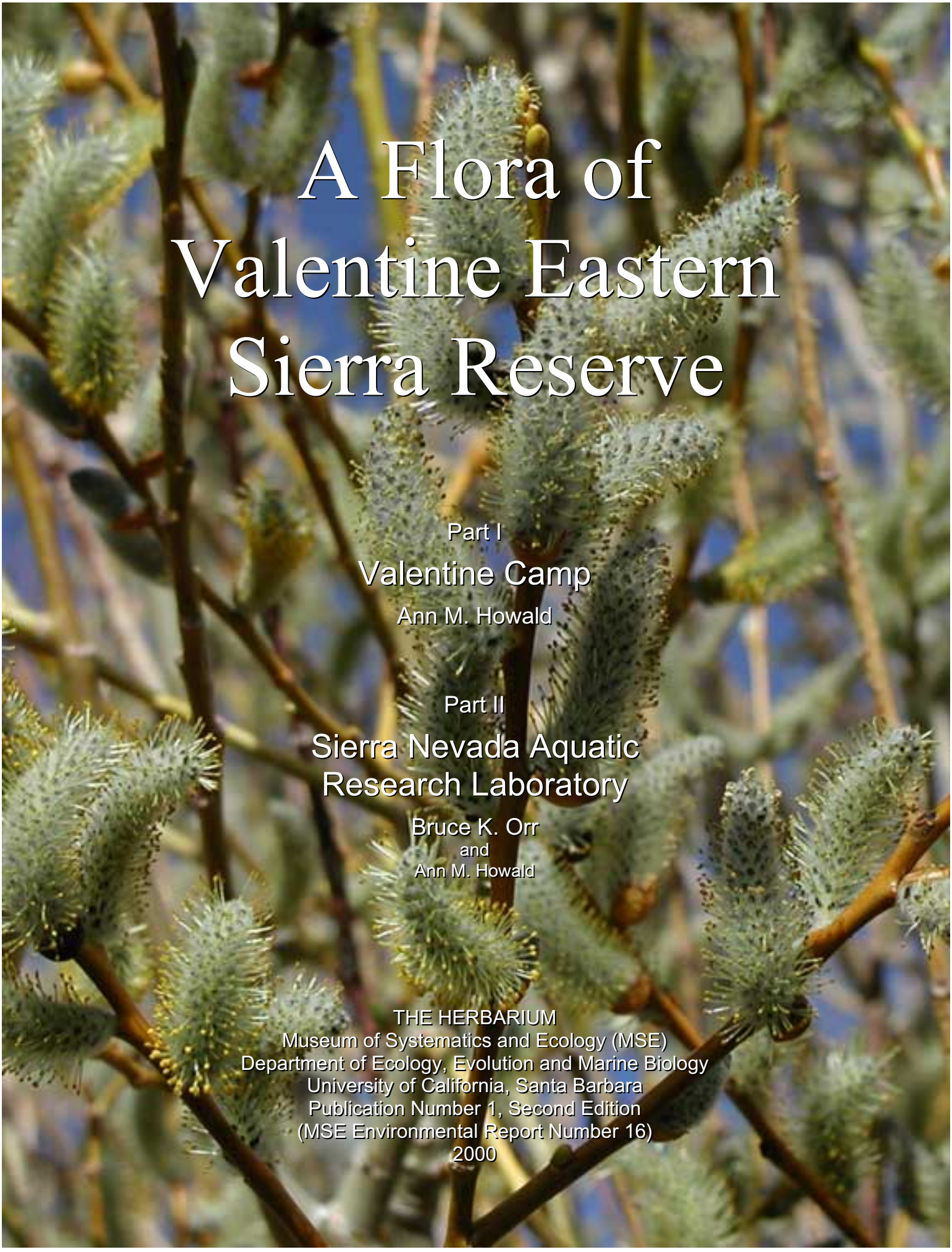

A Flora of Valentine Eastern Sierra Reserve

Part I

Valentine Camp

Ann M. Howald

Part II

Sierra Nevada Aquatic Research Laboratory

Bruce K. Orr
and
Ann M. Howald

THE HERBARIUM
Museum of Systematics and Ecology (MSE)
Department of Ecology, Evolution and Marine Biology
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Publication Number 1, Second Edition
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FOREWORD

The Environmental Report Series of the Museum of Systematics and Ecology (MSE), a programmatic facility that is administered through the Department of Ecology, Evolution, and Marine Biology at the University of California, Santa Barbara, serves as a publication vehicle for UCSB students, faculty, and staff, and other University associated investigators. Manuscripts accepted for publication include primarily those that report results of MSE investigations sponsored by contract and grant funding and student research projects. This endeavor is consistent with the mission of the Museum, which includes: (1) traditional roles of natural history museums such as research, education, and public outreach, as well as (2) extended roles such as land stewardship, habitat management and restoration, and environmental planning.

MSE Environmental Report No. 16, *A Flora of Valentine Eastern Sierra Reserve*, is a revised and amended edition of what was published previously as UCSB Herbarium Publication No. 1 (1981), which was a product of floristic research conducted by UCSB students. The research for Part I, *Valentine Camp*, by Ann Howald, and Part II, *Sierra Nevada Aquatic Research Laboratory*, by Bruce Orr, was conducted independently by the respective authors although each assisted the other during various phases of this work. The second edition, which also can be cited as UCSB Herbarium Publication No. 1, 2nd ed. (Howald and Orr 2000), was revised and amended by Ann Howald. Dan Dawson, Director of the Valentine Eastern Sierra Reserve, facilitated the revision and publication process, including the electronic and paper versions of the document.

This milestone publication is provided twenty years after the original work was conducted, and represents an important contribution to the knowledge of the botanical resources of the Eastern Sierra and to the stewardship of the natural resources of two reserves within the University of California Santa Barbara Natural Reserve System. It also represents an anniversary publication for the MSE, which now includes the UCSB Herbarium and its publication series. We are pleased to serve as the publication vehicle that makes this contribution possible. The *Flora of Valentine Eastern Sierra Reserve* is a demonstration of the continuing, productive, and beneficial relationship between the UCSB Natural Reserve System and the Museum of Systematics and Ecology.

Wayne R. Ferren Jr.
Executive Director, MSE
Associate Director, UCSB NRS

NATURAL RESERVE SYSTEM

The mission of the Natural Reserve System is to contribute to the understanding and wise management of the Earth and its natural systems by supporting university-level teaching, research, and public service at protected natural areas throughout California.

Over thirty years ago, the University of California Natural Reserve System (NRS) began to assemble, for scientific study, a system of protected sites that would broadly represent California's rich ecological diversity. By creating this system of outdoor classrooms and laboratories and making it available specifically for long-term study, the NRS supports a variety of disciplines that require fieldwork in wildland ecosystems.

The NRS makes relatively undisturbed samples of the state's natural ecosystems and the facilities needed to support teaching and research available not only to students, teachers, and researchers from the University of California, but to any qualified user from any institution, public or private, throughout the world. While other colleges and universities may have one or more sites for fieldwork, none can match the size, scope, and ecological diversity of the NRS. The NRS is the largest university-operated system of natural reserves in the world.

By the late 1950s, disruption and loss of wildland field sites in California had already become a significant problem for university researchers and educators in the natural sciences. The state's population was increasing rapidly, and development had accelerated to such a pace that few places remained safe from disruption, even on protected public lands. As a growing proportion of California's natural landscapes became unusable for wildland or natural ecosystem research and teaching, University faculty stated a need for natural areas managed specifically for academic use – samples of natural ecosystems where they could undertake long-term projects with confidence that their teaching and research sites would remain undisturbed.

Accordingly, in January of 1965, The Regents of the University of California established the Natural Land and Water Reserves System as the Natural Reserve System was first known and designated seven University-owned sites as its first reserves. Today the NRS manages thirty-three reserves that encompass over 120,000 acres across twelve ecological regions in one of the most physiographically diverse regions in the U.S.

The reserves vary in size, remoteness, degree of human impact, and ability to support use. Twelve of thirty-three sites currently are, or are envisioned as, full-facility reserves, possessing the facilities, equipment, and professional staff necessary to support long-term research projects and multiweek field courses remote from campus services. Nine sites have or will have partial facilities and professional staff. The remaining sites lack improvements other than possible restrooms or trails; they typically share the facilities of a nearby campus or full-service reserve.

Research

Researchers view the NRS reserves as outdoor laboratories: sites where they can analyze natural systems, comprehend important, basic, ecological principles, and attain better understanding of the impact of humankind upon the world and it upon us. Thus, the NRS is contributing to the solution of such problems as wildland conversion and loss of native biodiversity, environmental deterioration, and water conservation.

Some reserves serve as representative sites for carrying out studies with regional implications. Others are unique and so allow scientists to conduct site-specific research work that cannot be carried out anywhere else in the world. Yet, at all NRS reserves, scientists pursue their studies untroubled by the frequent and unpredictable human disturbances that afflict those who attempt to work on public land. The reserves themselves remain relatively free from the varying degrees of disruption that natural habitats elsewhere sustain under the pressures of growing population, urbanization, and intensified use of natural resources. This happy state of affairs means that scientists can use NRS reserves to establish baseline conditions and accurately measure environmental change.

Additional support for research evolves from the fact that NRS reserves draw scientists from many institutions and a variety of fields. Various NRS sites serve as catalysts for interdisciplinary studies, as "think tanks" where collaboration and mutual inspiration are common. Such robust intellectual cross-pollination creates a fertile climate for teaching as well, where students have a firsthand opportunity to conduct scientific study and interact with outstanding researchers in a less formal setting.

Teaching

The NRS is often accurately described as a classroom without walls or a library of ecosystems. Such descriptions recognize that, in order to study the environment, one must go out into it and learn through direct observation and measurement. Field study is an important dimension of many disciplines, and the NRS supports a wide variety of disciplines that require field sites. These disciplines include, but are not limited to: botany, entomology, zoology, geology, geography, meteorology, archaeology, paleontology, ecology, environmental planning, wildlife management, public health, even the arts. No limits of a disciplinary sort are normally imposed at NRS sites.

Public Service

Teaching and research are the principal activities on NRS reserves, and these endeavors benefit the public indirectly. However, the NRS also serves the public directly by making its reserves and facilities available to government agencies, conservation groups, and other appropriate organizations and by collaborating with these entities to protect the state's natural resources. While reserve use is by permission only and all uses of NRS reserves must be consistent with the University's teaching and research objectives, the NRS makes every effort to allow the general public to visit its reserves and learn of the work conducted there.

The NRS serves the public in many far-reaching ways. One very important way is by providing unparalleled opportunities for the environmental education of K-12 youth (kindergarten through 12th grade) in both elementary/secondary schools and informal instruction programs. Because the NRS is a University-administered program, many people do not realize that all of our University campuses are involved with K-12 education on their reserves. Moreover, resident reserve staff and their families often play leadership roles in the process, not only hosting groups of schoolchildren, but also designing instructional projects, compiling collections and databases, teaching students directly, and coordinating demonstrations by resident and visiting scientists.

NRS reserves help to preserve biodiversity and conserve genetic resources by protecting natural communities and rare, threatened, or endangered species for further study. In addition, NRS personnel provide technical consultation on such important community concerns as watershed protection, fire suppression, regional resource management, and potential land-use impacts.

Valentine Eastern Sierra Reserve

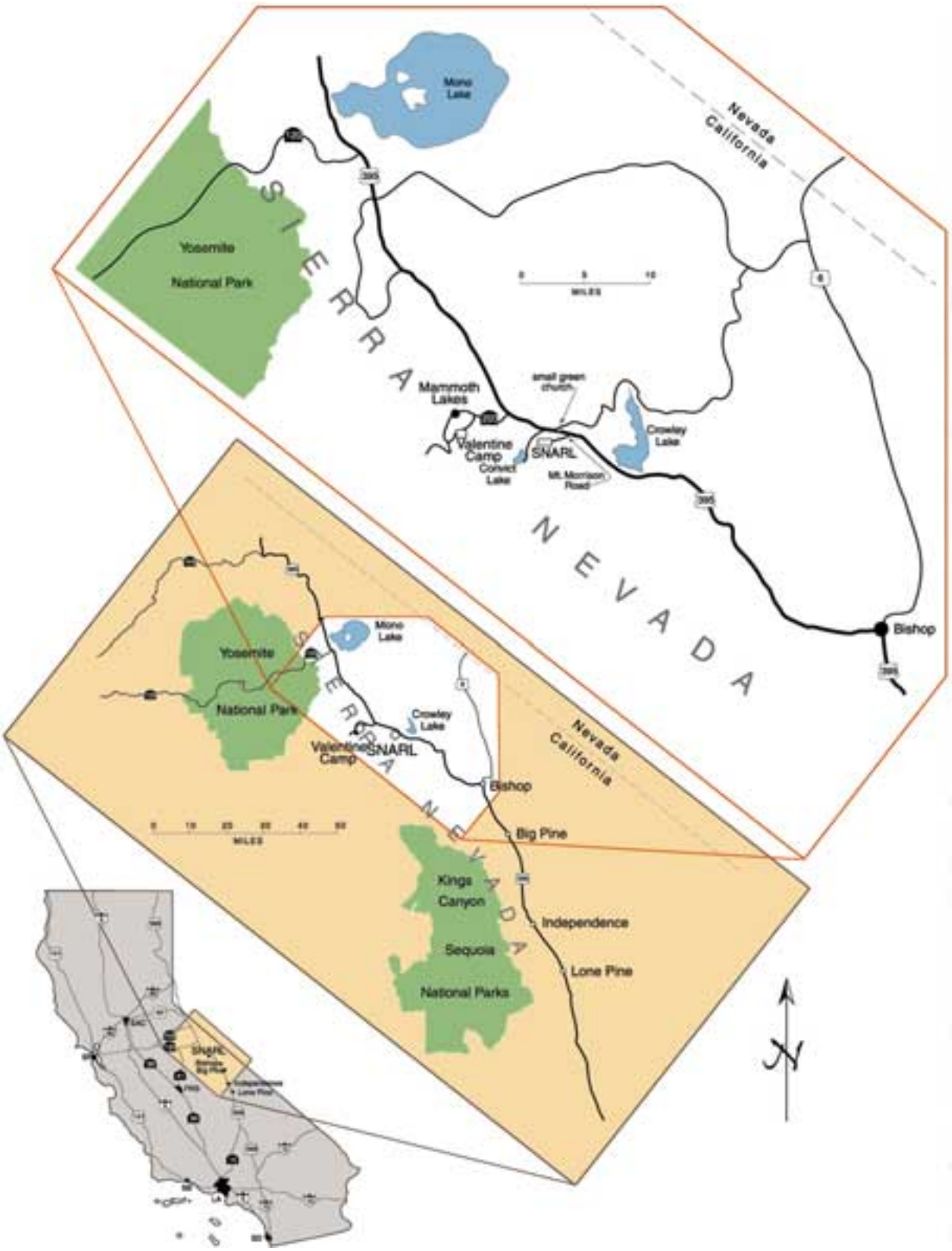
Valentine Eastern Sierra Reserve (VESR) consists of two separate parcels, Valentine Camp and the Sierra Nevada Aquatic Research Laboratory, located approximately eight miles apart. They are situated in Mono County on the eastern slope of the Sierra Nevada, near the Town of Mammoth Lakes. VESR became part of the NRS in 1973 and is administered though the Marine Science Institute, University of California, Santa Barbara.

Valentine Camp

Mrs. Edward R. Valentine donated Valentine Camp to the University in 1972 and provided a generous endowment fund for its support. The property was 136 acres at the time of donation but has grown to approximately 154 acres though other small gifts. The Reserve sits below the Mammoth Lakes Basin at an elevation of approximately 8,000-ft (2,400-m) and contains an unusually diverse sample of eastern Sierran habitats on the climatic ecotone between the sagebrush desert of the Great Basin and the coniferous forests of the Sierra Nevada. Mammoth Creek flows through the property, and numerous springs arise within its boundaries. The terrain is varied, including a variety of elevations, slopes, and aspects. Plant communities include Great Basin Sagebrush, Montane Chaparral, Sierran Upper Montane Forest, Meadow Vegetation, and Montane Riparian Vegetation. The facilities are open, as weather permits, from around the first of June through the middle of October, and on a limited basis for winter day use. Housing consists of three large cabins, which can accommodate a total of 16 persons. A system of foot trails provides access to all of the site's major habitats.

Sierra Nevada Aquatic Research Laboratory (SNARL)

SNARL is situated on 55 acres on the eastern slope of the Sierra Nevada and is an ideal base for field research throughout the eastern Sierra and the Owens Valley. SNARL provides a modern laboratory and experimental stream complex that promotes and encourages scientific research all year long. Modern housing, including dormitory accommodations for 25 persons, as well as five houses with accommodations for 15, furnishes classes with a base for instruction in the ecologically and geologically diverse eastern Sierra Nevada. The SNARL classroom annex is within walking distance of the dormitory. The laboratory facilities include six wet labs fitted with benches and cabinets, two controlled-environment rooms, a chemistry lab, and a radioisotope lab. SNARL's Headquarters building houses offices and a database center equipped with state-of-the-art computers, software, and dedicated Internet access. Within SNARL Convict Creek has a natural section and four controlled sections with dams and weirs. Typical High Desert Riparian Woodland of willow, aspen, and birch follows the stream, and a Great Basin Sagebrush community occupies the surrounding valley. Elements of Riparian Meadow Vegetation are also found with the fenced boundaries. A former US Fish and Wildlife Research station since 1935, the facilities at SNARL were transferred to the University in 1973. The land is leased from the Los Angeles Department of Water and Power.



Map 1. Valentine Eastern Sierra Reserve: Location of Valentine Camp and Sierra Nevada Aquatic Reasarch Laboratory (SNARL)

A Flora of Valentine Eastern Sierra Reserve

Part I

Valentine Camp

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Table of Contents

Introduction

Valentine Camp is a small, remarkably pristine site that preserves a remnant of the diverse natural vegetation found in the immediate vicinity of the town of Mammoth Lakes, Mono County, California. For the past 25 years, this area has undergone rapid change as a result of the expansion of ski facilities on and near Mammoth Mountain and of commercial and residential development of the town. As a result, virtually all native vegetation within town limits and in adjacent areas has been removed, or has lost much of its native biological diversity as a result of development-related disturbances and the spread of introduced species. These losses highlight the fact that, as a preserve for native biological diversity, Valentine Camp is even more important today than when the Valentine Eastern Sierra Reserve was established in 1973.

Although it is on the drier eastern slope of the Sierra Nevada, the Mammoth Basin lies east of a low elevation pass in the Sierran crest, and thus it receives more precipitation than similar areas to the north and south. The flora of Valentine Camp reflects this in its composition. Species characteristic of both the wetter western and drier eastern Sierran slopes are here, as well as representatives of the Great Basin flora that reaches its southwesternmost limits of distribution in eastern California.

The flora of the Mammoth Lakes area has not been systematically studied and there have been only a few botanical studies in Mono County. J. T. Howell collected in the county, particularly in the Convict Creek basin, in the 1940s. The Convict Creek watershed also was investigated briefly by Major and Bamberg (1963). DeDecker (1979) has studied the flora of Glass Mountain Ridge. Peirson collected in parts of the county, including in the vicinity of Convict Creek, in the 1930s (Major and Bamberg, 1963). Howald (1983, 1991) collected on Mammoth Mountain and in the Mammoth Lakes basin and adjacent area.

This flora includes a brief description of the physical characteristics and vegetation types of Valentine Camp, followed by an annotated catalog of the vascular plant taxa.

Location and Topography

Valentine Camp is located on the eastern slope of the Sierra Nevada approximately one and one-half miles (2.4 km) southwest of the town of Mammoth Lakes (Figure 1). The camp covers 154 acres (61.3 ha), with elevations ranging from approximately 8,000 to 8,500 ft (2,440 to 2,590 m). Access to the Camp is from Old Mammoth Road, which also forms part of the southern boundary of the property. The northern boundary is formed in part by Lake Mary Road. The eastern boundary runs across a small sagebrush-covered moraine (referred to here and locally as the “sagebrush knoll”) and the western boundary crosses a steep, northeast-facing slope. The land to the northwest, west and southwest of the Camp is within Inyo National Forest, and the land to the south and east is under private ownership.

The topography of the Camp is quite varied with respect to its small size. Some of the more notable features include a gently sloping glacial moraine, a stream-cut canyon with a small waterfall, and steep northeast- and south-facing slopes. Permanent and intermittent springs flow from several sites on the northeast- and south-facing slopes. The property is bisected by Mammoth Creek, which flows northeast from Twin Lakes and through the Camp roughly from west to east. Two constructed trout ponds, dug in 1920 and 1954, are fed by a small diversion of Mammoth Creek.

