyon pine woodland. Dry slopes. Rare. Mouth of Rock Creek Canyon near water tank, *England 662*.

ERIOGONUM INCANUM Torr. & A. Gray. Whitebark pine forest, alpine. Dry sandy/gravelly sites. Occasional. *England 199*.

ERIOGONUM LATENS Jeps. Whitebark pine forest, alpine. Dry sandy/gravelly slopes. Uncommon. Sherwin Peak on Wheeler Crest, *England 850*; along trail below Tamarack Lakes, *England 1219*.

ERIOGONUM LOBBII Torr. & A. Gray. Whitebark pine forest, alpine. Dry sandy flats and slopes. Occasional. *England 681*.

ERIOGONUM MICROTHECA Nutt. var. AMBIGUUM (M.E. Jones) Reveal. Pinyon pine woodland, sagebrush scrub. Dry open areas. Uncommon. Along Sand Canyon Road, *England 534*.

ERIOGONUM NUDUM Benth. var. DEDUCTUM (Greene) Jeps. Lodgepole and whitebark pine forests. Dry slopes. Occasional. *England 292*.

ERIOGONUM NUDUM Benth. var. SCAPIGERUM (Eastw.) Jeps. Lodgepole and whitebark pine forests. Dry slopes. Occasional. *England 1220*.

ERIOGONUM NUDUM Benth. var. WESTONII (S. Stokes) J.T. Howell. Pinyon pine woodland. Dry slopes. Uncommon. Along Rock Creek Road at third creek crossing, *England 259*.

ERIOGONUM OVALIFOLIUM Nutt. var. CAELESTINUM Reveal. Alpine. Talus slopes. Rare. Ridgeline of Mount Starr, *England 1021*.

ERIOGONUM OVALIFOLIUM Nutt. var. NIVALE (Coville) M.E. Jones. Whitebark pine forest, alpine. Dry rocky sites. Locally common. *England 362*.

ERIOGONUM ROSENSE A. Nelson & P.B. Kenn. var. ROSENSE. Whitebark pine forest, alpine. Dry sandy/gravelly sites. Occasional >10,500 ft (3200 m). *England 840*.

ERIOGONUM SPERGULINUM A. Gray var. REDDINGIANUM (M.E. Jones) J.T. Howell. Pinyon pine woodland, lodgepole and whitebark pine forests. Dry rocky slopes. Occasional. *England 525*.

ERIOGONUM UMBELLATUM Torr. var. NEVADENSE Gand. Pinyon pine woodland, sagebrush scrub, lodgepole and whitebark pine forests. Dry slopes. Common. *England 162*.

OXYRIA DIGYNA (L.) Hill. Whitebark pine forest, alpine. Sheltered places in rock outcrops. Locally common. *England 349*.

♦OXYTHECA DENDROIDEA Nutt. subsp. DENDROIDEA. Lodgepole pine forest. Rare. Iris Meadow area, *Howell, Fuller & Barbe 54498* (CAS).

*POLYGONUM AVICULARE L. subsp. DEPRESSUM (Meisn.) Arcang. Lodgepole pine forest. Open sandy/gravelly areas. Uncommon. Along Rock Creek Road opposite Big Meadow, *England 609*.

POLYGONUM DOUGLASII Greene. Lodgepole pine forest. Open sandy/gravelly areas. Occasional. Mosquito Flat, *Crafts 634*; along creek above East Fork Campground, *England 444*.

POLYGONUM MINIMUM S. Watson. Whitebark pine forest. Dry rocky slope. Rare. Between Box Lake and Hidden Lakes, *England 1520*.

POLYGONUM POLYGALOIDES Meisn. subsp. KELLOGGII (Greene) J.C. Hickman. Lodgepole and whitebark pine forests. Moist sandy/gravelly sites. Locally common. *England 230*.

POLYGONUM SAWATCHENSE Small subsp. SAWATCHENSE. Lodgepole and whitebark pine forests. +/- moist, open sites. Uncommon. Along stream below Ruby Lake at ca. 10,900 ft ("Ruby Falls"), *Peirson 9430*; Aspen Campground vicinity, *England 1480*.

RUMEX CALIFORNICUS Rech. f. Whitebark pine forest. Moist sandy/gravelly sites. Uncommon. Mosquito Flat, *Barbe, Howell & Fuller 3528* (UC); Hidden Lakes, *England 385*.

RUMEX PAUCIFOLIUS Nutt. Whitebark pine forest. Moist sites. Locally common. *England 152*.

PORTULACACEAE

*PORTULACA OLERACEA L. Lodgepole pine forest. Cracks in road pavement. Rare. Rock Creek Lake, *England 1645b*. This occurrence at ca. 9730 ft (2966 m) evidently the highest on record in California (CCH 2016; SEINet 2016).

PRIMULACEAE

ANDROSACE SEPTENTRIONALIS L. Alpine. Fellfields. Uncommon. Mono Mesa, *Howell 22765* (CAS); N slope of Mount Morgan, *England 1065*.

PRIMULA JEFFREYI (Van Houtte) Mast & Reveal. Whitebark pine forest. Meadow margins. Uncommon. Drainage S of Red Mountain, *England 895*. Evidently the only record for Mono County (CCH 2016; SEINet 2016).

PRIMULA TETRANDRA (Suksd. ex Greene) Mast & Reveal. Lodgepole and whitebark pine forests. Moist meadows. Locally common. *England 897*.

RANUNCULACEAE

ACONITUM COLUMBIANUM Nutt. subsp. COLUMBIANUM. Lodgepole and whitebark pine forests. Streams, seeps. Occasional. *England 325*.

♦ACTAEA RUBRA (Aiton) Willd. Whitebark pine forest. Rare. Heart Lake, *Peirson 9449*.

♦ANEMONE DRUMMONDII S. Watson var. DRUMMONDII. Alpine. Rare. Gorge below Mono Pass, *Peirson 10795*.

AQUILEGIA FORMOSA Fisch. ex DC. Riparian woodland, lodgepole and whitebark pine forests. Mesic areas along streams, seeps. Common. *England 272*.

AQUILEGIA PUBESCENS Coville. Whitebark pine forest, alpine. Rock outcrops. Locally common >10,500 ft (3200 m). *England 344*.

DELPHINIUM POLYCLADON Eastw. Lodgepole and whitebark pine forests. Moist rocky sites, wet drainages. Occasional. *England 303*.

RANUNCULUS ALISMIFOLIUS Geyer ex Benth. var. ALISMELLUS A. Gray. Whitebark pine forest. Dry meadows. Rare. Tamarack Bench along trail W of Dorothy Lake, *England 1504*.

RANUNCULUS AQUATILIS L. var. DIFFUSUS With. Lodgepole and whitebark pine forests. Submerged in pools, lakes. Uncommon. S foot of Transverse Ridge, *Peirson 12990*; large pool on Tamarack Bench at terminus of Sand Canyon Road, *England 537*.

RANUNCULUS CYMBALARIA Pursh. Lodgepole pine forest. Moist meadow. Rare. Big Meadow area, *England 611*.

RANUNCULUS ESCHSCHOLTZII Schltdl. var. ESCHSCHOLTZII. Alpine. Wet streamside among rocks. Rare. Drainage S of Francis Lake, *England 1083*.

♦RANUNCULUS ESCHSCHOLTZII Schltdl. var. OXYNOTUS (A. Gray) Jeps. Whitebark pine forest, alpine. Uncommon. Ruby Lake, *Peirson 10783*; valley S of Long Lake, *Peirson 9450* (JEPS).

†♦THALICTRUM ALPINUM L. CNPS List 4. Whitebark pine forest. Meadows, lake margins. Rare. Hidden Lakes area, *Peirson 12892*.

THALICTRUM FENDLERI Engelm. ex A. Gray var. FENDLERI. Lodgepole and whitebark pine forests. Moist sites. Occasional. *England 262*.

THALICTRUM SPARSIFLORUM Turcz. ex Fisch. & C.A. Mey. Whitebark pine forest. Moist sites. Locally common. *England 1087*.

RHAMNACEAE

CEANOTHUS PAUCIFLORUS DC. (*C. vestitus* Greene). Pinyon pine woodland. Dry open sites. Rare. NW of Rock Creek Road at third creek crossing, *England 255*.

♦CEANOTHUS VELUTINUS Douglas. Lodgepole pine forest. Dry slopes. Rare. N of Rock Creek Lake, *Robinson b65*.

ROSACEAE

AMELANCHIER UTAHENSIS Koehne. Whitebark pine forest. Rocky slopes. Occasional. *England 202*.

CERCOCARPUS LEDIFOLIUS Nutt. var. INTERMONTANUS N.H. Holmgren. Pinyon pine woodland, sagebrush scrub, Jeffrey, lodgepole and whitebark pine forests, alpine. Dry slopes. Common. *England 271*.

CHAMAEBATIARIA MILLEFOLIUM (Torr.) Maxim. Jeffrey and lodgepole pine forests. Dry slopes. Uncommon, <9000 ft (2743 m). Along Rock Creek Road near second creek crossing, *England 273*.

DASIPHORA FRUTICOSA (L.) Rydb. Whitebark pine forest, alpine. Rocky slopes. Locally common. *England 357*.

DRYMOCALLIS LACTEA (Greene) Rydb. var. LACTEA. Lodgepole and whitebark pine forests, alpine. Meadows, damp sites. Common. *England 317*.

♦DRYMOCALLIS PSEUDORUPESTRIS (Rydb.) Rydb. var. CRUMIANA D.D. Keck ex Ertter. Whitebark pine forest. Rocky talus slope. Rare. E side of Little Lakes Valley, *Peirson 11272*.

FRAGARIA VIRGINIANA Mill. Lodgepole and whitebark pine forests. Moist areas. Common. *England 141*.

GEUM MACROPHYLLUM Willd. var. PERINCISUM (Rydb.) Raup. Lodgepole and whitebark pine forests. Moist meadows. Occasional. *England 226*.

HOLODISCUS DISCOLOR (Pursh) Maxim. var. MICROPHYLLUS (Rydb.) Jeps. Jeffrey, lodgepole and whitebark pine forests, alpine. Rocky slopes/outcrops. Common. *England 274*.

♦HORKELIA FUSCA Lindl. var. PARVIFLORA (Nutt. ex Hook. & Arn.) Wawra. Lodgepole pine forest transition to whitebark pine forest. Wet meadow. Rare. Mosquito Flat, *Robinson b5*. Evidently the only record for Inyo County (CCH 2016; SEINet 2016).

HORKELIELLA CONGDONIS (Rydb.) Rydb. Lodgepole pine forest. Moist meadow. Rare. Iris Meadow area, *England 578*.

IVESIA LYCOPODIOIDES A. Gray var. MEGALOPETALA (Rydb.) Ertter & Reveal. Lodgepole and whitebark pine forests. Moist meadows. Occasional. *England 470*.

IVESIA LYCOPODIOIDES A. Gray var. SCANDULARIS (Rydb.) Ertter & Reveal. Whitebark pine forest, alpine. Moist rocky slopes, fellfields. Occasional. *England 183*.

IVESIA MUIRII A. Gray. Alpine. Dry rocky/gravelly sites. Locally common. *England 192*.

IVESIA SHOCKLEYI S. Watson var. SHOCKLEYI. Alpine. Dry rocky slopes. Rare. Wheeler Crest, *England 828*.

POTENTILLA BIENNIS Greene. Lodgepole pine forest. Grassy sites. Rare. Iris Meadow area, *England 605*.

POTENTILLA BREWERI S. Watson. Whitebark pine forest, alpine. Lake shores, moist meadows. Occasional. *England 150*.

♦POTENTILLA BRUCEAE Rydb. Whitebark pine forest. Rare. Ruby Lake, *Howell 22405* (DS).

♦POTENTILLA DRUMMONDII Lehm. Whitebark pine forest. Rare. Morgan Pass area, *Howell s.n.* 16 Jul 1946 (CAS).

POTENTILLA FLABELLIFOLIA Hook. ex Torr. & A. Gray. Whitebark pine forest. Moist sites. Uncommon. Ruby Lake area, *England 1299*.

POTENTILLA GLAUCOPHYLLA Lehm. var. GLAUCOPHYLLA. Lodgepole and whitebark pine forests. Moist sites. Occasional. *England 185*.

POTENTILLA GRACILIS Hook. var. ELMERI (Rydb.) Jeps. Lodgepole and whitebark pine forests. Meadows. Occasional. "At the falls in Ruby stream," *Peirson 9166*; along Rock Creek Road S of Big Meadow, *England 284*. Peirson's collection at ca. 10,900 ft (3322 m) evidently the highest documented occurrence in the state (CCH 2016; SEINet 2016).

♦POTENTILLA GRACILIS Hook. var. FASTIGIATA (Nutt.) S. Watson. Whitebark pine forest. Rocky slopes. Rare. Heart Lake area, *Peirson 10809* (JEPS).

♦POTENTILLA JEPSONII Ertter. Whitebark pine forest. Rocky areas. Uncommon. Along trail above Mack Lake, *Taylor & Ertter 15296* (JEPS); Heart Lake, *Peirson 9474*.

POTENTILLA PSEUDOSERICEA Rydb. Alpine. Fellfields. Uncommon. Mono Mesa, *Howell 22742* (CAS); Mount Morgan, *England 1076*.

PRUNUS ANDERSONII A. Gray. Pinyon pine woodland. Dry slopes. Locally common <8200 ft (2499 m). NW of Rock Creek Road near third creek crossing, *England 121*.

PRUNUS EMARGINATA (Douglas) Eaton. Jeffrey and lodgepole pine forests. Rocky slopes, road embankments. Occasional. *England 140*.

PURSHIA TRIDENTATA (Pursh) DC. var. GLANDULOSA (Curran) M.E. Jones. Sagebrush scrub, lodgepole and whitebark pine forests. Dry rocky slopes. Occasional. *England 807*.

PURSHIA TRIDENTATA (Pursh) DC. var. TRIDENTATA. Pinyon pine woodland, sagebrush scrub, Jeffrey pine forest. Dry rocky slopes. Common. *England 116*. Most *Purshia tridentata* specimens from Rock Creek appear intermediate between the two varieties.