Geology

The following discussion of the geology of Valentine Camp is based on studies by Lipshie (1976). He identified the rock types and mappable geologic units of the Camp. Several distinct rock and sediment types occur within the boundaries of Valentine Camp, including basalt, obsidian, pumice, granite, quartz latite, and glacial till. These rock and sediment types, either alone or in combination, occur within one or more of four mappable geologic units: andesite, rhyodacite, glacial deposits, and "low ground." The last includes meadows and areas of saturated soils, and as defined here, is not technically a geologic unit. However, it can be mapped and separated from the other units on the basis of distinctive physical characteristics.

Andesite, derived from andesitic lava, informally named the Valentine Andesite, crops out along Mammoth Creek for a distance of about 1,000 ft (305 m). It is at least 50 ft (15.3 m) thick near the creek and probably flowed from a source vent somewhere to the west. This andesite was dated by the potassium-argon method to an age of 83,000 ± 10,000 years b.p.

Rhyodacite (quartz latite) from Mammoth Mountain crops out along Mammoth Creek upstream from the andesite unit, and again along Lake Mary Road upslope from Valentine Camp. Mammoth Mountain, to the west, is a massive volcano built of rhyodacite lava extruded in a series of at least ten flows. These flows have potassium-argon dates ranging from approximately 180,000 to 50,000 years b.p. The rhyodacite flows in the northwest and southwest parts of Valentine Camp extended westward from source vents on the western flank of Mammoth Mountain.

Glacial deposits that cover most of Valentine Camp probably date from the Tioga (late Wisconsin) glacial stage that occurred about 20,000 years b.p. A glacier of Tiogan age formed in the Mammoth Lakes Basin below Mammoth Crest and flowed northward through the gap between Gold Mountain and Mammoth Mountain. Moving east, it flowed into the Mammoth Creek valley, now occupied by Old Mammoth. This glacier advanced east along Mammoth Creek to a point one-half mile (0.8 km) east of the present-day junction of Sherwin Creek and Old Mammoth Roads. Boulders and cobbles in the glacial till at Valentine Camp consist of three main rock types: granitic, basaltic, and metamorphic. The till contains all rock sizes from silt to large boulders. The sagebrush-covered knoll, on the northeastern boundary of the Camp, is part of a long lateral moraine of Tioga age that extends eastward for about a mile (1.6 km).

All of the geologic units of the Camp have been blanketed with pumice ash from volcanic eruptions, some of which occurred in the past several thousand years. Volcanic vents in the Inyo and Mono Craters chains were the source of widespread ash falls in the region, dated at about 1,200 and 700 years b.p. Obsidian flakes, probably transported to the area by indigenous Paiutes, are scattered in the pumice deposits.

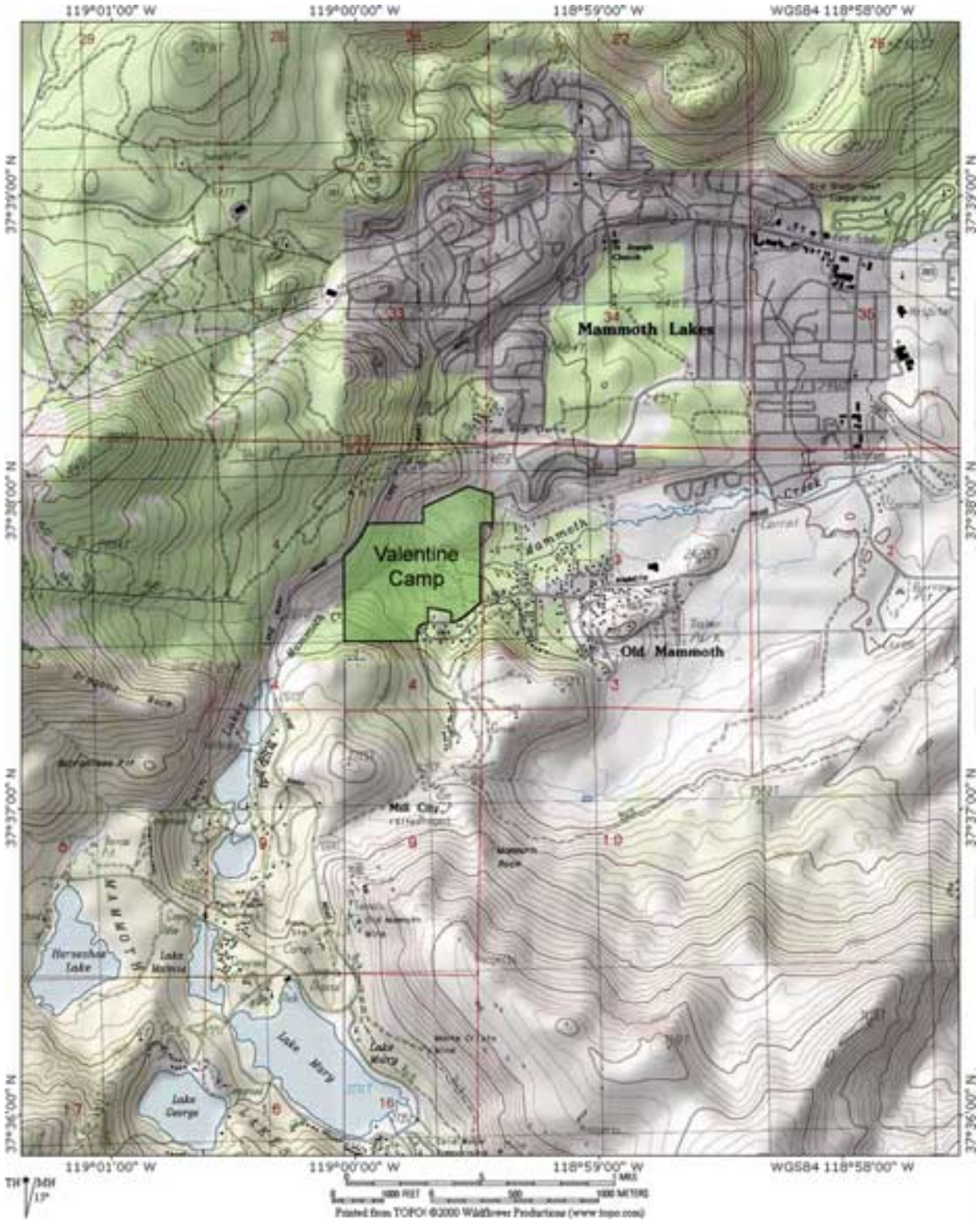

Figure 1. Location of Valentine Camp.

Climate

The climate of Valentine Camp is a product of the Mediterranean-type weather patterns of California, the general location of Valentine Camp on the eastern slope of the Sierra Nevada, and the specific topographic situation of the reserve. The broad regional climate is characterized by cool, wet winters and warm, dry summers. Pacific storms begin to affect California in October and November and continue intermittently through March in most years. Each winter, about 15 to 20 discrete storms affect central California, on the average. Interstorm periods of one to several days tend to be clear but cool. December, January, and February tend to be the months of greatest precipitation, although in any given winter, there is usually an extended dry period of three to six weeks during mid-winter. Storm frequency and intensity decrease in April and May, although there may be a few significant storms during the spring. Summers tend to be dry and warm because of the dominance of high pressure and the absence of a storm track through California during the summer months. Convective thunderstorms occasionally develop when adequate moisture enters the Sierra Nevada. When the "Arizona monsoon" pattern delivers moist air farther west and north than usual, significant thunderstorms can occur each afternoon and evening for several days at a time in the eastern Sierra. The larger events of this nature have occurred in September, which otherwise tends to be dry in most years.

The east-side location of Valentine Camp puts it in the rain-shadow of the Sierra Nevada crest. Orographic lifting tends to enhance precipitation on the western slope of the range, and the descent of the air masses, once over the crest, reduces precipitation. Amounts of precipitation decrease dramatically with distance east of the crest. Valentine Camp is at the western margin of the Great Basin and may be influenced somewhat by the arid, continental climate to the east. A few winter storms that progress south from eastern Oregon into Nevada produce upslope flow and orographic lifting on the eastern slope of the Sierra Nevada, as does the summer monsoon pattern.

Local topography has a strong influence on the climate of Valentine Camp. The reserve is roughly in line with the canyon of the upper San Joaquin River and Mammoth Pass, one of the two lowest gaps (Minaret Summit is the other) in the crest for dozens of miles. The southwest to northeast-oriented canyon of the San Joaquin River directs winter storms toward Mammoth Mountain and Mammoth Pass, which have been long recognized as high-precipitation anomalies. The relatively low gap allows some of the moisture-laden air to pass through the higher mountains and deposit more precipitation in the Valentine Camp and Mammoth Lakes areas than occurs elsewhere along the eastern slope of the Sierra Nevada, where the rain-shadow effect is more pronounced. Air flow through Mammoth Pass may also result in higher local wind speeds during storm periods at Valentine Camp than in areas with greater topographic barriers to the west. The relatively high elevation of Valentine Camp (8,000-8,500 ft [2,440-2,590 m]) keeps air temperatures well below those in most of lowland California. During winter and spring, the elevation of Valentine Camp is generally well above the elevation of the snowline. Consequently, snow is the dominant form of precipitation at Valentine Camp.

Temperature

Air temperatures vary markedly both seasonally and daily. There is also considerable variation between years for any given day, making averages a poor descriptor. During summer, mean daily maxima have ranged between 65 and 80°F (18 and 27°C) and mean daily minima have ranged between 40 and 50°F (4 and 10°C). Nighttime low temperatures, especially at ground level, can drop below 32°F (0°C) at any time of year, although rarely for more than a few hours on even the coldest summer nights. Radiational heat loss in the meadow and cold air drainage from the surrounding uplands can result in

locally low nighttime temperatures. The forest canopy maintains warmer temperatures among the trees. During winter, mean daily maxima have ranged between 35 and 45°F (2 and 7°C) and mean daily minima have ranged between 15 and 25°F (-9 and -4°C). However, on many winter days, air temperatures do not rise above 32°F (0°C). In some winters, minimum air temperatures can drop to about -20°F (-29°C) during outbreaks of polar air.

Wind

The prevailing wind direction during most of the year at Valentine Camp is from the southwest. Air flows up the San Joaquin River canyon, through Mammoth Pass, past Twin Lakes, and down Mammoth Creek into Valentine Camp. This pattern is strongest during winter storms. Most of the reserve is relatively sheltered from wind (compared to the outlet of Twin Lakes just upslope) because of the topographic depression that the reserve occupies (allowing the primary air flow to remain above the surface of the reserve) and the aerodynamic roughness provided by the forest. During occasional periods in summer when regional air flow is poorly developed, local energy balances control air movement. In the afternoon, warm air from Mammoth Lakes tends to flow upslope from east to west through Valentine Camp. At night, the circulation reverses, and cool air flows downhill from the Lakes Basin. Wind speeds have not been measured at Valentine Camp, and there is no reliable means of characterizing wind speed at the reserve.

Precipitation

Although annual precipitation has not been measured at Valentine Camp, estimates can be obtained from interpolating between records from nearby stations. One gage is located uphill of the reserve at Lake Mary (elevation 8920 ft [2720 m]) and is operated by the Los Angeles Department of Water and Power. Another gage is maintained at the Mammoth Lakes Ranger Station (elevation 7775 ft [2370 m]) by the U.S. Forest Service. Annual precipitation at Lake Mary from 1946 through 1997 has averaged 29.2 inches (743 mm). During this period, the maximum was 52.6 in (1336 mm), in calendar year 1981, and the minimum was 13.2 in (336 mm), in calendar year 1976. At the Mammoth Lakes Ranger Station, annual precipitation averaged 23.0 in (584 mm) from 1991 through 1997. The average for the same period at the Lake Mary gage was 35.0 in (890 mm). Based on the seven years of coincident record, average annual precipitation at Mammoth Lakes Ranger Station is about 66 percent of that at Lake Mary. A crude interpolation, based on elevation and topographic characteristics, suggests that average annual precipitation at Valentine Camp is about 80 percent of that at Lake Mary or about 24 in (600 mm). An earlier estimate was 25 in (630 mm) (Howald, 1981). From the Lake Mary record, about 75 percent of the annual precipitation occurs during the months of October through March and about 25 percent occurs during the months of April through September.

Snow Cover

Most of the annual precipitation at Valentine Camp falls as snow, resulting in a snowpack for several months of the year. Snow typically begins to fall in October, although there is the possibility of at least modest snow showers in any month. The early-season snow usually melts within a few hours or days after it is deposited. Snow cover tends to be thin and discontinuous into November or December, especially under dense forest cover. As storms become more frequent and deposit greater amounts of snow, a snowpack develops with contributions from successive storms. Individual storms during mid-winter can deposit a few millimeters to more than a meter of snow. Substantial rainfall rarely occurs at the elevation of Valentine Camp during winter or spring. However, notable exceptions occurred in January 1980, May 1996, and January 1997.

Snow depth typically reaches a maximum sometime in April, although peak accumulation can sometimes occur in May or as early as January, as in the unusual case of 1997. Snowpack measurements have been made at three locations (identified by their California Department of Water Resources name) in the Mammoth Lakes area for more than 70 years: Mammoth Pass (9,500 ft [2,896 m]), Mammoth (8,300 ft [2,530 m]), and Minarets 2 (8,200 ft [2,500 m]). The mean snowpack water equivalence (depth of water if a column of snow was melted) on about April 1 (near peak accumulation) over the period of record for these three sites is 44 in (1120 mm), 21 in (530 mm), and 31 in (780 mm), respectively. Average peak snowpack water equivalence at Valentine Camp is probably close to the value for the Mammoth snow course (about 21 in (530 mm). However, snowpack water storage varies greatly from year to year. Over the period of record at these three sites, peak water equivalence has varied from 20 percent to 200 percent of the mean. Although there is some melt of the snow at Valentine Camp during extended periods of clear weather in mid-winter, especially on south-facing slopes, sustained snowmelt does not typically begin until April. Daily melt amounts from a research site on Mammoth Mountain have averaged 0.8 to 1.2 in (20 to 30 mm) per day during clear spring weather. Snow cover usually disappears from Valentine Camp in May, except for isolated patches under dense forest cover.

Air Quality

Air quality in the Mammoth Lakes area tends to be excellent whenever the wind is blowing. However, on calm nights in winter, particulate matter (so-called PM10) levels from wood smoke and carbon monoxide from wood burning and vehicles can be significant. During these conditions, the levels of particulate matter exceed federal air-quality standards. Occasionally, ozone levels in Mammoth Lakes exceed state standards. These pollutants may affect Valentine Camp, but measurements of concentrations or effects have not been made at the reserve.

Vegetation

The varied topography and geology of Valentine Camp have contributed to the development of diverse vegetation. Haller and Howald have classified the vegetation into seven types adapted from those described by Cheatham and Haller (1975):

1) Sierran Upper Montane Forest
2) Sierran Upper Montane Chaparral
3) Great Basin Sagebrush Vegetation
4) High Montane Riparian Woodland
5) Meadow Vegetation
6) Sagebrush-Meadow Vegetation
7) Seep and Spring Vegetation

A generalized vegetation map is shown in Figure 2.

Sierran Upper Montane Forest is the most widespread vegetation type of the Camp. It is represented by three intergrading phases: the Red Fir Phase, the Jeffrey Pine Phase, and the Lodgepole Pine Phase. The Red Fir Phase is found on the steep northeast-facing slope, at elevations generally above those of the rest of the forest vegetation. This phase is dominated by Red Fir (*Abies magnifica*), with some Western White Pine (*Pinus monticola*) and Mountain Hemlock (*Tsuga mertensiana*) at one high elevation site. The understory is heavily shaded, and contains very sparse plant cover. The Jeffrey Pine Phase occupies the gradual slope at the base of the steep northeast-facing slope. It is dominated by Jeffrey Pine (*Pinus jeffreyi*) and White Fir (*Abies concolor*). In the late 1990s several large Jeffrey Pines in this area, with ages estimated from 650 to 800 years, died suddenly. The understory of this forest varies from shaded to sunny. Dry sunny forest openings support patches of chaparral or sagebrush vegetation. Areas of moist soil, which may be shaded or sunny, support lush seep vegetation. The Lodgepole Pine Phase occupies the lower flats west of the entrance road, around the cabins and around the big meadow. Lodgepole Pine (*Pinus contorta* ssp. *murrayana*) and White Fir are the dominant tree species. Lodgepole Pines in this area periodically have been subject to attack by native bark beetles. Dead trees contributed to a high fuel load that was reduced by selective clearing in 1998. The understory of the Lodgepole Pine Phase varies from shaded to sunny and supports a large variety of characteristic shrubs and herbaceous plants.

Sierran Upper Montane Chaparral is most extensive on the steeper portion of the south-facing slope below Lake Mary Road. It also occurs in patches in some dry sunny forest openings. The dominant shrubs of this vegetation include Pinemat Manzanita (*Arctostaphylos nevadensis*), Greenleaf Manzanita (*A. patula*), Tobacco Brush (*Ceanothus velutinus*), Snowbush (*C. cordulatus*), Huckleberry Oak (*Quercus vaccinifolia*), and Bitter Cherry (*Prunus emarginata*). Over the long-term, succession may favor forest trees on this slope, as indicated by scattered young Red and White Firs.

Great Basin Sagebrush Vegetation covers the gentle west-facing slope of the moraine (sagebrush knoll) in the northeast corner of Valentine Camp. This vegetation also occurs in some dry sunny forest openings. The dominant shrubs include Mountain Sagebrush (*Artemisia tridentata*), Antelope Bitterbrush (*Purshia tridentata*), and Snowberry (*Symphoricarpos rotundifolius*). This vegetation type contains a higher percentage of annual plants than any other found at the Camp.

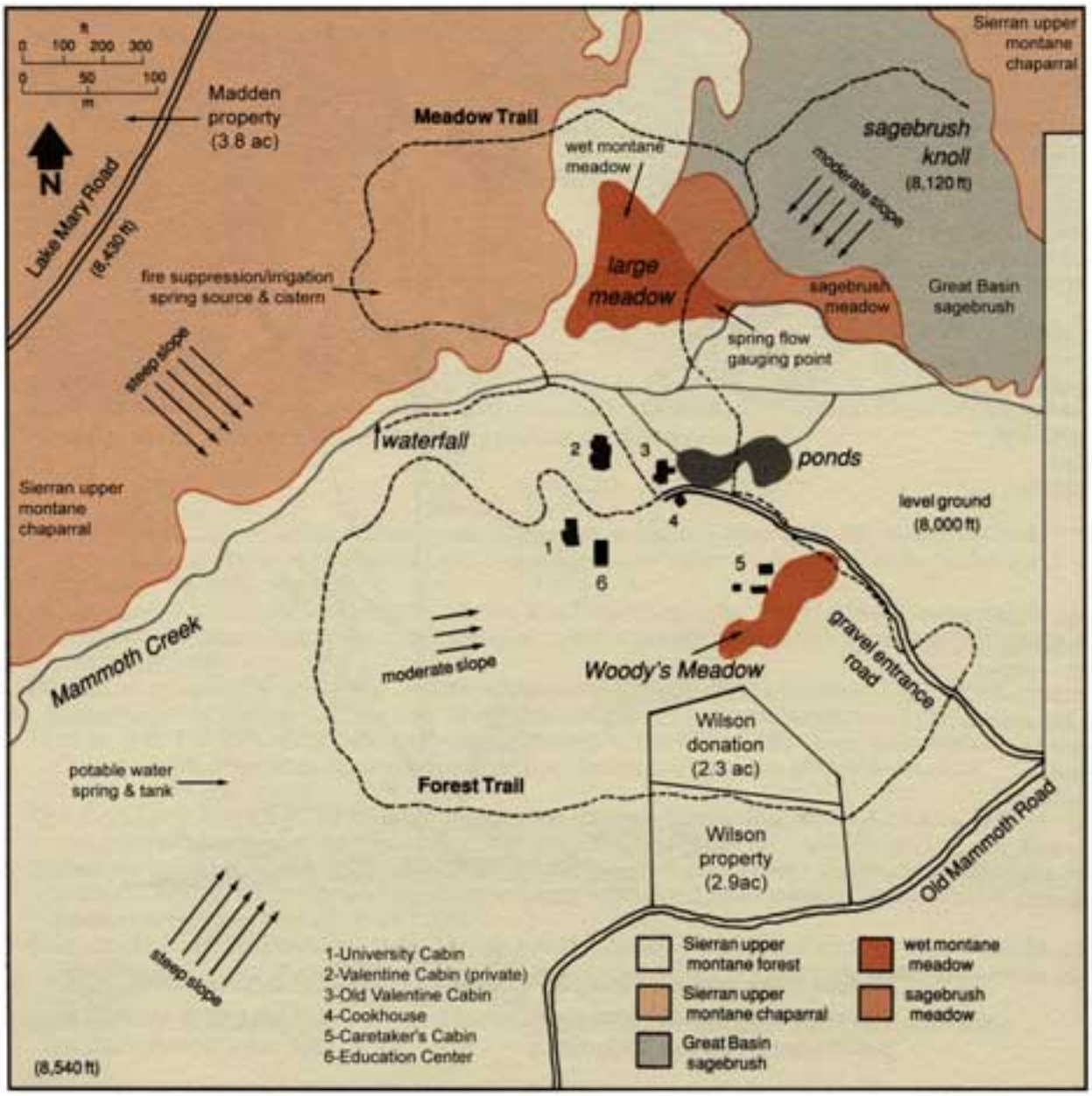

Figure 2. Valentine Camp: Vegetation, topography and landmarks. Note: Reserve boundary has been enlarged to the north.