ROSA WOODSII Lindl. subsp. GRATISSIMA (Greene) W.H. Lewis & Ertter. Riparian woodland, Jeffrey, lodgepole and whitebark pine forests. Moist sites. Common <10,000 ft (3048 m). *England 249*.

SIBBALDIA PROCUMBENS L. Whitebark pine forest, alpine. Damp rocky depressions, fellfields. Occasional. *England 196*.

♦SORBUS CALIFORNICA Greene. Whitebark pine forest. Rare. Along stream below Ruby Lake, *Peirson 11270*.

SPIRAEA SPLENDENS Baumann ex K. Koch. Whitebark pine forest. Rock outcrops. Occasional. *England 934*.

RUBIACEAE

GALIUM HYPOTRICHIUM A. Gray subsp. HYPOTRICHIUM. Whitebark pine forest, alpine. Dry rocky slopes. Occasional. *England 1495*.

GALIUM MULTIFLORUM Kellogg. Pinyon pine woodland. Dry rocky slopes. Rare. Along Rock Creek Road at first creek crossing, *England 244*.

GALIUM TRIFIDUM L. subsp. COLUMBIANUM (Rydb.) Hultén. Lodgepole pine forest. Moist shady site among willows. Rare. Meadows S of East Fork Campground, *England 450*.

GALIUM TRIFLORUM Michx. Lodgepole pine forest. Damp places beneath tree canopy. Rare. Along creek N of Palisade Campground, *England 1463*.

KELLOGGIA GALIOIDES Torr. Lodgepole pine forest. Dry rocky slopes. Uncommon. Along trail from Pine Grove Campground to jct. with Hilton Lakes trail, *England 394*.

SALICACEAE

POPULUS TREMULOIDES Michx. Aspen groves, riparian woodland, Jeffrey, lodgepole and whitebark pine forests. Common in mesic sites <10,500 ft (3200 m). *England 176*.

POPULUS TRICHOCARPA Hook. Riparian woodland. Stream margins. Locally common along main creek channel <8000 ft (2438 m). *England 138*.

SALIX EASTWOODIAE A. Heller. Whitebark pine forest. Mesic sites. Locally common. *England 144*.

SALIX EXIGUA Nutt. var. EXIGUA. Lodgepole pine forest. +/- dry sandy/gravelly slopes. Uncommon. Along road at entrance to Aspen Campground, *England 1479*.

SALIX GEYERIANA Andersson. Lodgepole and whitebark pine forests. Meadows. Occasional. *England 169*.

SALIX LASIANDRA Benth. var. CAUDATA (Nutt.) Sudw. Riparian woodland. Stream edges. Occasional. *England 139*.

♦SALIX LEMMONII Bebb. Whitebark pine forest. Rare. Heart Lake, *Howell 22837*.

SALIX LUTEA Nutt. Riparian woodland. Stream edges. Occasional. *England 167*.

SALIX ORESTERA C.K. Schneid. Whitebark pine forest, alpine. Mesic sites. Locally common. *England 1095*.

SALIX PETROPHILA Rydb. Whitebark pine forest, alpine. Rocky meadows, lake shores. Locally common >10,500 ft (3200 m). *England 198*.

SALIX PLANIFOLIA Pursh. Riparian woodland, lodgepole and whitebark pine forests. Mesic sites. Locally common. *England 143*.

A specimen of *Salix nivalis* Hook. (*Peirson 11207* [RSA]) was mislabeled with the locality of Ruby Lake, Rock Creek Lakes Basin, Inyo County. It was collected in the Virginia Lakes watershed of Mono County, as evidenced by Peirson's collection notebook entry for 11207, and by duplicates in other herbaria (HSC, NY, SBBG, SD, POM). *Salix nivalis* is not known to occur in the Rock Creek watershed.

SAXIFRAGACEAE

HEUCHERA RUBESCENS Torr. Pinyon pine woodland, lodgepole and whitebark pine forests, alpine. Crevices in rock outcrops. Common. *England 166*.

LITHOPHRAGMA GLABRUM Nutt. Lodgepole and whitebark pine forests. Moist slopes. Uncommon. Along trail to Mono Pass, *England 762*.

MICRANTHES APRICA (Greene) Small. Whitebark pine forest, alpine. Moist rocky slopes, depressions among rocks. Occasional >10,500 ft (3200 m). *England 195*.

MICRANTHES BRYOPHORA (A. Gray) Brouillet & Gornall. Alpine. Fellfields. Uncommon. Divide W of Long Lake, *Peirson 9117*; top of moraine dividing Gem Lakes and Dade Lake, *England 1627*.

♦MICRANTHES NIDIFICA (Greene) Small. Whitebark pine forest. Rocky slopes, meadows. Rare. W of Long Lake, *Peirson 12179*.

MICRANTHES ODONTOLOMA (Piper) A. Heller. Lodgepole and whitebark pine forests. Wet margins of streams and lakes in +/− open sites. Occasional. *England 521*.

MICRANTHES TOLMIEI (Torr. & A. Gray) Brouillet & Gornall. Alpine. Sandy/gravelly slopes, in sheltered spots among rocks. Uncommon. Not recorded by Peirson (1938, 1942) or Howell (1946). Drainage between Ruby Lake and Mills Lake, *England 623*; ridge W of Mono Pass, *England 959*.

PECTIANTIA BREWERI (A. Gray) Rydb. Lodgepole and whitebark pine forests. Mesic sites. Uncommon. Along stream below Ruby Lake, *Peirson 9461*; along trail to Hilton Lakes, *England 310*.

♦SAXIFRAGA HYPERBOREA R. Br. Alpine. Wet slopes. Rare. Above Ruby Lake, *Peirson 10765*.

SCROPHULARIACEAE

LIMOSELLA AQUATICA L. Lodgepole and whitebark pine forests. Uncommon. Partially submerged in shallow pools, stream edges. Heart Lake, *Peirson 10791* (UC); along creek between Rock Creek Lake and Pine Grove campgrounds, *England 691*.

SCROPHULARIA DESERTORUM (Munz) R.J. Shaw. Pinyon pine woodland. Dry rocky slopes. Uncommon. Near mouth of Rock Creek Canyon on steep W-facing slope, *England 131*.

*VERBASCUM THAPSUS L. Lodgepole pine forest. Roadsides, meadows; on disturbed ground. Uncommon. Big Meadow area, *England 617*; along Rock Creek Road above East Fork Campground, *England 1436*.

SOLANACEAE

CHAMAESARACHA NANA (A. Gray) A. Gray. Pinyon pine woodland, lodgepole pine forest. Steep dry rocky slopes. Uncommon. Near mouth of Rock Creek Canyon on steep W-facing slope, *England 132*; along road between East Fork and Pine Grove campgrounds, *England 926*.

ULMACEAE

*ULMUS PUMILA L. Riparian woodland. Rocky slope. Rare. A juvenile tree found alongside guard rail at second creek crossing along Rock Creek Road, *England 1440*. Evidently the only record for Mono County (CCH 2016; SEINet 2016).

URTICACEAE

♦URTICA DIOICA L. subsp. HOLOSERICEA (Nutt.) Thorne. Whitebark pine forest. Lake margin. Rare. W side of Long Lake, *Peirson 9429*.

VIOLACEAE

VIOLA MACLOSKEYI F.E. Lloyd. Lodgepole and whitebark pine forests. Wet margins of lakes, streams, seeps. Uncommon. NW corner of Long Lake, *England 1409*.

VISCACEAE

PHORADENDRON JUNIPERINUM A. Gray. Jeffrey pine forest. In tree canopy; parasitic on *Juniperus grandis*. Rare (single occurrence documented; likely occurs occasionally <9700 ft [2957 m] where host species is common). Along Rock Creek Road at third creek crossing, *England 561*.

MONOCOTS

ALLIACEAE

†ALLIUM ATRORUBENS S. Watson var. CRISTATUM (S. Watson) McNeal. CNPS List 4. Pinyon pine woodland. Dry sandy/gravelly slopes. Rare. Along Rock Creek Road at first creek crossing, *England 161*.

ALLIUM BISCEPTRUM S. Watson. Aspen groves, Jeffrey and lodgepole pine forests. In sites with filtered sunlight. Occasional. *England 160*.

ALLIUM VALIDUM S. Watson. Lodgepole and whitebark pine forests. Streams, seeps. Locally common. *England 304*.

CYPERACEAE

CALLISCIRPUS BRACHYTHRIX C.N. Gilmour, J.R. Starr, & Naczi. Whitebark pine forest. Moist meadows, grassy slopes. Uncommon. Gem Lakes, *England 1628*.

CAREX ABRUPTA Mack. Riparian woodland, lodgepole and whitebark pine forests. Streams, lake margins, moist meadows. Common. *England 695*.

CAREX AQUATILIS Wahlenb. var. AQUATILIS. Whitebark pine forest. Wet margins of lakes and streams. Locally common. *England 1408*.

CAREX ATHROSTACHYA Olney. Lodgepole and whitebark pine forests. Lakes, meadows, moist openings in forest. Occasional. *England 1468*.

CAREX AUREA Nutt. Lodgepole and whitebark pine forests. Moist meadows, streams. Locally common. *England 564*.

CAREX BREWERI Boott. Alpine. Rocky slopes. Occasional. *England 981*.

†CAREX BUXBAUMII Wahlenb. CNPS List 4. Whitebark pine forest. Lake margins, moist rocky sites. Uncommon. "Defile [i.e., narrow gorge] cutting across lower part of Transverse Ridge," *Peirson 12946*; Eastern Brook Lakes, *England 550*.

CAREX CANESCENS L. subsp. CANESCENS. Whitebark pine forest. Moist meadows. Uncommon. Hidden Lakes, *England 1228*.

CAREX CAPITATA L. Alpine. Fellfields. Uncommon. Mono Mesa, *Howell 22750*; Dade Lake, *England 1598*; Mount Morgan, *England 1072*.

†CAREX CONGDONII L.H. Bailey. CNPS List 4. Whitebark pine forest, alpine. Talus slopes. Occasional. Long Lake, *England 674*.

♦CAREX DEFLEXA Hornem. var. BOOTTII L.H. Bailey. Whitebark pine forest. Uncommon. Little Lakes Valley, *Peirson 12211*; Ruby Lake, *Howell 22408*.

CAREX DISPERMA Dewey. Riparian woodland. Moist sandy/gravelly stream banks. Rare. Rock Creek Road just below third creek crossing, *England 654*.

CAREX DOUGLASII Boott. Aspen groves, lodgepole and whitebark pine forests. Dry sandy/gravelly openings. Uncommon. Heart Lake, *Peirson 12212*; along Rock Creek Road below Aspen Campground, *England 428*.

CAREX FILIFOLIA Nutt. var. EROSTRATA Kük. Whitebark pine forest, alpine. Meadows. Locally common. *England 1013*.

CAREX FISSURICOLA Mack. Whitebark pine forest. Moist meadows, stream margins. Locally common. *England 670*.

CAREX HAYDENIANA Olney. Alpine. Fellfields. Rare. N slope of Mount Morgan, *England 1070*.

CAREX HELLERI Mack. Whitebark pine forest, alpine. Dry rocky slopes. Locally common. *England 937*.

CAREX HETERONEURA W. Boott. Lodgepole and whitebark pine forests. Moist sandy/gravelly sites, rocky slopes. Common. *England 1393*.

♦CAREX HOODII Boott. Whitebark pine forest. Dry slopes. Uncommon. W of Heart Lake, *Peirson 11306*; Mosquito Flat, *Howell 22321*.

†CAREX IDAHOA L.H. Bailey. CNPS List 2. Riparian woodland. Moist stream bank. Rare. Along creek near Iris Meadow, *England 591*.

CAREX ILLOTA L.H. Bailey. Whitebark pine forest. Moist sites near lakes, streams. Uncommon. S of Long Lake, *Peirson 10831*; Patricia Lake, *England 1243*.

†♦CAREX INCURVIFORMIS Mack. CNPS List 4. Alpine. Rare. Mono Mesa, *Howell 22700*.

CAREX JONESII L.H. Bailey. Whitebark pine forest, alpine. Rocky slopes. Uncommon. Heart Lake, *Peirson 11307*; Treasure Lakes, *England 507*.

♦CAREX LEPORINELLA Mack. Alpine. Rare. Treasure Lakes, *Howell 22827*. Identification tentative (perigynia not fully developed).

CAREX LUZULINA Olney. Lodgepole and whitebark pine forests. Meadows, lake margins. Uncommon. Ruby Lake, *Peirson s.n.* 20 Jul 1931 (CAS); W side of Rock Creek Road in meadow ca. halfway between pack station and Mosquito Flat, *England 475*.

CAREX MICROPTERA Mack. Riparian woodland, lodgepole and whitebark pine forests. Meadows, stream margins. Common. *England 1394*.

♦CAREX MULTICOSTATA Mack. Whitebark pine forest. Uncommon. Mosquito Flat, *Howell 22317* (CAS); Heart Lake, *Peirson 10849*.

CAREX NEBRASCENSIS Dewey. Lodgepole and whitebark pine forests. Streams, moist meadows. Occasional. *England 267*.

♦CAREX NIGRICANS C.A. Mey. Whitebark pine forest. Rocky sites. Uncommon. W side of Morgan Pass, *Howell 22460* (CAS); Heart Lake meadow, *Peirson 11704*.

CAREX ORESTERA Mack. Whitebark pine forest, alpine. Margins of lakes, streams and pools. Uncommon. W shore Ruby Lake, *Peirson 9134* (CAS); gorge below Mono Pass, *England 1548*.

CAREX PELLITA Willd. Riparian woodland, lodgepole and whitebark pine forests. Stream margins. Common. *England 414*.

CAREX PHAEOCEPHALA Piper. Whitebark pine forest, alpine. Dry, exposed rocky sites. Locally common. *England 951*.

♦CAREX PRAECEPTORUM Mack. Whitebark pine forest. Uncommon. Between Mosquito Flat and Ruby Lake, *Howell 22384* (CAS); along stream below Ruby Lake, *Peirson 9417*.