High Montane Riparian Woodland is restricted primarily to the immediate borders of Mammoth Creek. The dominants of this vegetation are small trees and large shrubs, including Quaking Aspen (*Populus tremuloides*), Mountain Alder (*Alnus incana* ssp. *tenuifolia*), American Dogwood (*Cornus sericea*), and willows (*Salix lucida* and *S. planifolia*). The understory is made up of a dense growth of mesophytic herbs and grasses also found in other moist-soil vegetation types of the Camp.

Meadow Vegetation is found in the two meadows at Valentine Camp; a large meadow north of Mammoth Creek near the center of the Camp; and a smaller meadow (Woody's meadow), near the caretaker's cabin and the entrance road. Meadow Vegetation is dominated by herbaceous perennials such as Corn Lily (*Veratrum californicum*), Cow Parsnip (*Heracleum lanatum*), Meadow Lupine (*Lupinus polyphyllus*), Willow-herb (*Epilobium ciliatum* and *E. halleanum*), Meadow Paintbrush (*Castilleja miniata*), a sedge (*Carex jonesii*), Mexican Rush (*Juncus mexicanus*), and many species of perennial grasses. Many species found here also occur in meadows on the western slope of the Sierra Nevada.

Sagebrush-Meadow Vegetation is a transitional type that includes dominants of Great Basin Sagebrush and Meadow Vegetation, as well as some species not found in other vegetation types at Valentine Camp (e.g., *Epilobium brachycarpum*, *Plagiobothrys cusickii*). This type characterizes the ecotone between meadow and sagebrush at the base of the sagebrush knoll.

Seep and Spring Vegetation occurs in the vicinity of seeps and springs in many locations throughout the Camp. Seeps and springs are concentrated at the base of the steep northeast-facing slope and on the steep south-facing slope below Lake Mary Road. The environment of the seep and spring habitats varies somewhat from that of meadow and riparian habitats, although all are characterized by high amounts of soil moisture. Seeps and springs have lower flow rates and intermittent flow patterns, which may vary substantially from year to year. Some springs dry up completely in drought years but may flow throughout the summer in wet years. Most seeps and springs at Valentine Camp are on slopes in areas characterized by good drainage. The riparian habitat has uninterrupted flow with potential for scouring and overflowing of the streambanks during the high runoff period in early summer. Meadows of the Camp are usually moist until fall and have boggy, poorly drained soils not subject to scouring. However, these soils may be flooded in the early summer of wet years as a result of snowmelt and abundant seep and spring flow.

The vegetation of seeps and springs includes elements of both Meadow Vegetation, and High Montane Riparian Vegetation, with a few species not found in other types. Characteristic species of seeps and springs include Quaking Aspen (*Populus tremuloides*), willows (*Salix* spp.), Ranger's Buttons (*Sphenosciadium capitellatum*), Sierra Rein Orchid (*Platanthera leucostachys*), Meadow Paintbrush (*Castilleja miniata*), Common Monkeyflower (*Mimulus guttatus*), Brewer’s Bitter-cress (*Cardamine breweri*) and rushes (*Juncus* spp.).

The Vascular Flora

General Remarks

The flora of Valentine Camp was studied intensively from 1975 to 1979 and in 1998. Limited observations were made from 1980 to 1997. The primary references used to identify the vascular flora include Hickman (1993), Munz and Keck (1959), Munz (1968) and available volumes of *Intermountain Flora*. (See References and Literature Cited for a complete list of references.) Common names used in this report were obtained from Hickman (1993), Weeden (1996), *Intermountain Flora*, and other sources. Voucher specimens are deposited in the Herbarium of the University of California, Santa Barbara (UCSB), and in herbarium cases in the headquarters building at the University of California's Sierra Nevada Aquatic Research Laboratory, southeast of the town of Mammoth Lakes. The vascular flora of Valentine Camp consists of 256 taxa (species, subspecies and varieties) from 54 families, distributed among the major groups as shown below:

	Families	Genera	Species*
Division Sphenophyta	1	1	1
Division Pterophyta	2	3	3
Division Coniferophyta	2	4	7
Division Anthophyta	49	163	245
Class Dicotyledonae	41	132	195
Class Monocotyledonae	8	31	50
Totals	54	171	256

* includes subspecies and varieties

Ten taxa have been added to the flora since publication of the first edition: *Chaenactis douglasii* var. *douglasii*, *Chamomilla suaveolens*, *Chrysothamnus nauseosus* ssp. *albicaulis*, *Stephanomeria exigua* ssp. *exigua*, *Tragopogon dubius*, *Cardamine breweri* var. *breweri*, *Medicago sativa*, *Epilobium glaberrimum* ssp. *fastigiatum*, *Veronica serpyllifolia* ssp. *humifusa*, and *Melica stricta*. Most of these were probably overlooked during previous surveys, but it is likely that the non-native *Chamomilla*, *Tragopogon* and *Medicago* have in fact become newly established at Valentine Camp since 1981.

Although the vegetation of Valentine Camp is dominated in large part by coniferous trees, the flora is comprised mainly of flowering plants. The ten largest families represented at the Camp, which contain 144 species and make up 56.3 percent of the flora, as shown below, are all members of Division Anthophyta.

Ten Largest Families	Number of Species	Percent of Flora
Asteraceae	37	14.5
Poaceae	25	9.8
Scrophulariaceae	13	5.1
Brassicaceae	11	4.3
Polemoniaceae	11	4.3
Polygonaceae	11	4.3
Rosaceae	10	3.9
Fabaceae	9	3.5
Liliaceae	9	3.5
Apiaceae	8	3.1
Totals 144	56.3	

The genera with greatest representation in the flora of Valentine Camp include *Trifolium* (Fabaceae) and *Epilobium* (Onagraceae), each with five species; *Arabis* (Brassicaceae), *Phacelia* (Hydrophyllaceae), *Eriogonum* (Polygonaceae), *Penstemon* (Scrophulariaceae), *Carex* (Cyperaceae), *Juncus* (Juncaceae) and *Agrostis* (Poaceae), each with four species; and *Artemisia* and *Senecio* (Asteraceae), *Ribes* (Grossulariaceae), *Mentzelia* (Loasaceae), *Phlox* (Polemoniaceae), *Rumex* (Polygonaceae), *Potentilla* (Rosaceae), *Mimulus* (Scrophulariaceae), *Elymus* and *Poa* (Poaceae), each with three species. An additional 30 genera are represented by two species each.

The flora of Valentine Camp is composed almost entirely of native species. In 1998 fourteen introduced species were identified (compared with 10 in 1979), constituting 5.5 percent of the flora. The majority of these are widespread weeds from Europe, including four grass species, that constitute no threat to the native flora. However, two introduced species, *Taraxacum officinale* (Common Dandelion) and *Tragopogon dubius* (Goat's Beard), both members of the Asteraceae, are known to be locally invasive.

Relationships Between the Floras of Valentine Camp and SNARL

The Valentine Camp flora (256 species) and the SNARL flora (162 species; Orr and Howald, 2000) have 74 species, subspecies and varieties in common. About one quarter (28.9 percent) of the plant taxa at Valentine Camp also occur at SNARL. The 74 taxa shared by Valentine Camp and SNARL account for 21.5 percent of the 344 taxa that comprise the flora of these two areas combined. These shared taxa are listed in Table 1.

The overlap between the two floras reflects the geographic proximity of Valentine Camp and SNARL, which lie within 8 miles (13 km) of each other. In addition, three vegetation types (sagebrush scrub, riparian woodland and meadow) are represented at both of the reserves. Valentine Camp is the larger and more topographically complex of the two sites and has four vegetation types that are not represented at SNARL, so one would expect its flora to be larger and more diverse, as is the case. Although montane and high desert plants are found at both reserves, the Valentine Camp flora is predominantly a montane flora, while the SNARL flora is more high desert in origin.

Table 1. Species, subspecies and varieties of Plants Common to Valentine Camp and SNARL

CONIFEROPHYTA
Cupressaceae
Juniperus occidentalis
Pinaceae
Pinus jeffreyi

ANTHOPHYTA: DICOTYLEDONAE
Apiaceae
Angelica lineariloba
Sphenosciadium capitellatum
Asteraceae
Achillea millefolium
Agoseris glauca var. *laciniata*
Antennaria rosea ssp. *confinus*
Artemisia cana var. *bolanderi*
Artemisia ludoviciana ssp. *candicans*
Artemisia tridentata
Chaenactis douglasii var. *douglasii*
Chrysothamnus nauseosus ssp. *albicaulis*
Chrysothamnus viscidiflorus
Cirsium congdonii
Crepis intermedia
Erigeron peregrinus var. *callianthemus*
Gnaphalium palustre
Machaeranthera canescens var. *canescens*
Senecio hydrophilus
Solidago canadensis ssp. *elongata*
*Taraxacum officinale**
Tetradymia canescens
*Tragopogon dubius**
Trimorpha lonchophylla
Brassicaceae
Descurainia incisa
Erysimum capitatum ssp. *perenne*
Caprifoliaceae
Symphoricarpos rotundifolius var. *rotundifolius*
Caryophyllaceae
Stellaria longipes var. *longipes*
Fabaceae
Astragalus purshii var. *tinctus*
Lupinus polyphyllus var. *burkei*
Trifolium longipes var. *nevadense*
T. wormskioldii
Gentianaceae
Gentianopsis holopetala
Grossulariaceae
Ribes cereum var. *cereum*
Loasaceae
Mentzelia congesta
Mentzelia montana
Onagraceae
Epilobium ciliatum
Gayophytum diffusum ssp. *parviflorum*
Papaveraceae
Argemone munita
Polemoniaceae
Allophyllum gilioides ssp. *violaceum*
Eriastrum wilcoxii
Phlox stansburyi
Polygonaceae
Eriogonum baileyi
Eriogonum spergulinum var. *reddingianum*
Eriogonum umbellatum var. *nevadense*
Polygonum douglasii var. *johnstonii*
Rumex salicifolius var. *triangulivalvis*
Ranunculaceae
Aconitum columbianum
Aquilegia formosa
Thalictrum fendleri var. *fendleri*
Rosaceae
Potentilla biennis
Potentilla glandulosa ssp. *hansenii*
Potentilla gracilis var. *elmeri*
Purshia tridentata var. *tridentata*
Rosa woodsii var. *ultramontana*
Salicaceae
Populus tremuloides
Scrophulariaceae
Castilleja miniata
Mimulus guttatus
Penstemon rostriflorus
Solanaceae
Nicotiana attenuata
Violaceae
Viola purpurea

ANTHOPHYTA: MONOCOTYLEDONAE
Iridaceae
Iris missouriensis
Juncaceae
Juncus macrandrus
Juncus mexicanus
Liliaceae
Allium bisceptrum
Fritillaria pinetorum
Lilium kelleyanum
Smilacina stellata
Poaceae
Elymus elymoides ssp. *elymoides*
Leymus cinereus
Leymus triticoides ssp. *triticoides*
Muhlenbergia richardsonis
*Phleum pratense**

* = not native to California; introduced

Annotated Catalog

This annotated catalog includes all vascular plants that have been identified at Valentine Camp, based on field surveys conducted mainly from 1975 to 1979 and in 1998. Taxonomic nomenclature is consistent with *The Jepson Manual* (Hickman, 1993). Families, genera and species are arranged alphabetically. The scientific name of each species is followed by common names of popular usage. Scientific names of native species are in **bold type**; those of introduced species are in plain type. Annotations include the abundance and distribution at Valentine Camp and, for flowering plants, the period of peak bloom at the Camp, based on six years or more of observations. Previously applied scientific names are given in brackets.

DIVISION SPHENOPHYTA

Equisetaceae. Horsetail Family

Equisetum arvense L. Common Horsetail.

Occasional in low-lying wet places, around constructed trout ponds and meadows, and along Mammoth Creek.

DIVISION PTEROPHYTA

Dennstaedtiaceae. Bracken Family

Pteridium aquilinum (L.) Kuhn var. ***pubescens*** Underw. Bracken Fern.

Occasional on south-facing slope above Mammoth Creek near the waterfall.

Dryopteridaceae. Wood Fern Family

Athyrium filix-femina (L.) Roth. var. ***cyclosorum*** Rupr. Lady Fern.

A few large plants occur beside the waterfall trail near the waterfall. [var. *californicum* Butters]

Cystopteris fragilis (L.) Bernh. Brittle Fern.

Scattered along waterfall trail near its junction with the meadow trail.

DIVISION CONIFEROPHYTA

Cupressaceae. Cypress Family

Juniperus occidentalis Hook. ssp. ***australis*** (Vasek) A. & N. Holmgren. Western Juniper. Sierra Juniper.

A few young trees on the south-facing slope near the northeastern U.S. Forest Service boundary tree and the very large Jeffrey Pine beside the meadow trail. One young tree beside entrance road near the gate.

Pinaceae. Pine Family

Abies concolor (Gord. & Glend.) Lindley. White Fir.

Common on flats west of entrance road, around cabins and at base of steep, northeast-facing slope.

Abies magnifica A. Murr. var. ***magnifica***. California Red Fir.

Common on steep, northeast-facing slope; occasional at its base. A few trees along Lake Mary Road and on south-facing slope below.

Pinus contorta Loudon ssp. ***murrayana*** (Grev. & Balf.) Critchf. Lodgepole Pine.

Common near entrance road and cabins, bordering meadows, and along Mammoth Creek. Occasional on steep, northeast-facing slope and at its base. [*P. m.* Grev. & Balf.]

Pinus jeffreyi Grev. & Balf. Jeffrey Pine.

Common along base of northeast-facing slope behind University cabin. Occasional near Mammoth Creek, on sagebrush knoll, on south-facing slope and west of entrance road. Eight (or more) very large, old (650 to 800 years) trees died in the mid to late-1990s during a period characterized by several years of below-average precipitation followed by the very wet “El Niño” year of 1997-98.

Pinus monticola Douglas. Western White Pine.

Occasional on steep, northeast-facing slope, extending from southwestern Reserve boundary down to elevation of forest trail. A solitary tree on the sagebrush knoll near the northeast boundary corner. More common at higher elevations than at Valentine Camp.

Tsuga mertensiana (Bong.) Carr. Mountain Hemlock.

A few trees near the western boundary on a north-facing slope above Mammoth Creek.

DIVISION ANTHOPHYTA

Class Dicotyledonae

Apiaceae. Carrot Family

Angelica lineariloba A. Gray. Sierra Angelica. Sierra Soda Straw.

Scattered in open sites on the steep, south-facing slope below Lake Mary Road. Mid-August to mid-September.

Cymopteris terebinthinus (Hook.) M.E. Jones var. ***californicus*** (Coult. & Rose) Jepson. Rocky Pteryxia.

Occasional in Lodgepole Pine forest understory, on steep, south-facing slopes and on sagebrush knoll. Mid-June to late July. [*Pteryxia t*. (Hook.) Coult. & Rose var. *c*. (Coult. & Rose) Math.]

Heracleum lanatum Michaux. Cow Parsnip.

Common in wet, low-lying places, around meadows and constructed trout ponds and along Mammoth Creek. Occasional west of Old Valentine Cabin along meadow trail. Early July to early August. [*H. sphondylium* L. ssp. *montanum* (Schleicher ex Gaudin) Briq.]

Lomatium dissectum (Torrey & A. Gray) Math. & Const. var. ***multifidum*** (Torrey & A. Gray) Math. & Const. Fern-leaved Lomatium.

Occasional in dry, open sites in understory of Lodgepole and Jeffrey Pine forests. Mid-June to mid-July.

Osmorhiza chilensis Hook. & Arn. Mountain Sweet-cicely.

Occasional in Lodgepole Pine forest understory, especially in moist sites. Early June to mid-July.

Osmorhiza occidentalis (Nuttall) Torrey. Western Sweet-cicely.

Common in Lodgepole Pine forest understory. Mid-June to late July.

Perideridia parishii (Coult. & Rose) Nelson & Macbr. Parish’s Yampah. Queen Anne's Lace.

Common in meadows; occasional about seeps and springs. Mid-July to mid-August.

Sphenosciadium capitellatum A. Gray. Ranger's Buttons. Swamp Whiteheads.

Common in and around meadows, at the base of the sagebrush knoll, along Mammoth Creek and around seeps and springs. Mid-July to mid-August.

Apocynaceae. Dogbane Family

Apocynum androsaemifolium L. Bitter Dogbane.

Occasional in the understory of the Jeffrey and Lodgepole Pine forests behind the University Cabin, and in openings in chaparral on south-facing slope below Lake Mary Road. Late July to late August. [*A. pumilum* (A. Gray) E. Greene var. *p*.]

Asteraceae. Sunflower Family

Achillea millefolium L. White Yarrow. Yarrow Milfoil.

Common on meadow margins at the base of the sagebrush knoll. Occasional on sagebrush knoll. Mid-July to late August. [var. *lanulosa* (Nuttall) Piper]

Ageratina occidentalis (Hook.) R. King & H. Rob. Western Eupatorium.

Uncommon at top of northeast-facing slope, at cliff base. Early July to mid-August. [*Eupatorium o*. Hook.]

Agoseris aurantiaca (Hook.) E. Greene. Mountain Dandelion.

Uncommon on southeast-facing slope near seeps. Early June to late July.

Agoseris glauca (Pursh) Raf. var. ***laciniata*** (D. Eaton) Smiley. Short-beaked Agoseris.

Occasional in openings in sagebrush scrub on sagebrush knoll. Early June to mid-July

Antennaria rosea E. Greene ssp. ***confinus*** (E. Greene) R. Bayer. Rosy Everlasting. Pussytoes.

Uncommon in openings in sagebrush scrub near Old Mammoth Road and on upper part of steep north-facing slope. Late June to mid-July.

Arnica chamissonis Less. ssp. ***foliosa*** (Nuttall) Maguire. Meadow Arnica.

Uncommon in big meadow near Mammoth Creek. Late July to early September.

Artemisia cana Pursh ssp. ***bolanderi*** (A. Gray) G. Ward. Silver or Hoary Sagebrush.

Occasional in sagebrush-meadow transition zone on south side of meadow trail. Early September to early October.

Artemisia ludoviciana Nuttall ssp. ***candicans*** (Rydb.) Keck. Wormwood.

Occasional on meadow margins and near Mammoth Creek. Late August to early October.

Artemisia ludoviciana Nuttall ssp. ***incompta*** (Nuttall) Keck. Silver Wormwood.

Common in wet, low-lying places, on meadow margins and near Mammoth Creek. Late August to early October.

Artemisia tridentata Nuttall ssp. ***vaseyana*** (Rydb.) Beetle. Mountain Sagebrush.

Common on sagebrush knoll and often forming a patchy understory in the dry soils of Lodgepole and Jeffrey Pine forests. Occasional on south-facing slope. Mid-August to early October.

Aster breweri (A. Gray) Semple. Golden-aster.

Occasional in semi-shaded understory of Red Fir forest. Mid-July to late August. [*Chrysopsis b*. A. Gray]

Aster eatonii (A. Gray) Howell. Eaton's Aster.

Common in meadows and along Mammoth Creek. Mid-August to late September.

Chaenactis douglasii (Hook.) H. & A. var. ***douglasii.*** Dusty Maidens. Hoary Chaenactis.

First collected at Valentine Camp in 1998. Occasional in open sites along Lake Mary Road and on south-facing slope below. Early July to mid-August.

Chamomilla suaveolens (Pursh) Rydb. Pineapple Weed.

First collected at Valentine Camp in 1998. Native to northwest North America and northeast Asia. Uncommon. One plant found on meadow trail at the base of the sagebrush knoll. Late July to late August. [*Matricaria matricarioides* (Less.) Porter]

Chrysothamnus nauseosus (Pallas) Britton ssp. ***albicaulis*** (Nuttall) Hall & Clem. Rubber Rabbit-brush.

First identified at Valentine Camp in 1998. Common along Lake Mary Road and on south-facing slope below road. Immature specimen tentatively identified as *C. parryi* in first edition of flora probably is this taxon. Jepson (1993) notes that stabilized hybrids of *Chrysothamnus nauseosus* ssp. *albicaulis* and *Ericameria discoidea* [*C. parryi* ssp. *bolanderi* (A. Gray) Hall & Clem.] occur in southwest Mono County. Early August to late September.

Chrysothamnus viscidiflorus (Hook.) Nuttall ssp. ***puberulus*** (D. Eaton) Hall & Clem. Sticky Rabbit-brush.

Occasional on sagebrush knoll and on south-facing slope below Lake Mary Road. Mid-August to late September.

Cirsium congdonii Moore & Frankton. Dwarf Thistle.

Occasional in meadow near streamlets and meadow trail, and in sagebrush-meadow transition area. A distinctive segregate from *C. scariosum* Nuttall. Early August to early September. [*C. drummondii* Torrey & A. Gray]

Crepis intermedia A. Gray. Intermediate Hawksbeard.

Occasional in Lodgepole Pine forest understory. Material identified as *C. modocensis* in first edition probably belongs here. Jepson (1993) calls *C. intermedia* a complex series of asexually reproducing forms, probably of hybrid origin, combining the characters of several *Crepis* species, including *C. modocensis*. Mid-July to mid-August.

Ericameria nana Nuttall. Goldenbush. Rubberweed.

Occasional on sagebrush knoll and on steep, south-facing slope below Lake Mary Road. Mid-August to late September. [*Haplopappus n*. (Nuttall) D.C. Eaton]

Erigeron breweri A. Gray var. ***breweri***. Brewer's Fleabane.

Occasional in forest understory. Mid-July to late August.

Erigeron peregrinus (Pursh) E. Greene var. ***callianthemus*** (E. Greene) Cronq. Wandering Daisy.

Occasional in meadow. Mid-August to mid-September.

Erigeron peregrinus (Pursh) E. Greene var. ***hirsutus*** Cronq. Wandering Daisy.

At Valentine Camp, rays usually purple but sometimes white. Occasional in Lodgepole and Jeffrey Pine forest understories. White-rayed plants seen near water tank in 1998. Mid-July to late August.

Gnaphalium palustre Nuttall. Pearly Everlasting

Occasional in Jeffrey Pine forest understory. Late July to late August.

Hieracium albiflorum Hook. White-flowered Hawkweed.

Occasional in shaded understory of Jeffrey Pine and Red Fir forests. Late July to late August.

Machaeranthera canescens (Pursh) A. Gray var. ***canescens***. Hoary Aster.

Occasional in forest openings along Old Mammoth Road near entrance road and along Lake Mary Road. Late July to late August.

Madia elegans D. Don. Elegant Madia.

Grows around shrubs near base of sagebrush knoll. Uncommon in 1975 to 1978, then not seen until mid-1990s. Common in 1997 and 1998. Re-evaluation of subspecies currently underway (Baldwin, pers. comm.) Late July to early September. [ssp. *wheeleri* (A. Gray) Keck]

Senecio hydrophilus Nuttall. Alkali-marsh Butterweed.

Common in the meadows, along Mammoth Creek and in low-lying wet places. Mid-August to late September.

Senecio integerrimus Nuttall var. ***exaltatus*** (Nuttall) Cronq. Single-stemmed Groundsel.

Occasional in understory of Jeffrey and Lodgepole Pine forests and on the sagebrush knoll. Early June to mid-July.

Senecio triangularis Hook. Arrowleaf Butterweed.

Common in moist places along Mammoth Creek, around constructed trout ponds and at seeps and springs. Not common in true meadows. Mid-July to mid-August.

Solidago canadensis L. ssp. ***elongata*** (Nuttall) Keck. Canada Goldenrod.

Common around constructed trout ponds, along Mammoth Creek and in moist places at the base of the sagebrush knoll. Mid-July to late September.

Stephanomeria exigua Nuttall ssp. ***exigua***. Small Wreath Plant.

First identified at Valentine Camp in 1998. Occasional along meadow trail in sagebrush-meadow transition zone. Late July to early September. [*S.e.* Nuttall var. *pentachaeta* (D.C. Eaton) H.M. Hall]

Stephanomeria tenuifolia (Torrey) Hall. Wire Lettuce.

Occasional in the understory of Jeffrey Pine and Red Fir forests. Late July to early September.

Taraxacum officinale Wigg. Common Dandelion.

Native to Europe. Invasive weed. Occasional in lawns around the caretaker's cabin and the constructed trout ponds, along trails and on meadow margins. Late June to late September. [*T. laevigatum* (Willd.) DC.]

Tetradymia canescens DC. Spineless Horsebrush.

Occasional on sagebrush knoll. Mid-August to late September.

Tragopogon dubius Scop. Goat's Beard.

Native to Europe. Invasive weed. First Valentine collection in 1998, from shoulder of Lake Mary Road. Potential to spread in open sites on south-facing slope below Lake Mary Road and elsewhere at Valentine Camp. Early July to mid-August.

Trimorpha lonchophylla (Hook.) G. Nesom. Short-rayed Aster.

Occasional near streamlets in meadow. Mid-August to late September. [*Erigeron l*. Hook.]

Wyethia mollis A. Gray. Mule's Ears.

Common on sagebrush knoll and in openings in Lodgepole and Jeffrey Pine forests. Mid-June to early August.

Betulaceae. Birch Family

Alnus incana (L.) Moench ssp. ***tenuifolia*** (Nuttall) Breitung. Mountain Alder.

Common along Mammoth Creek and around seeps and springs at the base of the steep, northeast-facing slope. Mid-June to mid-July. [*A.t.* Nuttall]

Boraginaceae. Borage Family

Cryptantha torreyana (A. Gray) E. Greene. Torrey's Cryptantha.

Occasional on sagebrush knoll, especially in open places and near path. Early July to early August.

Cryptantha watsonii (A. Gray) E. Greene. Watson's Cryptantha.

Occasional on sagebrush knoll and at top of steep, south-facing slope near Lake Mary Road. Mid-July to mid-August.

Hackelia micrantha (Eastw.) J. Gentry. Jessica's Stickseed.

Common in understory of Lodgepole Pine forest. Early June to late July. [*H. jessicae* (McGreg.) Brand.]

Hackelia mundula (Jepson) Ferris. Pink Stickseed.

Uncommon on south-facing slope and in understory of Lodgepole Pine forest. Late June to late July.

Plagiobothrys cusickii (E. Greene) I.M. Johnston. Cusick's Popcorn Flower.

Occasional in openings at base of sagebrush knoll in sagebrush-meadow transition zone. Mid-June to mid-August.

Brassicaceae. Mustard Family

Arabis divaricarpa A. Nelson. Bent-pod Rockcress.

Occasional in the understory of Red Fir and Lodgepole Pine forests. Late June to late July.

Arabis drummondii A. Gray. Drummond's Rockcress.

Common in openings in Lodgepole and Jeffrey Pine forests. Late June to early August. [*A. confinus* S. Watson]

Arabis holboellii Hornem. var. ***retrofracta*** (Graham) Rydb. Holboell's Rockcress.

Occasional in openings on sagebrush knoll. Mid-June to mid-July.

Arabis platysperma A. Gray var. ***platysperma***. Flat-seeded Rockcress.

Occasional throughout shaded northeast-facing slope, in understory of Red Fir forest. Immature specimen tentatively identified in first edition as *A. fernaldiana* var. *stylosa* is of this taxon. Mid-June to early July.

Capsella bursa-pastoris (L.) Medikus. Shepherd's Purse.

Native to Europe. Occasional in cleared areas near cabins and along trails. Early July to late August.

Cardamine breweri S. Watson var. ***breweri***. Brewer's Bitter-cress.

First identified at Valentine Camp in 1998. Occasional in open sites with saturated ground; around seeps and springs and near Mammoth Creek. Late June to late July.

Descurainia californica (A. Gray) O.E. Schulz. Tansy-mustard.

Common at the base of the sagebrush knoll and on south-facing slope. Mid-July to mid-August.

Descurainia incisa (A. Gray) Britton ssp. ***incisa***. Tansy-mustard.

Occasional along trails, especially waterfall trail, and in understory of Lodgepole Pine forest. Late July to mid-September. [*D. richardsonii* O.E. Schulz. ssp. *i*. (Engelm.) Dett.]

Erysimum capitatum (Douglas) E. Greene ssp. ***perenne*** (Cov.) R. Price. Sierra Wallflower.

Common in openings and in understory of Lodgepole Pine and Jeffrey Pine forests. Late June to early August. [*E. p*. (Wats. ex Cov.) Abrams]

Lepidum virginicum L. var. ***pubescens*** (E. Greene) Thell. Peppergrass.

Uncommon along Old Mammoth Road. Late June to early August.

Rorippa nasturtium-aquaticum (L.) Hayek. Watercress.

Common in Mammoth Creek and in small streams in meadow. Mid-June to early August. [*Nasturtium officinale* R.Br.]

Caprifoliaceae. Honeysuckle Family

Lonicera conjugialis Kellogg. Dwarf Honeysuckle.

Occasional in shaded understory of Lodgepole Pine and Red Fir forests. Late June to late July.

Sambucus species. Elderberry.

Uncommon, one shrub beside waterfall trail near waterfall. A few small plants in Red Fir forest near high trail. Observation of fruit color required for positive identification. Probably *S. racemosa* var. *microbotrys*, a species with red berries found on adjacent property, but possibly *S. mexicana*, with blue berries, which is also found in the Mammoth Lakes region. Mid-July to mid-August.

Symphoricarpos rotundifolius A. Gray var. ***rotundifolius***. Snowberry.

Common everywhere except in wet and heavily shaded sites. Mid-June to late July. [*S. vaccinoides* Rydb.]

Caryophyllaceae. Pink Family

Cerastium fontanum Baumg. *ssp. vulgare* (Hartman) Greuter & Burdet. Mouse-ear Chickweed.

Native to Europe. Occasional in lawn around constructed trout ponds. Mid-July to mid-September. [*C. vulgatum* L.]

Sagina saginoides (L.) Karsten. Arctic Pearlwort.

Uncommon, near seeps at southwestern corner of Reserve. Mid-June to late July. [var. *hesperia* Fern.]

Stellaria longipes Goldie var. ***longipes***. Long-stalked Starwort.

Occasional in meadow and at base of sagebrush knoll. Mid-July to mid-August.

Stellaria obtusa Engelm. Starwort.

Uncommon, near seeps at southwestern corner of Reserve. Mid-June to late July.

Chenopodiaceae. Goosefoot Family

Chenopodium atrovirens Rydb. Goosefoot.

Common on sagebrush knoll, especially at base, on south-facing slope and beside trails. Mid-July to late August.

Cornaceae. Dogwood Family

Cornus sericea L. ssp. ***sericea***. American or Creek Dogwood.

Common along Mammoth Creek. Late July to late August. [*C. stolonifera* Michaux]

Cuscutaceae. Dodder Family

Cuscuta californica Hook. & Arn. var. ***breviflora*** Engelm. California Dodder.

Uncommon, on *Erigeron*, on south-facing slope in open site in chaparral. Mid-July to early August. [*C. suksdorfii* Yunck. var. *subpedicellata* Yunck.]

Ericaceae. Heath Family

Arctostaphylos nevadensis A. Gray. Pinemat Manzanita.

Occasional in open understory of Red Fir forest and on south-facing slope. Early June to early July.

Arctostaphylos patula E. Greene. Greenleaf Manzanita.

Common on steep, south-facing slope and in openings in Jeffrey Pine forest. Early June to early July.

Orthilia secunda (L.) House. Sidebells. One-sided Wintergreen.

Uncommon, small colonies along forest trail near entrance gate and another near water tank. Mid-August to mid-September. [*Pyrola s*. L.]

Pterospora andromedea Nuttall. Pinedrops.

Uncommon saprophyte, widely scattered in understory of Jeffrey and Lodgepole Pine forests. Late July to late August.

Pyrola asarifolia Michaux ssp. ***asarifolia***. Pink Pyrola. Bog Wintergreen.

One colony on south side of Mammoth Creek, between the bridges. Late July to late August. [*P. californica* Krisa]

Pyrola picta Smith. White-veined Shinleaf.

Uncommon in shaded understory of Lodgepole Pine forest near water tank and east of big meadow. Early August to late September.

Fabaceae. Pea Family

Astragalus purshii Douglas var. ***tinctus*** M.E. Jones. Wooly Rattlepod.

Uncommon, along trail and in open sites on upper half of sagebrush knoll. Late May to mid-June.

Lupinus andersonii S. Watson. Anderson's Lupine.

Common in open sites in Lodgepole and Jeffrey Pine forests. Early July to early August.

Lupinus polyphyllus Lindley var. ***burkei*** (S. Watson) C. Hitchc. Meadow Lupine.

Common in wet places and meadows, near seeps and springs and at base of sagebrush knoll. Early July to mid-August. [ssp. *superbus* (Heller) Munz]

Medicago sativa L. Alfalfa.

First collected at Valentine Camp in 1998. Native to Eurasia. Uncommon roadside weed along Lake Mary Road. Probably transported to area by feed trucks supplying pack station at Twin Lakes. July to August.

Trifolium cyathiferum Lindley. Bowl Clover.

Occasional in meadow and at base of sagebrush knoll and in understory of Lodgepole Pine forest. Mid-July to mid-August.

Trifolium longipes Nuttall var. ***nevadense*** Jepson. Long-stalked Clover.

Common in meadow and at base of sagebrush knoll. Mid-June to late July.

Trifolium monanthum A. Gray var. ***monanthum*****.** Carpet Clover.

Occasional in openings in Jeffrey Pine forest. Late June to mid-August.

Trifolium repens L. White Clover.

Native to Eurasia. Occasional in lawns and in disturbed openings in Lodgepole Pine forest. Early July to late September.

Trifolium wormskioldii Lehm. Cow Clover.

Occasional in meadow and near seeps and springs. Mid-July to mid-August.

Fagaceae. Beech Family

Chrysolepis sempervirens (Kellogg) Hjelmquist. Chinquapin.

Occasional on steep, south-facing slope and in openings in Red Fir forest. Mid-July to late August.

Quercus vaccinifolia Kellogg. Huckleberry Oak.

Common on steep, south-facing slope and in openings in Jeffrey Pine forest. Late May to mid-July.

Gentianaceae. Gentian Family

Gentianopsis holopetala (A. Gray) Iltis. Sierra Gentian.

Uncommon in meadow near streamlets. Late August to late September. [*Gentiana h*. (A. Gray) Holm.]

Swertia radiata (Kellogg) Kuntze. Giant Green Gentian. Monument Plant.

A few small colonies in understory of Lodgepole Pine forest near base of side trail to sagebrush knoll. Early to late July. [*Frasera speciosa* Griseb.]

Grossulariaceae. Gooseberry Family

Ribes cereum Douglas var. ***cereum***. Squaw Currant.

Common in sunny forest openings and on sagebrush knoll and south-facing slope. Early June to mid-July.

Ribes inerme Rydb. White-stemmed Gooseberry.

Occasional at base of sagebrush knoll and on meadow borders. Mid-May to mid-June. [*R. divaricatum* Douglas var. *i.* (Rydb.) McMinn]

Ribes montigenum McClat. Alpine Prickly Currant. Mountain Gooseberry.

Common in shaded understory of forests and near Mammoth Creek. Early June to early July.

Haloragaceae. Water-Milfoil Family

Myriophyllum sibiricum V. Komarov. American Milfoil.

Formerly occasional in shallow water of constructed trout ponds. Dredging of ponds may have eliminated this species. Identification based on non-flowering material. *[M. spicatum* L. ssp. *exalbescens* (Fern.) Hult.]

Hippuridaceae. Mare's-tail Family

Hippurus vulgaris L. Mare's Tail.

Occasional in shallow water of constructed trout ponds. Early August to mid-September.

Hydrophyllaceae. Waterleaf Family

Nemophila pedunculata A. Gray. Meadow Nemophila.

Occasional near seeps and at base of sagebrush knoll. Early June to late July.

Phacelia hastata Lehm. ssp. ***compacta*** (Brand) Heckard. Silverleaf Phacelia.

Occasional on south-facing slope, especially near Lake Mary Road. Mid-July to mid-August. [*P. frigida* E. Greene]

Phacelia hydrophylloides A. Gray. Waterleaf Phacelia.

Occasional in understory of Red Fir forest. Mid-July to late August.

Phacelia mutabilis E. Greene. Changeable Phacelia.

Common in understory of Lodgepole and Jeffrey Pine forests. Plants at Valentine are very close to *P. heterophylla* ssp. *virgata*. Mid-July to mid-August.

Phacelia ramosissima Lehm. var. ***eremophila*** (E. Greene) Macbr. Branching Phacelia.

Common on steep, south-facing slope. Uncommon on sagebrush knoll. Early July to late August.

Hypericaceae. St. John's Wort Family

Hypericum anagalloides Cham. & Schlecht. Tinker's Penny.

Uncommon near seep in southwestern corner of Reserve. Mid-July to mid-August.

Lamiaceae. Mint Family

Agastache urticifolia (Benth.) Kuntze. Giant Hyssop. Horsemint.

Occasional near seeps and springs on otherwise dry slopes and in moist open sites in Red Fir forest. Mid-July to mid-August.

Monardella odoratissima Benth. ssp. ***pallida*** (A. Heller) Epl. Mountain Pennyroyal.

Common on steep, south-facing slope in chaparral and in openings in Jeffrey Pine forest. Late July to late August.

Stachys albens A. Gray. White Hedge-nettle.

Common in meadow near streamlets, along Mammoth Creek and in low-lying wet places. Mid-July to mid-August.

Loasaceae. Sandpaper Plant Family

Mentzelia congesta Torrey & A. Gray. Ventana Stick-leaf.

Occasional on sagebrush knoll. Mid-July to early August.

Mentzelia laevicaulis (Hook.) Torrey & A. Gray. Blazing Star.

Uncommon in openings in chaparral on steep, south-facing slope near Lake Mary Road. Early July to mid-August.

Mentzelia montana (Davidson) Davidson. Montane Sandpaper Plant

Occasional on sagebrush knoll. Late June to early August.

Malvaceae. Mallow Family

Sidalcea oregana Torrey & A. Gray ssp. ***spicata*** (Regel) C. Hitch. Spike Mallow.

Common in meadows, along Mammoth Creek and near seeps and springs. Mid-July to mid-August.

Onagraceae. Evening-primrose Family

Circaea alpina L. ssp. ***pacifica*** (Asch. & Magnus) Raven. Enchanter's Nightshade.

Occasional in deep shade near Mammoth Creek and on meadow trail below Valentine cabin. Mid-July to mid-August.

Epilobium angustifolium L. ssp. ***circumvagum*** Mosquin. Fireweed.

Common in moist or wet disturbed places, especially around cabins. Mid-July to late August.

Epilobium brachycarpum C. Presl. Panicled Willow-herb.

Uncommon at base of sagebrush knoll in sagebrush-meadow transition. Late July to late August. [*E. paniculatum* Torrey & A. Gray]

Epilobium ciliatum Raf. ssp. ***glandulosum*** (Lehm.) P. Hoch & Raven. American or Northern Willow-herb.

Common in wet places, in meadows and near seeps and springs. Early July to late August. [*E. brevistylum* Barbey var. *b*.; *E. glandulosum* Lehm.]

Epilobium glaberrimum Barbey ssp. ***fastigiatum*** (Nuttall) P. Hoch & Raven. Smooth Willow-herb.

First collected at Valentine Camp in 1998. Occasional near seeps and springs. July to early September.

Epilobium halleanum Hausskn. Hall's Willow-herb.

Common in wet places, in meadows and near seeps and springs. Early July to mid-August. [*E. pringleanum* Hausskn.]