CAREX PRAEGRACILIS W. Boott. Aspen groves, lodgepole pine forest. Meadows, sunny openings. Uncommon. Iris Meadow area, *England 593*.

♦CAREX PROPOSITA Mack. Whitebark pine forest, alpine. Dry rocky areas. Uncommon, historically found >10,500 ft (3200 m). Little Lakes Valley, *Peirson 10844* (CAS); Treasure Lakes, *Howell 22826*.

CAREX ROSSII Boott. Whitebark pine forest, alpine. Dry rocky sites. Uncommon, >10,800 ft (3292 m). Mono Mesa, *Howell 22698* (DS); S slope of Red Mountain, *England 893*.

CAREX SCOPULORUM Holm var. BRACTEOSA (L.H. Bailey) F.J. Herm. Lodgepole and whitebark pine forests. Stream banks, moist meadows. Common. *England 467*.

CAREX SIMULATA Mack. Lodgepole and whitebark pine forests. Stream margins, meadows. Uncommon. Heart Lake, *Peirson 10836* (CAS); Rock Creek Lodge corrals at N end of horse pasture, *England 570*.

CAREX SPECTABILIS Dewey. Whitebark pine forest, alpine. Rocky slopes, lake shores. Locally common. *England 511*.

†CAREX STEVENII (Holm) Kalela. CNPS List 2. Lodgepole pine forest. Springs, wet sites. Rare. Near Rock Creek Lodge corrals at base of slope along E edge of horse pasture, *England 575*. Determination confirmed by P.F. Zika. Evidently the only record for the Sierra Nevada; other California records are two collections from the White Mountains (CCH 2016; SEINet 2016).

♦CAREX STRAMINIFORMIS L.H. Bailey. Lodgepole and whitebark pine forests. Uncommon. Ruby Lake, *Howell 22415* (CAS); N of Little Lakes Valley at ca. 10,000 ft (3048 m), *Robinson b8*.

CAREX SUBFUSCA W. Boott. Lodgepole pine forest. Moist meadows. Uncommon. Mosquito Flat, *Howell 22327* (UC); N of Big Meadow Campground between Rock Creek Road and creek, *England 618*.

CAREX SUBNIGRICANS Stacey. Whitebark pine forest, alpine. Meadows, rocky depressions. Locally common. *England 1149*.

†CAREX TAHOENSIS Smiley. CNPS List 4. Whitebark pine forest, alpine. Rocky slopes. Uncommon. Box Lake, *Howell 22435* (CAS); drainage below Mills Lake, *England 628*.

CAREX UTRICULATA Boott. Riparian woodland, lodgepole and whitebark pine forests. Wet muddy margins of lakes, streams. Common, forming dense colonies in some locations. *England 495*.

CAREX VERNACULA L.H. Bailey. Whitebark pine forest, alpine. Rocky slopes, lake margins. Locally common. *England 1242*.

CAREX VESICARIA L. Whitebark pine forest. Rocky lake margins. Uncommon. "In defile [i.e. narrow gorge] cutting across [lower] part of Transverse Ridge", *Peirson 12947*; Serene Lake, *England 490*.

♦CAREX WHITNEYI Olney. Whitebark pine forest. Dry lake shore. Rare. W side of Long Lake, *Peirson 9415*.

ELEOCHARIS ACICULARIS (L.) Roem. & Schult. Lodgepole and whitebark pine forests. Muddy margins of pools and lakes. Uncommon. Pond below Ruby Lake, *Peirson 9413*; large pool on Tamarack Bench at terminus of Sand Canyon Road, *England 540*.

ELEOCHARIS MACROSTACHYA Britton. Whitebark pine forest. Lake margins. Uncommon. Hidden Lakes, *Peirson 12188*; Eastern Brook Lakes, *England 547*.

♦ELEOCHARIS QUINQUEFLORA (Hartmann) O. Schwarz. Lodgepole pine forest transition to whitebark pine forest. Rare. Mosquito Flat, *Howell 22271* (DS).

ELEOCHARIS SUKSDORFIANA Beauverd. Lodgepole and whitebark pine forests. Moist meadows. Uncommon. Heart Lake, *Peirson 10790*; along Rock Creek Road between pack station and Mosquito Flat, *England 473*.

SCIRPUS MICROCARPUS J. Presl & C. Presl. Riparian woodland. Stream margins. Rare. Along creek near Iris Meadow, *England 599*.

TRICHOPHORUM CLEMENTIS (M.E. Jones) S.G. Sm. Lodgepole and whitebark pine forests. Meadows, lake and stream margins. Occasional. Heart Lake, *Peirson 11300*; along Rock Creek Road between pack station and Mosquito Flat, *England 474*.

HYDROCHARITACEAE

ELODEA NUTTALLII (Planch.) H. St. John. Lodgepole pine forest. Lakes. Growing on gravelly lake bottom, submerged 2–3 ft (0.6–0.9 m). Rare. Rock Creek Lake, *England 439*.

IRIDACEAE

IRIS MISSOURIENSIS Nutt. Lodgepole and whitebark pine forests. Meadows. Occasional, typically <10,000 ft (3048 m). *England 290*.

SISYRINCHIUM IDAHOENSE E.P. Bicknell var. OCCIDENTALE (E.P. Bicknell) Douglass M. Hend. Lodgepole and whitebark pine forests. Stream and lake margins, meadows. Occasional. *England 1223*.

JUNCACEAE

♦JUNCUS BALTICUS Willd. subsp. ATER (Rydb.) Snogerup. Lodgepole pine forest transition to whitebark pine forest. Rare. Mosquito Flat, *Howell 22302* (DS).

♦JUNCUS BRYOIDES F.J. Herm. Lodgepole pine forest transition to whitebark pine forest. Rare. Mosquito Flat, *Howell 22490*.

JUNCUS DRUMMONDII E. Mey. Whitebark pine forest, alpine. Rocky lake shores, fellfields. Occasional. *England 1162*.

JUNCUS HEMIENDYTUS F.J. Herm. var. HEMIENDYTUS. Whitebark pine forest. Muddy margin of large ephemeral pool. Rare. Box Lake vicinity on W side of main trail, *England 1646*. Not recorded by Peirson (1938, 1942) or Howell (1946). Evidently the only record for Inyo County (CCH 2016; SEINet 2016).

♦JUNCUS MACRANDRUS Coville. Lodgepole pine forest. Wet meadows, other mesic sites. Uncommon. Rock Creek Lake vicinity, *Crafts & Halperin 502* (UCD); along Rock Creek Road ca. 1 mile (1.6 km) N of county line, *G.K. Helmkamp & E. Helmkamp 5898* (UCR).

JUNCUS MERTENSIANUS Bong. Whitebark pine forest, alpine. Lake margins, wet depressions in fellfields. Occasional. *England 1158*.

JUNCUS MEXICANUS Willd. Lodgepole and whitebark pine forests. Meadows. Locally common. *England 460*.

JUNCUS NEVADENSIS S. Watson. var. NEVADENSIS. Lodgepole and whitebark pine forests. Meadows, lake margins. Locally common. *England 454*.

JUNCUS ORTHOPHYLLUS Coville. Lodgepole and whitebark pine forests. Meadows, stream margins. Occasional. *England 468*.