Gayophytum diffusum Torrey & A. Gray ssp. ***parviflorum*** Lewis & Szweykowski. Diffuse Gayophytum.

Common in open dry places on sagebrush knoll, on south-facing slope and in forest openings especially along trails. Early June to mid-August.

Orobanchaceae. Broom-rape Family

Orobanche californica Cham. & Schldl. ssp. ***feudgei*** (Munz) Heckard. California Broomrape.

Uncommon on sagebrush knoll, probably on *Artemisia tridentata*. Late July to late August. [*O. grayana* G. Beck var. *f*. Munz]

Orobanche uniflora L. Naked Broomrape.

Uncommon, in deep shade on meadow trail below Valentine Cabin, probably on *Senecio* and *Osmorhiza*. Early to late July. [var. *sedi* (Suksd.) Achey]

Papaveraceae. Poppy Family

Argemone munita Durand & Hilg. Prickly Poppy. Fried Egg Flower.

Uncommon, at top of south-facing slope near Lake Mary Road. Early July to mid-August. [ssp. *rotundata* (Rydb.) Ownbey]

Plantaginaceae. Plantago Family

Plantago major L. Common or Broad-leaved Plantain.

Native to Europe. Uncommon, formerly in road near cookhouse, beneath Lodgepole Pines. Only vegetative growth observed.

Polemoniaceae. Phlox Family

Allophyllum gilioides (Benth.) A. & V. Grant ssp. ***violaceum*** (A. Heller) Day. Straggling Allophyllum.

Common on sagebrush knoll and in openings in Jeffrey Pine forest. Mid-June to early August. [*A. v.* (A. Heller) A. & V. Grant]

Allophyllum integrifolium (Brand) A. & V. Grant. Entire-leaved Allophyllum.

Common in openings in Jeffrey Pine forest. Early July to early August.

Collomia grandiflora Lindley. Large-flowered Collomia.

Occasional on south-facing slope and in dry forest openings. Mid-July to late August.

Collomia linearis Nuttall. Narrow-leaved Collomia.

Occasional in meadow and at base of sagebrush knoll. Early July to mid-August.

Eriastrum wilcoxii (A. Nels.) Mason. Wilcox's Eriastrum.

Occasional on sagebrush knoll. Mid-July to mid-August.

Gilia cana (M.E. Jones) A. Heller ssp. ***cana***. Mojave Gilia.

Uncommon, formerly at the top of the sagebrush knoll. Early to late June.

Ipomopsis aggregata (Pursh) V. Grant ssp. ***formosissima*** (E. Greene) Wherry. Scarlet Gilia. Firecracker Flower.

Scattered in understory of Lodgepole and Jeffrey Pine forests, especially in open sites. Mid-July to late August.

Linanthus ciliatus (Benth.) E. Greene. Whisker-brush. Bristly-leaved Linanthus.

Common in openings in Jeffrey Pine forest and on sagebrush knoll. Mid-June to early August. [var. *neglectus* (E. Greene) Jepson]

Phlox diffusa Benth. Spreading Phlox.

Occasional at top of sagebrush knoll and in dry openings in Lodgepole Pine forest near Old Mammoth Road. Mid-June to mid-July.

Phlox gracilis E. Greene. Slender Phlox

Occasional on sagebrush knoll. Early June to mid-July. [*Microsteris g*. (Hook.) E. Greene ssp. *humilis* (E. Greene) V. Grant]

Phlox stansburyi (Torrey) A. Heller. Stansbury Phlox.

Occasional at top of sagebrush knoll. Mid-June to mid-July.

Polygonaceae. Buckwheat Family

Eriogonum baileyi S. Watson var. ***baileyi***. Bailey's Wild Buckwheat.

First collected at Valentine Camp in 1998. Scattered on eastern edge of parking area outside entrance gate. Introduced to Valentine Camp from Sierra Nevada Aquatic Research Laboratory in soil transported to construct parking area. Eradication effort underway. Late July to August.

Eriogonum nudum Benth. var. ***deductum*** (E. Greene) Jepson. Nude Buckwheat.

Common in openings in Lodgepole and Jeffrey Pine forests, on south-facing slope and on sagebrush knoll. Early July to mid-August.

Eriogonum spergulinum A. Gray var. ***reddingianum*** (M.E. Jones) J. Howell.
Spurrey Buckwheat.

Common on sagebrush knoll, in dry openings in forest and on south-facing slope, especially near trail. Mid-June to late July.

Eriogonum umbellatum Torrey var. ***nevadense*** Gand. Nevada Sulphur Buckwheat.

Common on sagebrush knoll and on south-facing slope. Late June to late August.

Polygonum arenastrum Boreau. Common Knotweed.

Native to Europe. Occasional in lawns around constructed trout ponds and cabins. Late July to mid-September. [*P. aviculare* L.]

Polygonum douglasii E. Greene ssp. ***douglasii.*** Douglas' Knotweed.

Common in meadow and at base of sagebrush knoll. Mid-July to mid-August.

Polygonum douglasii E. Greene ssp. ***johnstonii*** Munz. Johnston's Knotweed.

Occasional in dry openings in Jeffrey Pine forest. Mid-July to mid-August.

Rumex acetosella L. Sheep Sorrel.

Native to Europe. Occasional in openings in chaparral and along trail on steep, south-facing slope. Late June to mid-July. [*R. angiocarpus* Murb.]

Rumex occidentalis S. Watson. Western Dock.

Common in meadows. Mid-August to mid-September.

Rumex salicifolius J.A. Weinm. var. ***denticulatus*** Torrey. Willow Dock.

Occasional along Mammoth Creek. Mid-July to late August. [*R. californicus* Rech. f.]

Rumex salicifolius J.A. Weinm. var. ***triangulivalvis*** (Danser) C. Hitchc. Willow Dock.

Occasional near seeps at base of northeast-facing slope. Late July to late August. [*R. t*. (Danser) Rech. f.]

Portulacaceae. Purslane Family

Calyptridium umbellatum (Torrey) E. Greene. Pussypaws.

Occasional in open sites in chaparral on south-facing slope and in Jeffrey Pine forest. Late June to late July.

Lewisia nevadensis (A. Gray) Rob. Nevada Lewisia.

Uncommon in loose pumice soil in semi-shaded sites in Lodgepole Pine forest. Seen at Valentine Camp only in 1978. Early to mid-July.

Montia chamissoi (Sprengel) E. Greene. Toad Lily.

Common on banks of constructed trout ponds, in the meadows, and at base of sagebrush knoll. Mid-June to mid-July. [*Crunocallis c*. (Ledeb.) Rydb.]

Ranunculaceae. Buttercup Family

Aconitum columbianum Nuttall. Monkshood.

Native to Mammoth Lakes region, but not native to Valentine Camp. Planted in 1960s (?) near spring at head of Woody's Meadow. Mid-August to early September.

Actaea rubra (Aiton) Willd. Baneberry.

Occasional in shaded understory of Jeffrey Pine and Red Fir forests and near seeps. Mid-June to mid-July. [ssp. *arguta* (Nuttall) Hult.]

Aquilegia formosa Fischer. Red Columbine.

Common in shaded understory of Lodgepole Pine forest, around meadow and near seeps and springs. Early July to mid-August. [var. *truncata* (F. & M.) Baker]

Delphinium glaucum S. Watson. Giant or Mountain Larkspur.

Native to Mammoth Lakes region, but not native to Valentine Camp. Planted on south side of University Cabin. Early August to early September.

Delphinium gracilentum E. Greene. Slender Larkspur.

Occasional in shaded understory of Lodgepole Pine forest and at base of sagebrush knoll. Mid-June to early August. [*D. pratense* Eastw.]

Ranunculus aquatilis L. var. ***capillaceus*** (Thuill.) DC. Aquatic Buttercup.

Common in constructed trout ponds. Early August to early September.

Thalictrum fendleri A. Gray var. ***fendleri***. Mountain Meadow Rue.

Formerly common in shaded understory of Lodgepole Pine forest, on meadow margins and near seeps. Late June to mid-July.

Rhamnaceae. Buckthorn Family

Ceanothus cordulatus Kellogg. Snowbush. Mountain Whitethorn.

Common on steep, south-facing slope and in openings in Jeffrey Pine forest. Mid-June to mid-July.

Ceanothus* X *lorenzenii (Jepson) McMinn. Snowbush-Tobacco Brush Hybrid.

Several shrubs with characteristics of *Ceanothus cordulatus* X *C. velutinus* hybrids grow along the forest trail, near spur trail to waterfall view. Other putative hybrids found along meadow trail on south-facing slope in Montane Chaparral. Late June to late July.

Ceanothus velutinus Hook. var. ***velutinus***. Tobacco Brush.

Common on steep, south-facing slope, especially near Lake Mary Road. Mid-June to late July.

Rhamnus rubra E. Greene ssp. ***yosemitana*** C.B. Wolf. Sierra Coffeeberry.

Occasional in chaparral on steep, south-facing slope. Mid-June to mid-July.

Rosaceae. Rose Family

Amelanchier utahensis Koehne. Utah Serviceberry.

Uncommon near the summit of the sagebrush knoll and along meadow trail near western bridge on Mammoth Creek. Early June to mid-July. [*A. pallida* E. Greene]

Fragaria virginiana Duchesne. Mountain Strawberry.

Occasional in shaded understory of Lodgepole Pine forest, especially around cabins and cookhouse. Late June to late July. [*F. platypetala* Rydb.]

Geum macrophyllum Willd. Big-leaf Avens.

Occasional along Mammoth Creek and near seeps and springs. Mid-July to late August.

Holodiscus microphyllus Rydb. var. ***microphyllus***. Rock Spiraea.

Occasional on south-facing slope and in openings in Jeffrey Pine forest. Mid-July to mid-August.

Potentilla biennis E. Greene. Greene's Cinquefoil.

Uncommon, near springs on south-facing slope and near Old Mammoth Road. Mid-July to late August.

Potentilla glandulosa Lindley ssp. ***hansenii*** (E. Greene) Keck. Sticky Cinquefoil.

Common in meadows near seeps and springs and in most other moist places. Early July to mid-August.

Potentilla gracilis Hook. var. ***elmeri*** (Rydb.) Jepson. Five-finger Cinquefoil.

Common on meadow margins, at base of sagebrush knoll and in moist places such as near seeps and springs. Early July to mid-August. [*P. pectinisecta* Rydb.; *P. flabelliformis* Lehm. var. *inyoensis* Jepson]

Prunus emarginata (Hook.) Walp. Bitter Cherry.

Common on south-facing slope and in openings in Jeffrey Pine forest. Early June to mid-July.

Purshia tridentata (Pursh) DC. var. ***tridentata***. Antelope Bitterbrush.

Common on sagebrush knoll and in openings in Jeffrey and Lodgepole Pine forests. Mid-June to mid-July.

Rosa woodsii Lindley var. ***ultramontana*** (S. Watson) Jepson. Mountain Wild Rose.

Occasional in shaded forest understory, especially on meadow trail near large Jeffrey Pine. Mid-July to mid-August.

Rubiaceae. Madder Family

Galium bifolium S. Watson. Low Mountain Bedstraw.

Common on sagebrush knoll, especially at base, around meadows and in other sunny moist places. Mid-June to late July.

Galium triflorum Michaux. Sweet-scented Bedstraw.

Occasional in understory of Jeffrey Pine forest, especially near seeps. Mid-July to mid-August.

Kelloggia galioides Torrey. Kelloggia.

Occasional in shaded understory of forests. Mid-July to mid-August.

Salicaceae. Willow Family

Populus tremuloides Michaux. Quaking Aspen.

Common along Mammoth Creek, on meadow margins and near seeps and springs. Only vegetative growth observed.

Salix lucida Muhlenb. ssp. ***caudata*** (Nuttall) E. Murray. Shining Willow.

Common along Mammoth Creek and near some springs. Early June to early July. [*S. c*. (Nuttall) E. Murray var. *bryantiana* Ball & Bracelin]

Salix planifolia Cham. ssp. ***planifolia***. Tea-leaved Willow.

Common along Mammoth Creek and near some springs. Early June to early July. [var. *monica* (Bebb) Jepson]

Saxifragaceae. Saxifrage Family

Heuchera rubescens Torrey var. ***alpicola*** Jepson. Pink Alumroot.

Uncommon on rock outcrops near Mammoth Creek, along waterfall trail and on north-facing slope above. Early July to early August. [var. *pachypoda* (E. Greene) Rosend.]

Lithophragma glabrum Nuttall. Rock-star.

Uncommon in openings in forest, near late-flowing snowmelt streamlets. Seen at Valentine Camp only in 1978. Early to late July. [*L. bulbiferum* Rydb.]

Mitella pentandra Hook. Miterwort.

Uncommon in shaded understory of Lodgepole Pine forest, near seeps around water tank. Mid-June to mid-July.

Scrophulariaceae. Figwort Family

Castilleja applegatei Fern. ssp. ***pinetorum*** (Fern.) Chuang & Heckard.
Wavy-leaved Indian Paintbrush.

Common on sagebrush knoll, in chaparral on south-facing slope and in dry forest openings. Specimen identifed as *C. chromosa* in first edition of flora is of this taxon. Mid-June to late July.

Castilleja miniata Hook. ssp. ***miniata***. Meadow Paintbrush.

Common in meadows and near seeps and springs. Late June to mid-August.

Collinsia parviflora Lindley. Small-flowered Blue-eyed Mary.

Common in sunny open places on sagebrush knoll, especially at the base, and in forest openings and along trails. Mid-June to late July.

Mimulus breweri (E. Greene) Cov. Brewer's Monkeyflower.

Occasional in sunny open places on sagebrush knoll and in forest openings. Early July to early August.

Mimulus guttatus DC. Common Monkeyflower.

Common in moist places throughout. Mid-June to late August. [*M. nasutus* E. Greene]

Mimulus lewisii Pursh. Lewis's Monkeyflower.

Occasional in shaded, moist places in forest understory, especially near seeps, and along Mammoth Creek near top of waterfall. Planted on north side of University Cabin in 1960s (?) but not observed there in 1998. Mid-July to mid-August.

Pedicularis semibarbata A. Gray. Pine-woods Lousewort.

Occasional in shaded understory of Jeffrey Pine and Red Fir forests. Mid-June to early August.

Penstemon heterodoxus A. Gray. Sierra Penstemon.

Native to Mammoth Lakes region, but not native to Valentine Camp. Planted on south side of University Cabin in 1960s (?) but not observed there in 1998. Mid-August to early September.

Penstemon newberryi A. Gray. var. ***newberryi***. Pride of the Mountains. Mountain Penstemon.

Occasional on rock outcrops overlooking Mammoth Creek and downslope from Lake Mary Road. Mid-July to late August.

Penstemon rostriflorus Kellogg. Scarlet Penstemon.

Common on south-facing slope. Early July to early August. [*P. bridgesii* A. Gray]

Penstemon speciosus Lindley. Showy Penstemon.

Uncommon on south-facing slope near Lake Mary Road. Mid-June to late July. [ssp. *kennedyi* (A. Nels.) Keck]

Veronica americana (Raf.) Schw. American Brooklime. Speedwell.

Occasional along meadow trail near Mammoth Creek, at base of sagebrush knoll and around constructed trout ponds. Mid-June to mid-August.

Veronica serpyllifolia L. ssp. ***humifusa*** (Dickson) Syme. Thyme-leaf Speedwell.

First identified at Valentine Camp in 1998. Uncommon, waterfall trail near intersection with meadow trail, in boggy soil. Late June to early August.

Solanaceae. Nightshade Family

Chamaesaracha nana (A. Gray) A. Gray. Dwarf Chamaesaracha.

Occasional in openings in Jeffrey Pine forest near Old Mammoth Road, and along Lake Mary Road. Mid-July to mid-August.

Nicotiana attenuata Torrey. Coyote Tobacco.

Uncommon in sunny openings along Old Mammoth Road. Early to late August.

Solanum xanti A. Gray. Purple Nightshade.

Occasional on south-facing slope below Lake Mary Road. Mid-July to mid-August. [var. *montanum* Munz]

Urticaceae. Nettle Family

Urtica dioica L. ssp. ***holosericea*** (Nuttall) Thorne. Sierra Nettle.

Occasional on meadow margins, at base of sagebrush knoll, along Mammoth Creek and near seeps and springs. Mid-July to late August. [*U. serra* Blume]

Valerianaceae. Valerian Family

Valeriana californica A. Heller. California Valerian.

Occasional in shaded understory of Jeffrey and Lodgepole Pine forests. Early June to late July. [*V. capitata* Link ssp. *c*. (A. Heller) Mey.]

Violaceae. Violet Family

Viola macloskeyi Lloyd. White-flowered Violet.

Uncommon near seep behind University Cabin and near spring above meadow, near boundary tree. Early to late June.

Viola purpurea Kellogg ssp. ***integrifolia*** Baker & Clausen. Mountain Violet.

Common in forest understory. Early June to late July.

DIVISION ANTHOPHYTA

Class Monocotyledonae

Cyperaceae. Sedge Family

Carex athrostachya Olney. Slender-beaked Sedge.

Occasional in shaded understory of Lodgepole Pine forest. Early July to late August.

Carex integra Mkze. Smooth-beaked Sedge.

Occasional around seeps and springs. Late June to early August.

Carex jonesii Bailey. Jones' Sedge.

Common in meadows. Late June to late July.

Carex lenticularis Michaux var. ***impressa*** (Bailey) Standley. Few-ribbed Sedge.

Common on meadow margins, along Mammoth Creek, and near seeps and springs. Mid-June to early August. [*C. paucicostata* Mkze.]

Hydrocharitaceae. Frogbit Family

Elodea nuttallii (Planchon) H. St. John. Nuttall's Waterweed.

Occasional in shallow water on margins of constructed trout ponds. Early August to mid-September.

Iridaceae. Iris Family

Iris missouriensis Nuttall. Western Blue Flag. Wild Iris.

Common in meadows, at base of sagebrush knoll and near seeps and springs. Mid-June to mid-July.

Juncaceae. Rush Family

Juncus macrandrus Cov. Long-anthered Rush.

Occasional along streamlets in meadows and near seeps and springs. Mid-July to late August.

Juncus mexicanus Willd. Mexican Rush.

Common in and around meadows. Mid-July to late August.

Juncus nevadensis S. Watson. Nevada Rush.

Occasional in meadows. Mid-July to mid-August.

Juncus xiphioides E. Meyer. Iris-leaved Rush.

Common in wet areas at base of sagebrush knoll. Mid-July to late August.

Luzula parviflora (Ehrh.) Desv. Small-flowered Wood Rush.

Occasional in shaded understory of Jeffrey Pine and Red Fir forests. Mid-July to late August.

Liliaceae. Lily Family

Allium bisceptrum S. Watson var. ***bisceptrum***. Patis or Aspen Onion.

Common on sagebrush knoll, in Lodgepole Pine forest understory and beneath aspens. Mid-June to early August.

Calochortus leichtlinii Hook. f. Mountain Mariposa Lily.

Common in favorable years on sagebrush knoll and in understory of Jeffrey and Lodgepole Pine forests. Early July to early August.

Fritillaria pinetorum Davidson. Mountain Fritillary.

Uncommon; scattered on sagebrush knoll and in openings in Lodgepole Pine forest. Early June to mid-July.

Lilium kelleyanum Lemmon. Kelley's Lily.

Common in favorable years on meadow margins and near some seeps and springs. Formerly, seeds were annually collected and distributed by the caretaker in an effort to expand distribution. Early July to early August.

Lilium pardalinum Kellogg ssp. ***pardalinum***. Leopard Lily.

Very uncommon. Formerly, one small colony south of University Cabin in shade of lodgepole pines. Not observed in 1998. Early to late August.

Smilacina racemosa (L.) Link. False Solomon's Seal.

Occasional on meadow margins, near seeps and springs and in understory of Red Fir forest. Late June to late July. [var. *glabra* (Macbr.) St. John]

Smilacina stellata (L.) Desf. False Solomon's Seal.

Common in meadow, on meadow margins and near seeps and springs. Mid-June to mid-July. [var. *stellata*]

Triteleia ixioides (S. Watson) E. Greene ssp. ***anilina*** (E. Greene) Lenz. Pretty Face. Golden Brodiaea.

Uncommon in sunny openings in Jeffrey Pine and Red Fir forests. Late July to mid-August. [*Brodiaea lutea* (Lindley) Mort. var. *a.* (E. Greene) Munz]

Veratrum californicum Durand var. ***californicum***. Corn Lily.

Common on meadow margins, at base of sagebrush knoll and near seeps and springs. Early July to late August.

Orchidaceae. Orchid Family

Corallorhiza maculata Raf. Spotted Coral-root.

Occasional in shaded understory of Jeffrey Pine and Red Fir forests. Mid-July to mid-August.

Listera convallarioides (Sw.) Nuttall. Broad-leaved Twayblade.

Formerly uncommon, one colony along early season streamlet that crosses forest trail. Not seen since early 1980s when streamlet became much drier after local earthquakes. Mid-July to mid-August.

Piperia unalascensis (Spreng.) Rydb. Alaska Orchid.

Uncommon, a small colony in open area behind University Cabin, and a few plants between lawn and parking area in front of University Cabin. Not observed in 1998. Mid-July to mid-August. [*Habenaria u*. (Spreng.) S. Watson]

Platanthera leucostachys Lindley. Sierra Rein Orchid.

Common in meadows, along Mammoth Creek and near seeps and springs. Late June to early August. [*Habenaria dilatata* (Pursh) Hook. var. *l.* (Lindley) Ames]

Poaceae. Grass Family

Achnatherum occidentalis (Thurb.) Barkworth ssp. ***occidentalis***. Western Needlegrass.

Uncommon on sagebrush knoll. Mid-June to mid-July. [*Stipa o*. Thurb.]

Agrostis idahoensis Nash. Idaho Bentgrass.

Occasional in vicinity of seeps near southwestern boundary corner. Late July to early September.

Agrostis pallens Trin. Sequoia Bentgrass.

Occasional near streamlets in meadow and near seeps and springs. Late July to late August. [*A. lepida* A. Hitchc.]

Agrostis scabra Willd. Ticklegrass

Occasional in vicinity of seeps near southwestern boundary corner. Late July to early September.

Agrostis stolonifera L. Creeping Bent. Redtop.

Native to Europe. Occasional in forest openings near Old Mammoth Road. Mid-July to mid-August. [var. *major* (Gaud.) Farwell]

Alopecurus aequalis Sobol. Short-awn Foxtail.

Formerly occasional, growing in shallow water of constructed trout ponds. Dredging of ponds may have eliminated it. Late June to early August.

Bromus carinatus Hook. & Arn. var. ***carinatus***. Mountain Brome Grass.

Common on sagebrush knoll, in chaparral on south-facing slope, and in sunny open sites in Lodgepole and Jeffrey pine forests. Mid-July to late August. [*B. marginatus* Steudel]

Calamagrostis canadensis (Michaux) Beauv. Bluejoint Reedgrass.

Occasional in meadows and near seeps and springs. Mid-July to late August.

Calamagrostis stricta (Timm) Koeler ssp. ***inexpansa*** (A. Gray) E. Greene.
Narrow-spiked Reedgrass.

Common in meadows. Mid-August to mid-September. [*C. i*. A. Gray]

Elymus elymoides (Raf.) Swezey ssp. ***elymoides***. Bottlebrush Squirreltail.

Common on sagebrush knoll, on south-facing slope and in sunny openings in forests. Mid-July to late August. [*Sitanion hystrix* (Nuttall) J.G. Sm.]

Elymus glaucus Buckley. Blue Wildrye.

Occasional in understory of Lodgepole Pine forest and at base of sagebrush knoll. Mid-August to mid-September.

Elymus multisetus (J.G. Smith) B. Davy X ***E. trachycaulus*** (Link) Shinn.
Big Squirreltail-Bearded Wheatgrass Hybrid.

Common around cabins, in understory of Lodgepole Pine forest, at base of sagebrush knoll and on south-facing slope. Mid-August to mid-September. [*E. aristatus* Merr.]

Elymus trachycaulus (Link.) Shinn ssp. ***subsecundum*** (Link.) Gould. Bearded Wheatgrass

Common in meadows. Late August to late September. [*Agropyron s*. (Link.) A. Hitchc.]

Festuca rubra L. Red Fescue.

Commercial cultivar forming lawns around constructed trout ponds. Mid-July to late August.

Glyceria elata (Lam.) A. Hitchc. Tall Mannagrass.

Occasional in meadows and near seeps and springs. Mid-July to mid-August.

Hordeum brachyantherum Nevski ssp. ***californicum*** (Covas & Steb.) Both., Jac. & Seb.
California Barley.

Uncommon, near seeps in northeast corner of Reserve, near boundary tree. Mid-July to mid-August. [*H. c*. Covas]

Leymus cinereus Scribn. & Merr. Ashy Wildrye. Basin Wildrye.

Common on sagebrush knoll, especially at base. Mid-July to mid-August. [*Elymus c*. Scribn. & Merr.]

Leymus triticoides (Buckley) Pilger ssp. ***triticoides***. Creeping Wildrye. Beardless Wildrye.

Common in meadows and near seeps and springs. Mid-August to early September. [*Elymus t*. Buckley]

Melica bulbosa Geyer. Melicgrass. Oniongrass.

Occasional in understory of Jeffrey Pine and Red Fir forests. Early July to mid-August.

Melica stricta Bolander. Rock melic.

First collected at Valentine Camp in 1998. Occasional in sagebrush scrub at the summit of the sagebrush knoll. Late June to July.

Muhlenbergia jonesii (Vasey) A. Hitchc. Jones' Muhly.

Occasional on steep, south-facing slope. Late June to late July.

Muhlenbergia richardsonis (Trin.) Rydb. Mat Muhly.

Occasional near seeps and springs. Mid-July to mid-August.

Phleum pratense L. Timothy Hay.

Native to Eurasia. Widely cultivated for forage. Occasional around cabins, in understory of Lodgepole Pine forest. Mid-August to early September.

Poa leptocoma Trin. ssp. ***leptocoma***. Bog Bluegrass

Common in understory of Lodgepole and Jeffrey Pine forests. Mid-June to early August.

Poa pratensis L. ssp. *pratensis*. Kentucky Bluegrass.

Native to Europe. Widely planted. Common in meadows. Late July to late August.

Poa wheeleri Vasey. Wheeler Bluegrass.

Occasional in understory of Jeffrey Pine and Red Fir forests. Mid-July to mid-August. [*P. nervosa* (Hook.) Vasey]

Potamogetonaceae. Pondweed Family

Potamogeton pusillus L. Small Pondweed.

Submerged aquatic formerly found in constructed trout ponds. Only vegetative plants seen. Dredging of ponds may have eliminated this species at Valentine Camp.

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Index

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

Y

A Flora of Valentine Eastern Sierra Reserve

Part II

Sierra Nevada Aquatic Research Laboratory

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and
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THE HERBARIUM
Museum of Systematics and Ecology (MSE)
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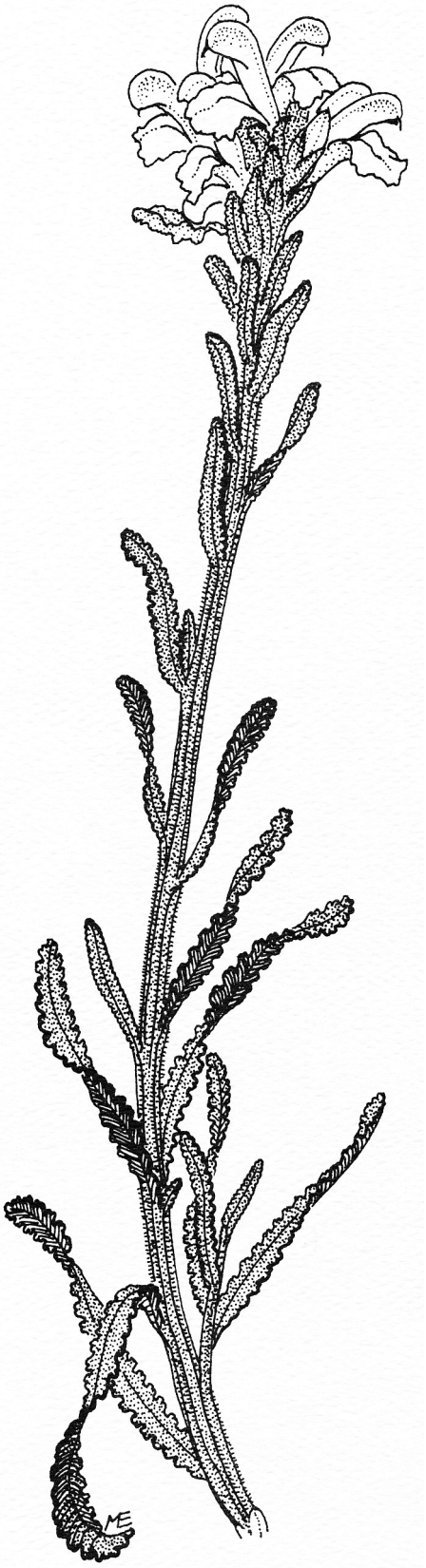

Pedicularis crenulata Benth. in DC.
f. *candida* Macbr.

Scalloped-leaved Lousewort

The only locality known in California for this member of the Figwort Family is a streamside meadow at SNARL.

Table of Contents

Introduction

The Sierra Nevada Aquatic Research Laboratory (SNARL) is a small reserve known more for its stream research facilities than for its vegetation and flora. Located on Convict Creek, approximately 8 miles (13 km) southeast of the town of Mammoth Lakes, in Mono County, SNARL has escaped the adverse impacts of urban expansion and ski area development that have affected natural areas in the immediate vicinity of the town of Mammoth Lakes.

SNARL lies immediately at the base of the eastern slope of the Sierra Nevada, along the borderline that separates the montane environment of the Sierra from the arid Great Basin desert to the east. Not surprisingly, the flora of SNARL includes species characteristic of mesic mountain habitats as well as xeric desert sites. Convict Creek provides a perennial water supply that contributes to SNARL's habitat diversity.

The flora of Mono County has not been studied in detail. The Convict Creek basin is one of the few areas in the greater Mammoth Lakes region that has been the subject of botanical investigation. J. T. Howell collected in the basin during the 1940s. Major and Bamberg (1963) discuss a number of disjunct Cordilleran species in the Convict Creek basin, including one found at SNARL (*Pedicularis crenulata*). Peirson collected along Convict Creek at lower elevations, near what is now SNARL, during the 1920s and 1930s (Major and Bamberg, 1963). Valentine Camp (Howald, 2000), Mammoth Mountain and environs (Howald 1983; 1991), and Glass Mountain Ridge (DeDecker, 1979) are other areas of Mono County where botanical surveys have been completed.

This flora includes a brief introduction to the physical characteristics and vegetation types of SNARL and an annotated catalog of the vascular plant taxa.

Location and Topography

SNARL is located along Convict Creek at the base of the eastern slope of the Sierra Nevada, Mono County, California (Figure 1). The Laboratory is approximately 1.0 mile (1.6 km) west of U.S. Highway 395, and 1.75 miles (2.8 km) northeast of Convict Lake. SNARL covers 55 acres (22 ha) at elevations ranging from 7,075 to 7,125 feet (2,156 to 2,172 m). The property is leased by the University of California from the City of Los Angeles, which also owns the land to the north and east of SNARL. The land to the west and south is part of the Inyo National Forest.

The topography of SNARL is quite uniform. The Laboratory is located downstream from Convict Lake on a gently sloping alluvial fan. There is only a slight drop in elevation across the property, from west to east. Convict Creek runs through the property from west to east and within the confines of SNARL is divided into four sections of controlled stream and a constructed flood bypass channel (Figure 2). In 1991, the southern boundary of SNARL was expanded to provide space for a series of nine constructed experimental stream channels.

Geology and Soils

SNARL is underlain by recent (Holocene) deposits of alluvium and stream gravels (Mayo, 1934; Rinehart, 1976). Although the surface soils at SNARL are quite sandy, gravel and larger rocks usually lie just below the surface. Soils in the low-lying meadow areas are more fine-grained than the sandier soils typical of higher and drier sites.

There are two sets of Pleistocene glacial moraines near SNARL. To the west are a terminal and a recessional moraine formed during the Tahoe glacial stage. South of the Laboratory lies an older lateral moraine, formed during one of the Post-Sherwin and Pre-Tahoe glacial stages (Mayo, 1934; Rinehart and Ross, 1964; Rinehart, 1976).

The geology of the Convict Creek basin, upstream from SNARL, is unusual for the Sierra Nevada in that metamorphic rather than granitic rocks predominate, although some granodiorite is present (Major and Bamberg, 1963). The Ordovician metasedimentary rocks in the Mount Morrison roof pendant found in the basin are the oldest known Sierran rocks (Norris and Webb, 1976). The fragmentary fossils of crinoids and brachiopods that occur in the exposed limestone beds in upper Convict Creek canyon provide evidence of their age (Rinehart, 1976).

The extensive distribution of calcareous substrates in the basin is quite unusual in comparison with most of the Sierra Nevada, which is granitic. Mount Baldwin marble underlies 1,372 acres (549 ha) in the basin, and an additional 114 acres (45.6 ha) are underlain by meadow sediments that are probably derived from Mount Baldwin marble. These calcareous substrates may be an important factor affecting plant distributions in the area (Major and Bamberg, 1963).

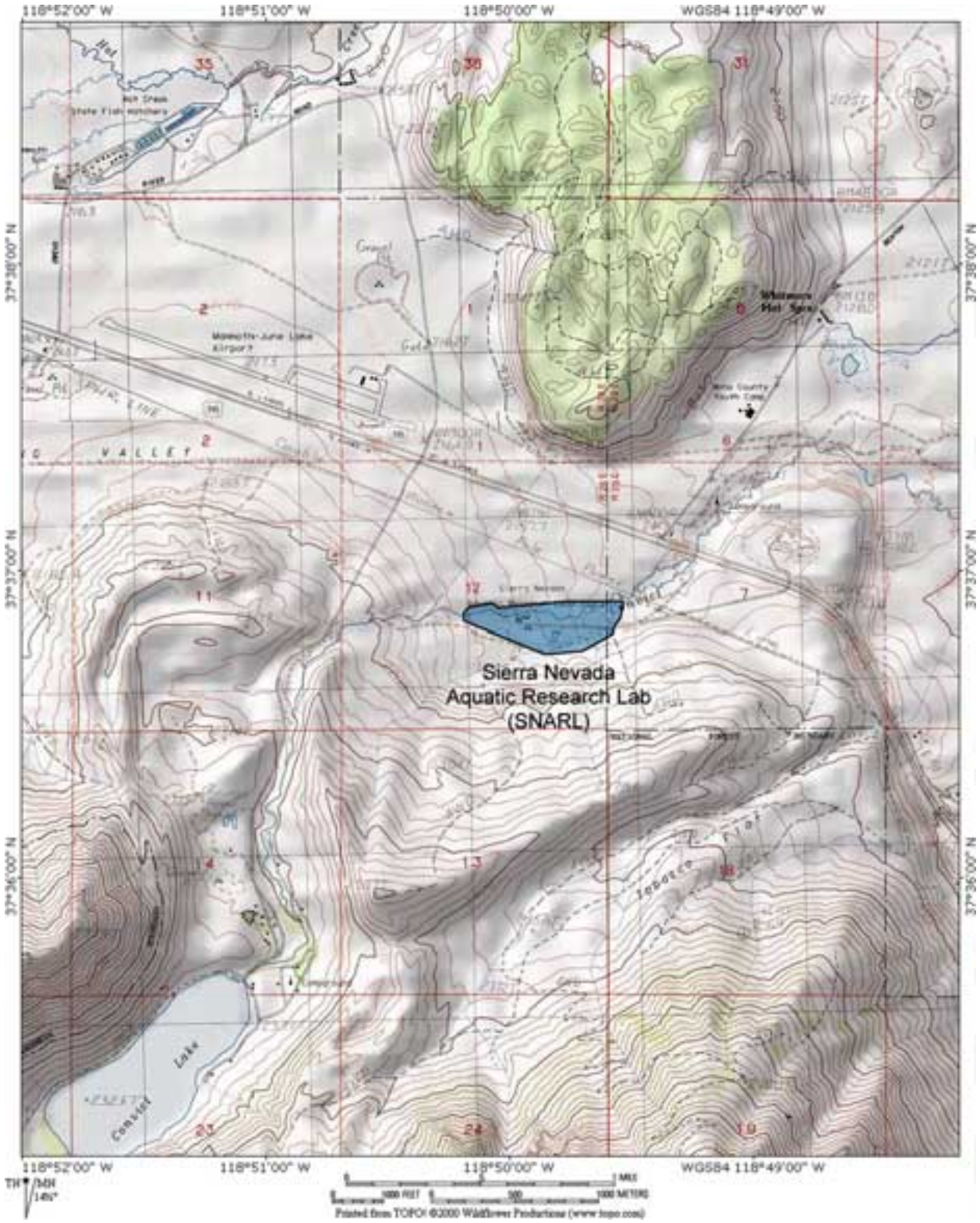

Figure 1. Location of the Sierra Nevada Aquatic Research Laboratory (SNARL).

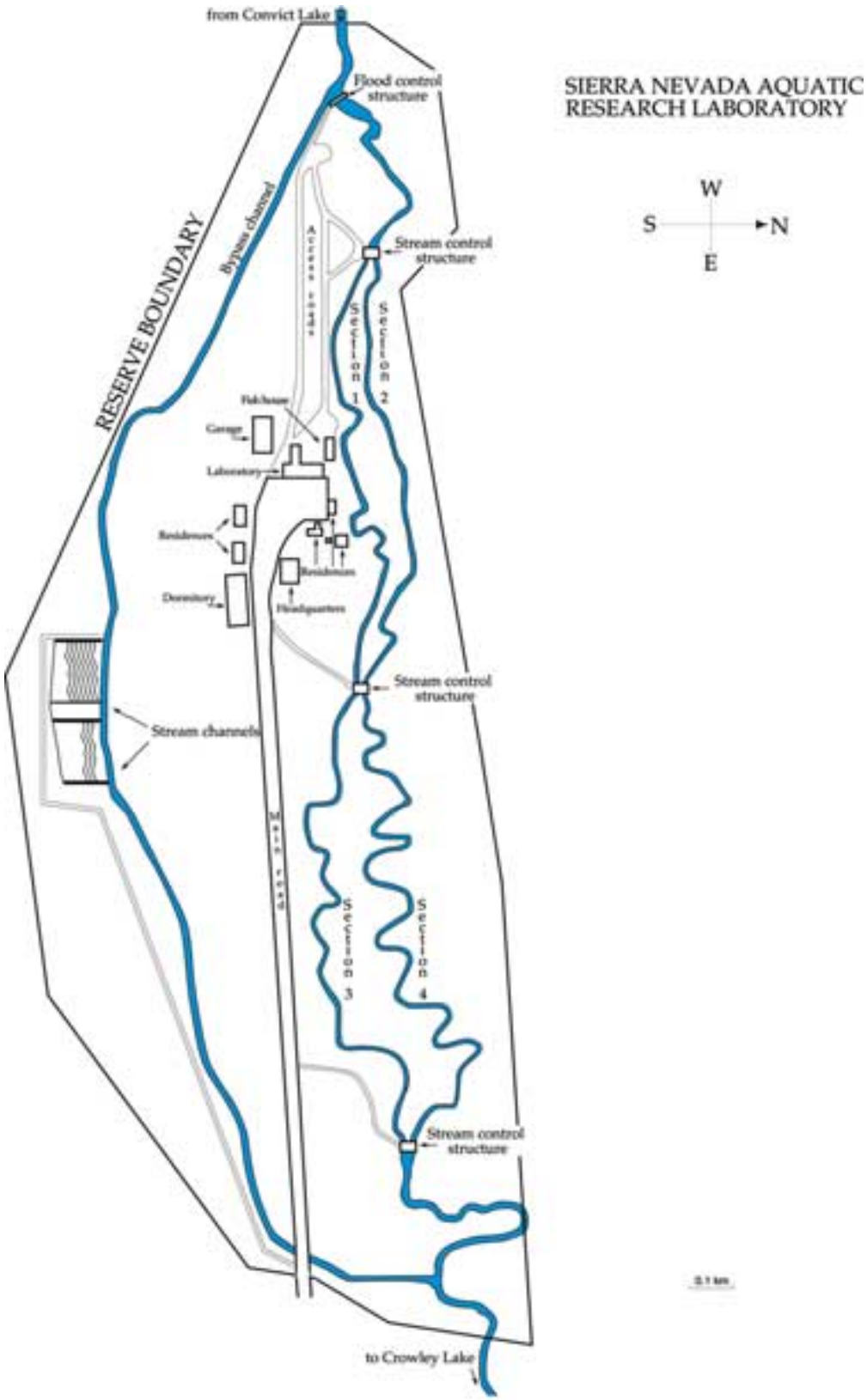

Figure 2. The Sierra Nevada Aquatic Research Laboratory.