JUNCUS PARRYI Engelm. Whitebark pine forest, alpine. Rocky slopes, dry sandy/gravelly sites. Locally common. *England 1120*.

LUZULA CASCADENSIS Zika. Lodgepole and whitebark pine forests. Lake shores, stream margins. Occasional. W shore of Ruby Lake, *Peirson 12778* (CAS); Francis Lake, *England 1091*. Collections historically identified as *L. comosa* E. Mey. were redetermined by P.F. Zika to be the recently described *L. cascadensis* (Zika et al. 2015).

LUZULA DIVARICATA S. Watson. Whitebark pine forest, alpine. Fellfields, other sparsely vegetated rocky sites. Uncommon, >10,800 ft (3292 m). Ruby Lake, *Howell 22417* (CAS); gorge below Mono Pass, *England 1547*.

LUZULA ORESTERA Sharsm. Lodgepole and whitebark pine forests, alpine. Meadows, lake margins. Common >9800 ft (2987 m). *England 481*.

LUZULA PARVIFLORA (Ehrh.) Desv. subsp. PARVIFLORA. Lodgepole and whitebark pine forests. Wet margins of lakes, streams. Uncommon. Heart Lake tributary stream from Ruby Lake, *Peirson 9168*; Francis Lake, *England 1092*.

LUZULA SPICATA (L.) DC. Whitebark pine forest, alpine. Moist places among rocks. Locally common. *England 1551*.

LUZULA SUBCONGESTA (S. Watson) Jeps. Alpine. Uncommon. Rocky lake shores, fellfields. Treasure Lakes, *England 510*.

JUNCAGINACEAE

†TRIGLOCHIN PALUSTRIS L. CNPS List 2. Lodgepole and whitebark pine forest. Wet borders of lakes, pools. Uncommon. E side of Little Lakes Valley, *Peirson 12180*; E shoreline of unnamed small lake S of Pine Grove Campground, *England 2195*.

LILIACEAE

CALOCHORTUS BRUNEAUNIS A. Nelson & J.F. Macbr. Pinyon pine woodland. Dry slopes. Rare. Along Rock Creek Road at first creek crossing, *England 237*.

CALOCHORTUS LEICHTLINII Hook. f. Lodgepole and whitebark pine forests. Dry slopes. Occasional. *England 435*.

†FRITILLARIA PINETORUM Davidson. CNPS List 4. Lodgepole pine forest transition to whitebark pine forest. Dry slopes. Uncommon. Mosquito Flat S of trailhead to Little Lakes Valley, *England 211*.

LILIUM KELLEYANUM Lemmon. Riparian woodland, lodgepole and whitebark pine forests. Streams, seeps. Occasional. *England 930*.

♦LILIUM PARVUM Kellogg. Whitebark pine forest. Rare. W shore Long Lake, *Butler 546* (UCD).

MELANTHIACEAE

VERATRUM CALIFORNICUM Durand var. CALIFORNICUM. Lodgepole and whitebark pine forests. Wet margins of lakes, streams, seeps. Locally common. *England 372*.

ORCHIDACEAE

PLATANTHERA DILATATA (Pursh) Lindl. ex L.C. Beck var. LEUCOSTACHYS (Lindl.) Luer. Lodgepole and whitebark pine forests. Streams, seeps, lake margins. Occasional. N shore Long Lake, *Peirson 9426*; S of East Fork Campground, *England 265*.

PLATANTHERA SPARSIFLORA (S. Watson) Schltr. Lodgepole pine forest. Seeps, partially shaded. Rare. Along Hilton Lakes trail at Wilderness boundary, *England 311*.

SPIRANTHES ROMANZOFFIANA Cham. Lodgepole and whitebark pine forests. Wet meadows, seeps, stream margins. Uncommon. W side of Long Lake, *Conrad 12968*; along Rock Creek Road near county line, *England 1422*. Only two known collections from the watershed; both specimens exhibit intermediate floral characters between *S. romanzoffiana* and *S. porrifolia* Lindl.

POACEAE

*AGROPYRON CRISTATUM (L.) Gaertn. subsp. PECTINATUM (M. Bieb.) Tzvelev. Jeffrey pine forest. Road shoulder. Rare. Rock Creek Road just below third creek crossing, *England 657*.

†AGROSTIS HUMILIS Vasey. CNPS List 2. Alpine. Lake margin with moist spongy soil. Rare. Not recorded by Peirson (1938, 1942) or Howell (1946). Mills Lake, *England 638*. Dwarf plants almost appearing annual in habit. Determined by J.T. Columbus and England.

AGROSTIS IDAHOENSIS Nash. Riparian woodland, lodgepole and whitebark pine forests. Meadows, stream margins, moist sandy/gravelly sites. Common. *England 314*.

AGROSTIS PALLENS Trin. Lodgepole and whitebark pine forests. Meadows, moist banks. Occasional. *England 580*.

AGROSTIS SCABRA Willd. Lodgepole and whitebark pine forests. Streams, moist banks. Locally common <10,000 ft (3048 m). *England 589*.

AGROSTIS VARIABILIS Rydb. Lodgepole and whitebark pine forests, alpine. Rocky slopes, sandy/gravelly depressions. Locally common >10,000 ft (3048 m). *England 1122*.

ALOPECURUS AEQUALIS Sobol. var. AEQUALIS. Riparian woodland. Stream margins. Occasional. *England 692*.

BROMUS CARINATUS Hook. & Arn. var. MARGINATUS (Nees ex Steud.) Barkworth & Anderton. Jeffrey, lodgepole and whitebark pine forests. Slopes, forest openings. Common. *England 1343*.

BROMUS CILIATUS L. Lodgepole pine forest. Moist areas near streams. Uncommon. S of East Fork Campground, *England 413*.

*BROMUS INERMIS Leyss. Riparian woodland. Stream banks. Rare. Iris Meadow Campground vicinity, *England 601*.

BROMUS PORTERI (J.M. Coult.) Nash. Aspen groves, lodgepole and whitebark pine forests. Openings among trees. Uncommon. Mosquito Flat, *Crafts & Halperin 524*; along Rock Creek Road N of Aspen Campground, *England 429b*.

BROMUS SUKSDORFII Vasey. Lodgepole and whitebark pine forests. Openings in forest canopy. Uncommon. Along stream below Ruby Lake, *Peirson 10824*; between pack station and Mosquito Flat, *England 486*.

*BROMUS TECTORUM L. Pinyon pine woodland, Jeffrey, lodgepole and whitebark pine forests. Road shoulders, areas disturbed by vehicles and foot traffic. Common <10,000 ft (3048 m). *England 1342*. This collection from Rock Creek Lake at 9800 ft (2987 m) and *Peirson 11308* from Ruby Lake at 11,150 ft (3399 m) evidently the highest elevations recorded for *B. tectorum* in California (CCH 2016; SEINet 2016). Peirson's collection is perplexing—the alpine habitat of Ruby Lake is not likely to have supported a population. The species was not found there, nor anywhere within the Wilderness Area, during fieldwork for this study.