Climate

The climatic conditions at SNARL are typical of much of the eastern slope of the Sierra Nevada, with long, cold, wet winters and short, dry summers. A standard suite of meteorological data has been collected continuously at SNARL since November 1987. Measurements include air temperature, wind speed and direction, relative humidity, precipitation (heated tipping bucket), and solar radiation. Measurements taken at SNARL prior to 1987 include a 13-year (1950 to 1972) record of air temperatures, and a single year (1957 to 1958) of precipitation data (Kennedy, 1964). Temperature and precipitation data also are available from sites at Mono Lake (USNOAA, 1980) and Long Valley Reservoir (Roberts and Associates, 1973), both located at similar elevations and within 25 miles (40 km) of SNARL. The following climatic summary is derived mainly from the recent 11-year (1988 to 1998) record of data recorded at SNARL.

Average annual precipitation at SNARL was 15.1 in (382 mm), and ranged from 8.7 to 26.6 in (221 to 674 mm). Seventy percent of this fell from November to March and thus was mainly snow. Snowfall is normally moderate, with typical snow depth from 1 to 4 ft (0.3 to 1.2m) during mid-winter (Kennedy, 1964). Summer precipitation derives primarily from thundershowers, during which rain may fall at the rate of 0.4 in (10 mm) per hour or more. On average, 12 per cent of annual precipitation falls during summer (21 June to 23 September).

Average annual air temperatures ranged from 40 to 45°F (4.4 to 7.2°C), with a mean of 43°F (6°C). The summer season at SNARL is short and dry (average afternoon relative humidity of 24 percent), with large diurnal temperature fluctuations. Daytime high temperatures in summer range from 73 to 85°F (23 to 29°C), with nighttime low temperatures between 32 and 43°F (0 to 6°C). July and August are typically the only frost-free months, although frost may occur at any time of the year. July is normally the warmest month of the year (Kennedy, 1964). The mean summer air temperature was 59°F (15.1°C).

During the winter (22 December to 21 March) the average temperature was 19°F (-7.4°C). Winter diurnal temperature fluctuations are less than in summer. Daytime high temperatures range from 30 to 52°F (-1 to 11°C) , and nighttime lows range from 0 to 23°F (-18 to -5°C). January is normally the coldest month of the year (Kennedy, 1964). Temperatures below freezing (32°F, 0°C) were recorded an average of 244 days each year.

Windy conditions are common throughout the year at SNARL. In summer the typical pattern is for the wind to be calm from sunrise through mid-morning, with a light breeze developing around noon. In the afternoon, wind velocity increases steadily through the afternoon and early evening, then decreases rapidly after sunset. Prevailing winds are usually from the west or northwest, except during stormy conditions, when they are typically from the south. The mean annual wind velocity was 4 mph (1.9 m/sec). In the SNARL area, much stronger winds often accompany the passage of storm fronts in winter, when winds occasionally attain velocities greater than 80 mph (36 m/sec) (Nielson *et al.*, 1957). Periods of high (greater than 45 mph, 20 m/sec), sustained (hourly means) winds occurred at SNARL on 1.6 percent of the days during the 11-year measurement period.

Vegetation

Three major types of vegetation occur on the relatively uniform terrain found at SNARL. Each is characterized by floristic composition and accompanying physical features, including soil type, exposure, and water availability. The three vegetation types found at SNARL are:

1) Great Basin Sagebrush Vegetation
2) High Desert Riparian Woodland
3) Riparian Meadow Vegetation

Great Basin Sagebrush Vegetation occupies most of the southern half of the reserve. It occurs mainly on sandy soil, often with rocks just below the surface, and is elevated above the level of the creek by approximately 3 feet (1 m). As a result of this combination of topography and soil type, water drainage away from the surface soil is rapid, resulting in lower soil moisture content in the sagebrush areas than in adjacent low-lying meadows and stream banks. The sagebrush community at SNARL is dominated by three species of shrubs: Great Basin Sagebrush (*Artemisia tridentata*), Rubber Rabbit-brush (*Chrysothamnus nauseosus*), and Antelope Bitterbrush (*Purshia tridentata*).

High Desert Riparian Woodland occurs along the banks of the natural branches of Convict Creek, and is developing along the bypass channel. The greater availability of water near the creek allows relatively large mesophytic plants to survive along a narrow ribbon of land running through this arid region. The dominant species of this community are trees and large shrubs, such as Quaking Aspen (*Populus tremuloides*), Water Birch (*Betula occidentalis*), and willows (*Salix* spp.). Stands of Quaking Aspen occur at the western end of the property on both sides of Convict Creek and along the southern edge of the creek from the western boundary to the area near the laboratory and houses. Extensive willow thickets are found in the northwestern corner. Other species characteristic of High Desert Riparian Woodland can be found just outside the boundaries of SNARL. One example is Jeffrey Pine (*Pinus jeffreyi*), which is common along Convict Creek just upstream from SNARL.

Riparian Meadow Vegetation is the name used here for a distinctive form of meadow vegetation that is found along the banks of Convict Creek in low-lying areas with poorly drained, fine-grained soils. It is most common at the eastern end of SNARL. The waterlogged soil appears to exclude trees and to favor certain perennial herbaceous species. The most common plants in these meadows at SNARL are sedges (*Carex* spp.), rushes (*Juncus* spp.), Western Blue Flag (*Iris missouriensis*), and various species of grasses. Many other species of perennial herbs and a few annual herbs are scattered throughout the meadows.

The Vascular Flora

General Remarks

The flora of SNARL was studied intensively from 1978 through 1980, and from 1995 through 1998. More limited observations were made from 1981 through 1994. All observed vascular plants were collected and identified, with the exception of horticultural cultivars and ornamentals restricted to the lawns and flower beds. Voucher specimens are deposited in the Herbarium of the University of California, Santa Barbara (UCSB) and in herbarium cases in the headquarters building at SNARL. *The Jepson Manual* (Hickman,1993), Munz and Keck (1959), Munz (1968, 1974) and available volumes of *Intermountain Flora* were the primary references used in identification. (See References and Literature Cited for a complete list of references.) Common names are primarily from the above sources, but Weeden (1996), Niehaus (1974) and other sources also were used.

A total of 162 taxa (species, subspecies, and varieties) have been identified at SNARL. These taxa are distributed among the major vascular plant groups as shown below:

	Families	Genera	Species*
Division Sphenophyta (Horsetails)	1	1	1
Division Pterophyta (Ferns)	1	1	1
Division Coniferophyta (Conifers)	2	2	2
Division Anthophyta (Angiosperms)			
Class Dicotyledonae	31	90	123
Class Monocotyledonae	8	24	35
Totals	43	118	162

* includes subspecies and varieties

Eleven taxa have been added to the flora since the first edition: *Amaranthus blitoides*, *Artemisia ludoviciana* ssp. *candicans*, *Stephanomeria spinosa*, *Tetradymia canescens*, *Tragopogon dubius*, *Caulanthus pilosus*, *Silene vulgaris*, *Lupinus argenteus* var. *argenteus*, *Lupinus argenteus* var. *meionanthus*, *Mimulus mephiticus* and *Tribulus terrestris*. Most of these were probably overlooked during previous surveys, but it is likely that the non-native *Tragopogon dubius*, *Silene vulgaris* and *Tribulus terrestris* have become established at SNARL since publication of the first edition of the flora.

Flowering plants (Division Anthophyta) dominate the flora of SNARL. The ten largest families are all angiosperms, containing 105 species and constituting over 64 percent of the total flora.

Ten Largest Families	Number of Species	Percent of Flora
Asteraceae	28	17.3
Poaceae	14	8.6
Fabaceae	10	6.2
Scrophulariaceae	10	6.2
Brassicaceae	9	5.5
Polygonaceae	8	4.9
Rosaceae	8	4.9
Liliaceae	7	4.3
Cyperaceae	6	4.1
Onagraceae	5	3.1
Totals	105	64.7

Many genera are represented at SNARL by multiple species. *Mimulus* (Scrophulariaceae), *Carex* (Cyperaceae) and *Muhlenbergia* (Poaceae), each are represented by four species. Genera that contribute three species each include: *Artemisia* (Asteraceae), *Arabis* (Brassicaceae), *Lupinus* (Fabaceae), *Eriogonum* (Polygonaceae), *Potentilla* (Rosaceae), and *Juncus* (Juncaceae). Of the remaining genera at SNARL, 20 are represented by two species each.

The flora of SNARL is composed largely of native species, excluding cultivars and ornamentals used in landscaping. Apart from these plantings, only 15 species (9.3 percent of the total flora) are introduced. (In 1980, 12 introduced species were known from SNARL.) Six of these introduced species are invasive, with the potential to decrease native biological diversity in natural communities. These include four species, *Cirsium vulgare* (Bull Thistle), *Sisymbrium altissimum* (Tumble Mustard), *Salsola tragus* (Tumbleweed) and *Verbascum thapsus* (Woolly Mullein) listed as invasive in wildlands by the California Exotic Pest Plant Council (1996), and two others *Taraxacum officinale* (Common Dandelion) and *Tragopogon dubius* (Goat's Beard) known to be locally invasive. In comparison, the flora of Valentine Camp, located near Mammoth Lakes, contains only 5.5 percent introduced species (Howald, 2000).

Relationships Between the Floras of SNARL and Valentine Camp

Although the flora of SNARL (162 species) contains only about three-fifths as many species as the Valentine Camp flora (256 species; Howald, 2000), it is relatively large and diverse when the high desert setting and small size of SNARL are taken into consideration. The floras of these two reserves have 74 species, subspecies and varieties in common, meaning that 45.7 percent of the plant taxa at SNARL also occur at Valentine Camp. These taxa are listed in Table 1.

The degree of similarity between the two floras is not surprising, considering that the two sites lie within 8 miles (13 km) of each other and support three similar vegetation types. However, Valentine Camp has four additional vegetation types (Howald, 2000) that are not represented at SNARL. The degree of similarity of the two areas is influenced by their close geographical proximity; although this is somewhat offset by differences in physical factors, such as climate and topography, that affect local vegetation and flora. Considering all of the above, a low to moderate degree of similarity would be expected between the high desert flora of SNARL and the montane flora of Valentine Camp. The 74 species shared between SNARL and Valentine Camp account for 21.5 percent of the 344 species that comprise the flora of these two areas combined.

Table 1. Species, subspecies and varieties of Plants Common to SNARL and Valentine Camp

CONIFEROPHYTA
Cupressaceae
Juniperus occidentalis
Pinaceae
Pinus jeffreyi

ANTHOPHYTA: DICOTYLEDONAE
Apiaceae
Angelica lineariloba
Sphenosciadium capitellatum
Asteraceae
Achillea millefolium
Agoseris glauca var. *laciniata*
Antennaria rosea ssp. *confinus*
Artemisia cana var. *bolanderi*
Artemisia ludoviciana ssp. *candicans*
Artemisia tridentata
Chaenactis douglasii var. *douglasii*
Chrysothamnus nauseosus ssp. *albicaulis*
Chrysothamnus viscidiflorus
Cirsium congdonii
Crepis intermedia
Erigeron peregrinus var. *callianthemus*
Gnaphalium palustre
Machaeranthera canescens var. *canescens*
Senecio hydrophilus
Solidago canadensis ssp. *elongata*
*Taraxacum officinale**
Tetradymia canescens
*Tragopogon dubius**
Trimorpha lonchophylla
Brassicaceae
Descurainia incisa
Erysimum capitatum ssp. *perenne*
Caprifoliaceae
Symphoricarpos rotundifolius var. *rotundifolius*
Caryophyllaceae
Stellaria longipes var. *longipes*
Fabaceae
Astragalus purshii var. *tinctus*
Lupinus polyphyllus var. *burkei*
Trifolium longipes var. *nevadense*
T. wormskioldii
Gentianaceae
Gentianopsis holopetala
Grossulariaceae
Ribes cereum var. *cereum*
Loasaceae
Mentzelia congesta
Mentzelia montana
Onagraceae
Epilobium ciliatum
Gayophytum diffusum ssp. *parviflorum*
Papaveraceae
Argemone munita
Polemoniaceae
Allophyllum gilioides ssp. *violaceum*
Eriastrum wilcoxii
Phlox stansburyi
Polygonaceae
Eriogonum baileyi
Eriogonum spergulinum var. *reddingianum*
Eriogonum umbellatum var. *nevadense*
Polygonum douglasii var. *johnstonii*
Rumex salicifolius var. *triangulivalvis*
Ranunculaceae
Aconitum columbianum
Aquilegia formosa
Thalictrum fendleri var. *fendleri*
Rosaceae
Potentilla biennis
Potentilla glandulosa ssp. *hansenii*
Potentilla gracilis var. *elmeri*
Purshia tridentata var. *tridentata*
Rosa woodsii var. *ultramontana*
Salicaceae
Populus tremuloides
Scrophulariaceae
Castilleja miniata
Mimulus guttatus
Penstemon rostriflorus
Solanaceae
Nicotiana attenuata
Violaceae
Viola purpurea

ANTHOPHYTA: MONOCOTYLEDONAE
Iridaceae
Iris missouriensis
Juncaceae
Juncus macrandrus
Juncus mexicanus
Liliaceae
Allium bisceptrum
Fritillaria pinetorum
Lilium kelleyanum
Smilacina stellata
Poaceae
Elymus elymoides ssp. *elymoides*
Leymus cinereus
Leymus triticoides ssp. *triticoides*
Muhlenbergia richardsonis
*Phleum pratense**

* = not native to California; introduced

Rare Plants

***Pedicularis crenulata* (Scalloped-leaved Lousewort)**

The SNARL flora includes *Pedicularis crenulata*, a perennial herb in the Figwort Family (Scrophulariaceae), and a plant of special status (Skinner and Pavlik, 1994). This species was considered extinct in California (Smith *et al.*, 1980) until it was rediscoved at SNARL in 1978 (Howald and Orr, 1981). Convict Creek is the only known locality for this species in California (Hickman, 1993; Munz and Keck, 1959). It is more widespread outside California, especially in the Rocky Mountains of Colorado and Wyoming. The 1978 collections at SNARL (*Howald, 952; Orr, 337*) were the first California collections of this species since Peirson collected it along Convict Creek in 1933. Sprague (1962) studied the pollination ecology of *Pedicularis crenulata* but apparently did not make any collections. She mentions a colony of 25 to 30 white-flowered plants along Convict Creek, although the precise location where she made her observations is uncertain. All individuals of *Pedicularis crenulata* observed at SNARL from 1978 through 1998 were white-flowered (forma *candida*).

Although the range of *Pedicularis crenulata* along Convict Creek previously may have been more extensive, in recent years (1978 through 1998) it has not been found outside the fenced boundaries of SNARL during extensive searches of suitable habitat along Convict Creek and in other nearby stream drainages. All suitable habitat outside SNARL boundaries has been grazed by livestock (cattle and sheep) for many years. The meadows at SNARL may support the only known populations of *Pedicularis crenulata* in California because they offer the only suitable habitat in the area that has been protected from livestock grazing over the long-term.

In 1998 the distribution of *Pedicularis crenulata* at SNARL consisted of two subpopulations of approximately 250 individuals each and a single outlying individual (Howald, unpub. data). Demographic monitoring is conducted annually on this species at SNARL.

The California Native Plant Society's *Inventory of Rare and Endangered Vascular Plants of California* (Pavlik and Skinner, 1994) lists *Pedicularis crenulata* on List 2, which includes plants that the Society rates as rare, threatened or endangered in California, but more common elsewhere.

***Eriogonum ampullaceum* (Mono Wild Buckwheat)**

The first edition of this flora noted the presence of another plant considered at that time to be rare, the annual *Eriogonum ampullaceum* (Mono wild buckwheat). *E. ampullaceum* has not been found during surveys throughout SNARL conducted from 1980 to 1998. However, *Eriogonum baileyi*, a common annual buckwheat that is similar in some characters to *E. ampullaceum*, is common and widely distributed at the reserve. Therefore, it is possible that the previous record of *E. ampullaceum* resulted from misidentification of *E. baileyi*. The current edition of the California Native Plant Society's *Inventory of Rare and Endangered Vascular Plants of California* (Pavlik and Skinner, 1994) notes that *E. ampullaceum* was considered for listing, but was not listed because it is too common to meet the criteria for listing.

Annotated Catalog

This updated catalog for the Sierra Nevada Aquatic Research Laboratory includes all vascular plants identified during field studies conducted from 1978 through 1980 and from 1995 through 1998. Taxonomic nomenclature is consistent with *The Jepson Manual* (1993). The families, genera, and species are arranged alphabetically. The scientific name of each species is followed by common names of popular usage. No attempt was made to determine all common names that might apply to a given species. Scientific names of native species are in **bold** type; those of introduced species are in plain type. Annotations include the general abundance and distribution at SNARL for all taxa and, for flowering plants, the approximate flowering period in the eastern Sierra. Locations of most landscape features mentioned in the text (e.g., control structure 3) are shown in Figure 2. Previously applied scientific names are given in brackets.

DIVISION SPHENOPHYTA

Equisetaceae. Horsetail Family

Equisetum laevigatum A. Braun. Smooth Scouring Rush.

Occasional in moist areas near Convict Creek, especially near the laboratory and cabins. Also in sagebrush scrub at east end and elsewhere. [*E. kansanum* J. Schaffn.]

DIVISION PTEROPHYTA

Ophioglossaceae. Adder's Tongue Family

Botrychium simplex Hitchc. Yosemite Moonwort. Little Grape Fern.

Uncommon in meadow north of control structure 3. To be looked for in other meadow areas at SNARL. Most evident when fronds are mature in June to early July.

DIVISION CONIFEROPHYTA

Cupressaceae. Cypress Family

Juniperus occidentalis Hook. ssp. ***australis*** (Vasek) A. & N. Holmgren. Western Juniper. Sierra Juniper.

One juvenile at the edge of the aspen grove west of laboratory.

Pinaceae. Pine Family

Pinus jeffreyi Grev. & Balf. Jeffrey Pine.

One tree east of building Q2; possibly planted. Native along Convict Creek upstream from SNARL.

DIVISION ANTHOPHYTA

Class Dicotyledonae

Amaranthaceae. Amaranth Family

Amaranthus blitoides S. Watson. Prostrate Amaranth.

First collected at SNARL in 1998. Common in areas of recent disturbance, especially near buildings and constructed stream channels. Native weed. June to September. [*A. graecizans* L.]

Apiaceae. Carrot Family

Angelica lineariloba A. Gray. Sierra Angelica. Sierra Soda Straw.

Probably not native to SNARL. Formerly, one plant in flower bed in front of laboratory, apparently a volunteer. In 1999, one plant observed in sagebrush vegetation near entrance road. July to August.

Lomatium nevadense (S. Watson) Coult. & Rose. Nevada Lomatium.

Uncommon in sagebrush scrub near southwestern corner. June to July.

Sphenosciadium capitellatum A. Gray. Ranger's Buttons. Swamp Whiteheads.

Occasional along wet banks of Convict Creek. July to August.

Asclepiadaceae. Milkweed Family

Asclepias speciosa Torrey. Showy Milkweed.

Several plants at edge of meadow northeast of control structure 3. June to July. [*A. giffordii* Eastw.]

Asteraceae. Sunflower Family

Achillea millefolium L. White Yarrow. Yarrow Milfoil.

Common in moist areas of streambank woodland and in meadows. Late June to late August. [var. *lanulosa* (Nuttall) Piper]

Agoseris glauca (Pursh) Raf. var. ***laciniata*** (D. Eaton) Smiley. Short-beaked Agoseris.

Common in damp soil of meadows, especially at east end. Mid-June to late July.

Agoseris glauca (Pursh) Raf. var. ***monticola*** (E. Greene) Q. Jones. Short-beaked Agoseris.

Common in damp soil of meadows, growing with variety *laciniata*. Mid-June to late July.

Antennaria rosea E. Greene ssp. ***confinus*** (E. Greene) R. Bayer. Rosy Everlasting. Pussytoes.

Occasional in wet soil along banks of Convict Creek on east island near control structure 4. Late May to early July.

Arnica parryi A. Gray ssp. ***sonnei*** (E. Greene) Maguire. Nodding Arnica.

Occasional in moist, low-lying, open meadows near eastern boundary. Late June to late August.

Artemisia cana Pursh ssp. ***bolanderi***. (A. Gray) G. Ward. Silver or Hoary Sagebrush.