Calamagrostis canadensis (Michx.) P. Beauv. var. canadensis. Riparian woodland, lodgepole and whitebark pine forests. Stream and lake margins, moist meadows. Common <10,000 ft (3048 m). *England 493*.

Calamagrostis muiriana B.L. Wilson & Sami Gray. Lodgepole and whitebark pine forests, alpine. Meadows, moist depressions in fellfields. Locally common >10,000 ft (3048 m). *England 667*.

Calamagrostis purpurascens R. Br. Whitebark pine forest, alpine. Dry rocky slopes. Locally common. *England 1146*.

Calamagrostis stricta (Timm) Koeler subsp. stricta. Riparian woodland. Stream banks. Rare. Iris Meadow Campground vicinity, *England 597*.

*Dactylis glomerata L. Riparian woodland, lodgepole pine forest. Road shoulders, moist sandy/gravelly sites. Uncommon. Iris Meadow Campground vicinity, *England 603*.

Danthonia intermedia Vasey subsp. intermedia. Whitebark pine forest. Meadows, moist banks, slopes. Locally common. *England 1221*.

♦Danthonia unispicata (Thurb.) Munro ex Vasey. Whitebark pine forest. Rare. Gem Lakes, *Howell 22820*.

Deschampsia cespitosa (L.) P. Beauv. subsp. cespitosa. Riparian woodland, lodgepole and whitebark pine forests, alpine. Streams, lake margins, meadows, fellfields. Common. *England 315*.

♦Deschampsia danthonioides (Trin.) Munro. Lodgepole pine forest transition to whitebark pine forest. Rare. Mosquito Flat, *Howell 22494* (CAS).

Deschampsia elongata (Hook.) Munro. Lodgepole and whitebark pine forests. Forest understory. Uncommon. Mosquito Flat, *Howell s.n.* 14 Jul 1946 (CAS); S base of Red Mountain, *England 902*.

Elymus cinereus Scribn. & Merr. Aspen groves, lodgepole pine forest. +/− dry areas at forest edge. Uncommon. Along Rock Creek Road below Aspen Campground, *England 426*.

Elymus elymoides (Raf.) Swezey var. californicus (J.G. Sm.) J.P. Sm. Sagebrush scrub, Jeffrey, lodgepole and whitebark pine forest, alpine. Dry slopes and flats, fellfields. Common. *England 844*.

Elymus elymoides (Raf.) Swezey var. elymoides. Pinyon pine woodland. Dry rocky slopes. Uncommon. Along Rock Creek Road at first creek crossing, *England 240*.

♦Elymus glaucus Buckley subsp. glaucus. Whitebark pine forest. Rare. W shore of Long Lake, *Peirson 10813*.

*Elymus ponticus (Podp.) N. Snow. Lodgepole pine forest. Sandy/gravelly road bank. Rare. Along E side of Rock Creek Road near Pine Grove Campground, *England 1431*. This occurrence at ca. 9400 ft (2865 m) is >1000 ft (305 m) higher than previously documented for the state (Kern Plateau, Kern County [CCH 2016; SEINet 2016]).

Elymus sierrae Gould. Alpine. Moist drainages. Rare. Between Mills Lake and Ruby Lake, *England 649*.

Elymus trachycaulus (Link) Gould ex Shinners subsp. trachycaulus. Aspen groves, lodgepole and whitebark pine forests. Meadows, rocky slopes, stream banks. Common. *England 384*.

Elymus triticoides Buckley. Aspen groves, lodgepole pine forest. Beneath tree canopy. Uncommon. Along Rock Creek Road near Aspen Campground, *England 430*.

*Festuca arundinacea Schreb. Riparian woodland. Stream bank. Rare. Iris Meadow Campground vicinity, *England 598*.

Festuca brachyphylla Schult. & Schult. f. subsp. breviculmis Fred. Alpine. Ridgetops, fellfields. Uncommon, only seen >12,000 ft (3658 m). Type locality: Mono Mesa, *Howell 22706* (CAS); summit of Mount Morgan, *England 1056*.

†♦Festuca minutiflora Rydb. CNPS List 2. Whitebark pine forest. Uncommon. Known only from two collections: E side of Little Lakes Valley, *Peirson s.n.* 23 Jul 1934 (POM); Mosquito Flat, *Howell 22276* (DS).

*♦Festuca myuros L. Lodgepole pine forest. Rare. Rock Creek Lake, *Benson 12577*.

Festuca rubra L. Lodgepole and whitebark pine forests. Meadows, moist banks. Occasional. Mosquito Flat, *Howell 22286* (CAS); Ruby Lake, *England 699*. These two collections, at ca. 11,100 ft (3383 m) and ca. 10,300 ft (3139 m), respectively, are the highest this species has been recorded in California (CCH 2016; SEINet 2016).

Festuca saximontana Rydb. Whitebark pine forest, alpine. Meadows, fellfields. Occasional. *England 1041*.

Glyceria elata (Nash ex Rydb.) M.E. Jones. Riparian woodland. Stream margins. Common. *England 655*.

♦Hordeum jubatum L. subsp. jubatum. Whitebark pine forest. Roadside. Rare. "Roadside at Heart Lake," *Peirson 9410*. This collection was made in 1931 when the road from Mosquito Flat to Morgan Pass existed.

Koeleria macrantha (Ledeb.) Schult. Lodgepole and whitebark pine forests, alpine. Rocky open areas with dryish soils. Common. *England 1052*.

♦Melica bulbosa Geyer ex Porter & J.M. Coult. Whitebark pine forest. Uncommon. Box Lake, *Howell 22439* (CAS); stream gorge below Ruby Lake, *Peirson 12224*.

Melica stricta Bol. Pinyon pine woodland, whitebark pine forest. Dry rocky slopes. Occasional. *England 379*.

Muhlenbergia asperifolia (Nees & Meyen ex Trin.) Parodi. Riparian woodland. Stream bank at meadow margin. Rare. Iris Meadow Campground vicinity, *England 600*.

Muhlenbergia filiformis (Thurb. ex S. Watson) Rydb. Lodgepole and whitebark pine forests. Moist banks, meadows. Locally common. *England 445*.

Muhlenbergia richardsonis (Trin.) Rydb. Sagebrush scrub, lodgepole and whitebark pine forests, alpine. Rocky slopes, dry sandy/gravelly sites. Common. *England 382*.

Phleum alpinum L. Lodgepole and whitebark pine forests, alpine. Moist places in forest understory, grassy lake shores, fellfields. Common >10,000 ft (3048 m). *England 1157*.

*Phleum pratense L. Lodgepole and whitebark pine forests. Meadows, moist grassy areas. Uncommon. Between pack station and Mosquito Flat, *England 482*; SW end of Box Lake, *England 1420*.

*Poa annua L. Riparian woodland, lodgepole pine forest. Stream margins, other moist sites. Occasional. Mosquito Flat, *Howell 22493* (CAS); Pine Grove Campground vicinity, *England 697*.

Poa bolanderi Vasey. Lodgepole pine forest. Beneath tree canopy. Rare. Near entrance to Rock Creek Lake along foot trail downslope toward the creek, *England 1648*. Evidently the only record for Inyo County (CCH 2016; SEINet 2016).

Poa cusickii Vasey subsp. cusickii. Whitebark pine forest, alpine. Moist slopes, fellfields. Locally common. *England 1581*.

Poa cusickii Vasey subsp. epilis (Scribn.) W.A. Weber. Whitebark pine forest, alpine. Dry rocky slopes. Uncommon. W slope of Wheeler Ridge above Sand Canyon Road, *England 869*.

Poa fendleriana (Steud.) Vasey subsp. longiligula (Scribn. & T.A. Williams) Soreng. Lodgepole pine forest. Dry rocky slopes. Rare. SW of East Fork Campground below Rock Creek Road, *England 223*.

Poa glauca Vahl subsp. rupicola (Nash ex Rydb.) W.A. Weber. Alpine. Fellfields. Uncommon. Along summit of Transverse Ridge, *Peirson 13466*; N slope of Mount Morgan, *England 1079*.

Poa keckii Soreng. Alpine. Talus slopes. Uncommon. E side of Little Lakes Valley, *Peirson 12938*; N slope of Mount Morgan, *England 1066*.

*Poa palustris L. Riparian woodland. Disturbed stream bank at meadow margin. Rare. Iris Meadow Campground vicinity, *England 596*.

*Poa pratensis L. subsp. pratensis. Riparian woodland, lodgepole and whitebark pine forests. Roadsides, stream and lake margins. Common in moist areas disturbed by vehicles and foot traffic. Heart Lake, *Peirson 10817*; along Rock Creek Road below Big Meadow, *England 288*.

♦Poa cf. pringlei Scribn. Alpine. Rare. Gorge below Mono Pass, *Peirson s.n.* 27 Jul 1934 (POM). Florets of this specimen appear to have fertile anthers 2 mm length. *Poa pringlei* in the Sierra Nevada typically has only pistillate flowers and is not known to occur in the central/southern part of the range. Specimen annotated by R. Soreng as "*Poa pringlei* → *Poa hansenii*?" in 1985.

Poa secunda J. Presl subsp. juncifolia (Scribn.) Soreng. Lodgepole pine forest. Beneath forest canopy. Uncommon. Below Rock Creek Lodge, *Halperin 538* (CAS); day use picnic area on S side of Pine Grove Campground, *England 1649*.

POA SECUNDA J. Presl subsp. SECUNDA. Whitebark pine forest, alpine. Open rocky sites. Locally common. *England 640*.

POA STEBBINSII Soreng. Alpine. Rocky areas around pools and lakes. Uncommon. Gorge below Mono Pass, *England 1550*.

POA WHEELERI Vasey. Whitebark pine forest, alpine. Rocky slopes. Locally common. *England 805*.

STIPA BLOOMERI Bol. (= *S. hymenoides* × *S. occidentalis* var. *occidentalis*). Jeffrey pine forest. Dry sandy/gravelly site partially shaded by pines. Rare. Along Rock Creek Road below third creek crossing, *England 658*.

STIPA COMATA Trin. & Rupr. var. COMATA. Pinyon pine woodland. Dry rocky slope. Rare. Along Sand Canyon Road NW of Wheeler Crest, *England 784*.

STIPA COMATA Trin. & Rupr. var. INTERMEDIA Scribn. & Tweedy. Lodgepole pine forest. Dry sandy/gravelly sites. Uncommon. Palisade day parking area, *England 321*.

STIPA HYMENOIDES Roem. & Schult. Pinyon pine woodland, sagebrush scrub. Dry sandy/gravelly sites. Locally common. *England 786*.

STIPA KINGII Bol. Whitebark pine forest. Lake margins, meadows. Occasional. *England 546*.

STIPA NELSONII Scribn. var. DOREI (Barkworth & J.R. Maze) Dorn. Lodgepole and whitebark pine forests. Dry to moist rocky sites, meadows. Uncommon. Slopes high above N shore of Long Lake, *England 1230*.

♦STIPA NEVADENSIS B.L. Johnson. Lodgepole to whitebark pine forest. Uncommon. Rock Creek Canyon, *Wallace 2033*; Mosquito Flat, *Howell 22260* (CAS).

STIPA OCCIDENTALIS Thurb. ex S. Watson var. CALIFORNICA (Merr. & Burtt Davy) C.L. Hitchc. Sagebrush scrub, lodgepole pine forest. Dry rocky slopes. Occasional. *England 280*.

STIPA OCCIDENTALIS Thurb. ex S. Watson var. OCCIDENTALIS. Sagebrush scrub, lodgepole and whitebark pine forests, alpine. Dry rocky slopes. Common. *England 827*.

STIPA OCCIDENTALIS Thurb. ex S. Watson var. PUBESCENS (Vasey) J.R. Maze, Roy L. Taylor & MacBryde. Jeffrey and lodgepole pine forests. Dry rocky slopes. Uncommon. SW of East Fork Campground below Rock Creek Road, *England 217*.

STIPA PINETORUM M.E. Jones. Whitebark pine forest, alpine. Rocky exposed sites. Uncommon, >10,500 ft (3200 m). S of Hidden Lakes at W base of Mount Morgan, *England 1496*; N side of Francis Lake, *England 1051*.

STIPA SPECIOSA Trin. & Rupr. Pinyon pine woodland, sagebrush scrub. Dry slopes. Occasional. *England 738*.

TORREYOCHLOA PALLIDA (Torr.) G.L. Church var. PAUCIFLORA (J. Presl) J.I. Davis. Whitebark pine forest. Muddy margin of drying ephemeral pool. Uncommon. Not recorded by Peirson (1938, 1942) or Howell (1946). Gem Lakes vicinity W of Morgan Pass, *England 370*.

TRISETUM SPICATUM (L.) K. Richt. Lodgepole and whitebark pine forests, alpine. Rocky slopes, flats, meadows, dry to moist open sites. Common >9800 ft (2987 m). *England 503*.

♦TRISETUM WOLFII Vasey. Lodgepole pine forest transition to whitebark pine forest. Rare. Mosquito Flat, *Howell 22282* (CAS).

POTAMOGETONACEAE

POTAMOGETON PUSILLUS L. Lodgepole pine forest. Large stream-fed pool; plants completely submerged in shallow water, anchored in soft deep mud. Rare. Tamarack Bench at terminus of Sand Canyon Road, *England 536*.

†POTAMOGETON ROBBINSII Oakes. CNPS List 2. Lodgepole pine forest. Lake shallows with gravelly bottoms; plants completely submerged. Rare. W shore of Rock Creek Lake, *England 440*.

RUSCACEAE

MAIANTHEMUM STELLATUM (L.) Link. Riparian woodland, aspen groves, lodgepole and whitebark pine forests. Meadows, forest understory. Occasional. *England 289*.

TOFIELDIACEAE

TRIANTHA OCCIDENTALIS (S. Watson) R.R. Gates subsp. OCCIDENTALIS. Whitebark pine forest. Moist grassy banks of streams and lakes. Occasional. *England 522*.

TYPHACEAE

SPARGANIUM ANGUSTIFOLIUM Michx. Lodgepole and whitebark pine forests. Shallow lakes. Partially submerged aquatic. Uncommon. Eastern Brook Lakes, *England 551*.