Uncommon, in one patch southwest of control structure 3 with *A. tridentata*. August to September.

Artemisia ludoviciana Nuttall ssp. ***candicans*** (Rydb.) Keck. Silver Wormwood.

First collected at SNARL in 1998. Occasional in sagebrush scrub, especially in northeast corner. August to September.

Artemisia tridentata Nuttall ssp. ***tridentata***. Great Basin Sagebrush. Big Sagebrush.

Common, dominant of sagebrush scrub, in dry, well-drained soils; throughout much of SNARL. August to October.

Chaenactis douglasii (Hook.) Hook. & Arn. var. ***douglasii***. Dusty Maidens. Hoary Chaenactis.

Occasional in open sites in sagebrush scrub. July to August. [var. *rubricaulis* (Rydb.) Ferris]

Chrysothamnus nauseosus (Pallas) Britton ssp. ***albicaulis*** (Nuttall) Hall & Clem. Rubber Rabbit-brush.

Occasional throughout sagebrush scrub in southern half of SNARL, with subspecies *consimilis.* August to October.

Chrysothamnus nauseosus (Pallas) Britton ssp. ***consimilis*** (E. Greene) Hall & Clem. Rubber Rabbit-brush.

Common throughout sagebrush scrub in southern half of SNARL, especially along the entrance road. August to October.

Chrysothamnus viscidiflorus (Hook.) Nuttall ssp. ***viscidiflorus***. Sticky Rabbit-brush.

Occasional in sagebrush scrub. August to October.

Cirsium congdonii Moore & Franklin. Dwarf Thistle.

Common in moist areas in meadows. A distinctive segregate from *C. scariosum* Nuttall. June to August. [*C. drummondii* Torrey & A. Gray]

Cirsium vulgare (Savi) Ten. Bull Thistle.

Native to Europe. Uncommon, one small colony along north bank of flood bypass channel. First noted in 1980; not observed in 1998. June to August.

Conyza canadensis (L.) Cronq. Horseweed.

Occasional in disturbed areas, especially along trails west of the laboratory. June to August.

Crepis intermedia A. Gray. Intermediate Hawksbeard.

Uncommon, a few plants in sagebrush vegetation near fence along southern boundary. July to August.

Erigeron peregrinus (Pursh) E. Greene var. ***callianthemus*** (E. Green) Cronq. Wandering Fleabane.

Occasional on moist banks of Convict Creek and in meadows. July to September.

Gnaphalium palustre Nuttall. Pearly Everlasting.

Occasional along moist banks of Convict Creek. July to August.

Lactuca serriola L. Prickly Lettuce.

Native to Europe. Uncommon, a few plants in disturbed area within sagebrush scrub, approximately 50 meters east of building Q2. First collected in 1980. June to August.

Machaeranthera canescens (Pursh) A. Gray ssp. ***canescens***. Hoary Aster.

Uncommon in dry soil near edge of aspen grove at west end and in vicinity of constructed stream channels. July to September.

Senecio hydrophilus Nuttall. Alkali-marsh Butterweed.

Common in wettest parts of meadows at east end and along wet banks of Convict Creek. August to September.

Solidago canadensis L. ssp. ***elongata*** (Nuttall) Keck. Canada Goldenrod.

Occasional near Convict Creek. August to October.

Stephanomeria pauciflora (Nuttall) Nelson var. ***pauciflora***. Few-flowered Stephanomeria. Wire Lettuce.

Occasional in sagebrush scrub, especially along southern border. Late July to mid-September.

Stephanomeria spinosa (Nuttall) Tomb. Spiny Wire Lettuce.

First identified at SNARL in 1998. Uncommon in sagebrush scrub along road to constructed stream channels. August to September. [*Lygodesmia s*. Nuttall]

Taraxacum officinale L. Common Dandelion.

Native to Europe. Invasive weed. Common in meadow areas and near buildings. May to July. [*T. laevigatum* (Willd.) DC.]

Tetradymia canescens DC. Spineless Horsebrush.

First collected at SNARL in 1998. Uncommon in sagebrush scrub near constructed stream channels. August to September.

Tragopogon dubius Scop. Goat's Beard.

Native to Europe. Invasive weed. First observed at SNARL in 1996. Large patch in northeast corner of reserve was removed in 1998. June to July.

Trimorpha lonchophylla (Hook.) G. Nesom. Short-rayed Aster.

Scattered along creek bank of West Island near control structure 2. August to September. [*Erigeron l*. Hook.]

Betulaceae. Birch Family

Betula occidentalis Hook. Copper or Water Birch.

Occasional on banks of Convict Creek. May to June. [*B. fontinalis* Sarg.]

Boraginaceae. Borage Family

Cryptantha circumscissa (Hook. & Arn.) I. Johnston. Cushion Cryptantha.

Common in sagebrush scrub, especially open sites. Late May to July.

Cryptantha simulans E. Greene. Cryptantha.

Common in sagebrush scrub, especially in the southwest corner. June to July.

Lappula redowskii (Hornem.) E. Greene var. ***redowskii***. Stickseed.

Common in disturbed sites in sagebrush scrub, near buildings and along roads. June to early August.

Tiquilia nuttallii (Hook.) A. Richardson. Rosette Tiquilia.

Common in open or disturbed sites in sagebrush scrub, especially near roads and buildings and in vicinity of constructed stream channels. Late May to August. [*Coldenia n*. Hook.]

Brassicaceae. Mustard Family

Arabis hirsuta (L.) Scop. var. ***glabrata*** Torrey & A. Gray. Hairy Rockcress.

Occasional in meadows north of Convict Creek. June to July.

Arabis puberula Torrey & A. Gray. Blue Mountain Rockcress.

Uncommon in patches of sagebrush scrub north of control structure 3. July to early August.

Arabis pulchra M. Jones. Beautiful Rockcress.

Occasional in sagebrush scrub in southwestern part of SNARL. Not seen in 1998. June to July.

Caulanthus pilosus S. Watson. Chocolate Drops.

First identified at SNARL in 1996. Uncommon in sagebrush scrub in southwest corner. May to June.

Descurainia incisa (A. Gray) Britton ssp. ***filipes*** (A. Gray) Rollins. Tansy Mustard.

Common in disturbed sites in sagebrush scrub, near buildings, along trails and entrance road. Mid-May to June. [*D. pinnata* (Walt.) Britton ssp. *f.* (A. Gray) Detl.]

Erysimum capitatum (Douglas) E. Greene ssp. ***perenne*** (Cov.) R. Price. Sierra Wallflower.

Occasional in sagebrush vegetation at southeast end. May to June. [*E. p*. (Wats. ex Cov.) Abrams]

Lepidium densiflorum Schrad. var. ***macrocarpum*** G. Mulligan. Peppergrass.

Common in disturbed areas along entrance road and around buildings. May to August.

Rorippa sphaerocarpa (A. Gray) Britton. Yellow-cress.

Uncommon in wet low-lying areas in eastern meadow. June to September. [*R. obtusa* (Nuttall) Britton]

Sisymbrium altissimum L. Tumble-mustard.

Native to Europe. Invasive weed. Common in disturbed areas, especially along entrance road and near buildings. May to August.

Cactaceae. Cactus Family

Opuntia erinacea Engelm. & Bigel. var. ***utahensis*** (Engelm.) L. Benson. Old Man Cactus.

A few individuals in sagebrush scrub in southwestern section of Reserve. Occasional in sagebrush scrub south of SNARL borders. June to July.

Caprifoliaceae. Honeysuckle Family

Symphoricarpos rotundifolius A. Gray var. ***rotundifolius***. Snowberry.

Uncommon, a few plants in sagebrush scrub near the eastern boundary. June to July. [*S. vaccinoides* Rydb.]

Caryophyllaceae. Pink Family

Silene vulgaris (Moench) Garcke. Common Silene.

Native to Europe. Uncommon, one plant seen in 1996 near steps to east dormitory entrance. Possibly brought in by visitor from Central Valley or Bay Area since this introduced plant is not noted from the eastern Sierra in *The Jepson Manual* (Hickman, 1993).

Stellaria longipes Goldie var. ***longipes***. Starwort.

Occasional in wet soil along banks of Convict Creek and in low-lying wet meadow areas. June to July.

Chenopodiaceae. Goosefoot Family

Chenopodium botrys L. Jerusalem-oak.

Native to Europe. Occasional in disturbed areas. June to August.

Chenopodium incognitum Wahl. Goosefoot.

Common in disturbed areas, especially along dirt trail west of lab and around fish observation ponds. July to August.

Monolepis spathulata A. Gray. Club-leaved Monolepis.

Occasional along bank of flood bypass channel. June to August.

Salsola tragus L. Tumbleweed. Russian Thistle.

Native to Eurasia. Highly invasive weed. Occasional along entrance road, near buildings and in vicinity of constructed stream channels. First collected in 1980. New infestations are promptly removed. July to October. [*S. iberica* Sennin & Pau]

Euphorbiaceae. Spurge Family

Chamaesyce serpyllifolia (Pers.) Small. ssp. ***serpyllifolia***. Thyme-leaved Spurge.

Common in dry disturbed areas near buildings and along trail to west end. July to September. [*Euphorbia s*. Pers.]

Fabaceae. Pea Family

Astragalus canadensis L. var. ***brevidens*** (Gand.) Barneby. Canada Milkvetch.

Common near Convict Creek, on meadow borders and in moist sites in sagebrush scrub. Identification determined by Dr. Rupert C. Barneby, New York Botanical Garden. Specimen identified as *A. whitneyi* in first edition of flora is this taxon. July to August.

Astragalus purshii Hook. var. ***tinctus*** M.E. Jones. Woolly-pod.

Occasional in sagebrush vegetation, especially near eastern end. Common outside northern fence in drier sagebrush sites. [var. *longilobus* M.E. Jones]

Lupinus argenteus Pursh var. ***argenteus***. Spurred Lupine.

First collected at SNARL in 1998. Uncommon in sagebrush scrub at east end. July to August. [var. *tenellus* (G. Don) D. Dunn]

Lupinus argenteus Pursh var. ***meionanthus*** (A. Gray) Barneby. Silver Lupine.

First identified at SNARL in 1996. Formerly, a few plants along road, just inside entrance to SNARL, but these were eliminated during repaving in 1998. Uncommon along Mt. Morrison Road, just east of entrance to SNARL (outside property boundary). July to August. [*L. m*. A. Gray]

Lupinus lepidus Douglas var. ***confertus*** (Kellogg) C. Smith. Kellogg's Prairie Lupine.

Abundance has fluctuated since the 1970s from very common in some years to sparse in others. Found in understory of aspen groves and riparian woodland, drier sites in meadows and, formerly, near buildings, especially in disturbed areas with moist to dry soil. Plants with pink flowers have been seen in the past. Specimen identified as *L. pratensis* in first edition probably is this taxon. July to August.

Lupinus polyphyllus Lindley var. ***burkei*** (S. Watson) C. Hitchc. Meadow Lupine.

Common in wet places in meadows and especially on banks of Convict Creek. July to August. [ssp. *superbus* (Heller) Munz]

Melilotus alba Medikus. White Sweet-clover.

Native to Eurasia. A few plants along trail near flood control structure 1. July to August.

Trifolium longipes Nuttall var. ***nevadense*** Jepson. Long-stalked Clover.

Common in moist understory of streambank woodland and in meadows. June to July.

Trifolium wormskioldii Lehm. Cow Clover.

Occasional in wet places. June to July.

Vicia americana Muhl. var. ***americana***. American Vetch.

Formerly, several plants in flower beds in front of laboratory. July to August. [ssp. *oregana* (Nuttall) Abrams]

Gentianaceae. Gentian Family

Gentianopsis holopetala (A. Gray) Iltis. Sierra Gentian.

Scattered colonies in wet soil of eastern meadows. August to September. [*Gentiana h*. (A. Gray) Holm.]

Grossulariaceae. Gooseberry Family

Ribes cereum Douglas var. ***cereum***. Squaw Currant.

Occasional in sagebrush scrub. June to July.

Hydrophyllaceae. Waterleaf Family

Nama densum Lemmon. Matted Nama.

Formerly common along banks of flood bypass channel. Not observed in 1998. June to July.

Phacelia bicolor S. Watson var. ***bicolor***. Bicolored Phacelia.

Common in sagebrush scrub, also along edges of aspen grove at the western end. A few individuals with white and yellow corollas have been seen in southwest corner. Late May to July.

Lentibulariaceae. Bladderwort Family

Utricularia minor L. Lesser Bladderwort.

Uncommon, found in a few small pools just south of control structure 4; with *Potamogeton filiformis.* Only sterile material has been collected. Flowering individuals have not been seen. Plants not found in dry years.

Loasaceae. Sandpaper Plant Family

Mentzelia congesta Torrey & A. Gray. Ventana Stick-leaf.

Occasional in sagebrush scrub, especially along southern border, growing with the more common *M. montana*. June to July.

Mentzelia montana (Davidson) Davidson. Sandpaper Plant.

Common in sagebrush scrub, growing with the less common *M. congesta*. Specimen identified as *M. albicaulis* in first edition probably is this taxon. May to July.

Malvaceae. Mallow Family

Malva neglecta Wallr. Common Mallow.

Native to Eurasia. Occasional in disturbed areas near buildings. June to August.

Onagraceae. Evening-Primrose Family

Epilobium ciliatum Raf. ssp. ***ciliatum***. American Willow-herb.

Occasional in moist to wet soil near Convict Creek. June to July.
[*E. adenocaulon* Hausskn.]

Epilobium oregonense Hausskn. Oregon Willow-herb.

Formerly, occasional in wet soil of fish observation ponds. Not observed in 1998. June to July.

Gayophytum diffusum Torrey & A. Gray ssp. ***parviflorum*** Lewis & Szweykowski. Diffuse Gayophytum.

Common in moist open areas near aspen groves, along roads and trails. Late June to mid-August.

Oenothera californica (S. Watson) S. Watson ssp. ***avita*** Klein. California Evening-primrose.

Uncommon, in scattered small patches in sagebrush scrub. A few plants near concrete fish tanks behind (west of) the laboratory. Also along Mt. Morrison Road east of SNARL. Late May to early August. [*O. a*. (Klein) Klein]

Oenothera elata Kunth ssp. ***hirsutissima*** (S. Watson) W. Dietr.
Hooker's or Yellow Evening-primrose.

Occasional to common along entrance road and trails and on creek banks west of laboratory. Also, in flower beds in front of laboratory and dormitory, around edges of lawns and in meadows. Late June to late August. [*O. hookeri* Torrey & A. Gray ssp. *angustifolia* (Gates) Munz]

Papaveraceae. Poppy Family

Argemone munita Durand & Hilg. Prickly Poppy. Fried Egg Flower.

Several plants along roadside, more common outside reserve near Highway 395. July to August. [ssp. *rotundata* (Rydb.) Ownbey]

Polemoniaceae. Phlox Family

Allophyllum gilioides (Benth.) A.D. & V. Grant ssp. ***violaceum*** (Heller) Day.
Straggling Allophyllum.

Common in moist open areas in aspen groves west of laboratory. June to July. [*A. v.* (A. Heller) A. & V. Grant]

Eriastrum wilcoxii (A. Nels.) Mason. Wilcox's Eriastrum.

Common in sagebrush scrub, especially in open areas and lightly disturbed soils. Late May to July.

Leptodactylon pungens (Torrey) Rydb. Prickly Phlox.

Occasional in sagebrush scrub. Late May to July. [ssp. *pulchriflorum* (Brand) H. Mason]

Phlox stansburyi (Torrey) Heller. Stansbury Phlox.

Common in sagebrush scrub, especially in southwestern corner of SNARL. Mid-May to July.

Polygonaceae. Buckwheat Family

Chorizanthe brevicornu Torrey var. ***spathulata*** (Rydb.) Hitchc. Brittle Spineflower.

Occasional in sagebrush scrub near southern boundary. Late May to July.

Eriogonum baileyi S. Watson var. ***baileyi***. Bailey's Wild Buckwheat.

Common in sagebrush scrub, especially along roads and trails and in disturbed sites around buildings. Probably misidentified as *E. ampullaceum* in first edition. July to early September.

Eriogonum spergulinum A. Gray var. ***reddingianum*** (M.E. Jones) J. Howell.
Spurrey Wild Buckwheat.

Occasional in open or disturbed areas in sagebrush scrub, especially in southeastern section. July to August.

Eriogonum umbellatum Torrey var. ***nevadense*** Gand. Nevada Sulfur Buckwheat.

Occasional in sagebrush scrub, mainly in southeastern section. More common east of SNARL boundary. July to September.

Polygonum arenastrum Boreau. Common Knotweed.

Native to Europe. Occasional in disturbed ground near constructed stream channels and headquarters building. July to September. [*P. aviculare* L.]

Polygonum douglasii E. Greene var. ***johnstonii*** (Munz) J. Hickman. Douglas's Knotweed.

Common in moist to dry sites along edges of meadows and especially in disturbed areas near aspen groves west of laboratory. July to August.

Rumex paucifolius S. Watson. Alpine Sheep Sorrel.

Formerly, a few plants in empty fish observation ponds. Not observed in 1998. July to September.

Rumex salicifolius J.A. Weinm. var. ***triangulivalvis*** (Danser). Hitchc. Willow Dock.

Occasional in moist meadow areas. July to August. [*R. t*. (Danser) Rech. f.]

Ranunculaceae. Buttercup Family

Aconitum columbianum Nuttall. Monkshood.

Occasional along Convict Creek, especially on edges of willow thickets near picnic area. July to August.

Aquilegia formosa Fischer. Red Columbine.

Occasional along banks of Convict Creek, especially near the western end. July to August. [var. *truncata* (F. & M.) Baker]

Ranunculus aquatilus L. var. ***subrigidus*** (Drew) Breitung. Aquatic Buttercup.

Common in Convict Creek and in constructed stream channels. July to August. [*R. s.* Drew]

Thalictrum fendleri A. Gray var. ***fendleri***. Mountain Meadow-rue.

Occasional in moist soil near Convict Creek. Late June to July.

Rosaceae. Rose Family

Cercocarpus ledifolius Nuttall. Curl-leaf Mountain Mahogany.

Uncommon. A few individuals in sagebrush scrub. Late May to June.

Horkeliella congdonis (Rydb.) Rydb. Congdon's Little Horkelia.

Uncommon in moist sagebrush scrub. One colony along road west of the laboratory; also found at eastern end. Specimen identified as *Ivesia kingii* in first edition is this taxon. July to August. [*Ivesia purpurascens* (S. Watson) Keck ssp. *c*. (Rydb.) Keck]

Potentilla biennis E. Greene. Greene's Cinquefoil.

Occasional in moist sandy areas of sagebrush scrub and along trails to western end. Common in moist disturbed sites on East Island. Late May to August.

Potentilla glandulosa Lindley ssp. ***hansenii*** (E. Greene) Keck. Sticky Cinquefoil.

Common in moist areas near Convict Creek and flood bypass channel. June to August.

Potentilla gracilis Hook. var. ***elmeri*** (Rydb.) Jepson. Five-finger Cinquefoil.

Common in moist places. June to August. [*P. pectinisecta* Rydb.; *P. flabelliformis* Lehm. var. *inyoensis* Jepson]

Prunus andersonii A. Gray. Desert Peach.

Several plants in sagebrush scrub near eastern and western boundaries. More common in sagebrush scrub outside of SNARL boundaries. May to June.

Purshia tridentata (Pursh) DC. var. ***tridentata***. Antelope Bitterbrush.

Common dominant of sagebrush scrub. May to June.

Rosa woodsii Lindley var. ***ultramontana*** (S. Watson) Jepson. Mountain Wild Rose.

Common in understory of aspen groves and in moist areas along and near Convict Creek. June to July.

Salicaceae. Willow Family

Populus tremuloides Michaux. Quaking Aspen.

Common along Convict Creek, especially in a large grove west of the laboratory. May to June.

Populus balsamifera L. ssp. ***trichocarpa*** (Torrey & A. Gray) Brayshaw. Black Cottonwood.

Four trees along the flood bypass channel. May to June. [*P. t.* (Torrey & A. Gray) Brayshaw]

Salix exigua Nuttall. Narrow-leaved Willow.

Common. Forms dense thickets in wet places near Convict Creek. May to June.

Salix lutea Nuttall. Yellow Willow.

Common in wet places near Convict Creek, especially in dense thickets north of the creek. May to June. [var. *watsonii* (Bebb) Jepson]

Saxifragaceae. Saxifrage Family

Parnassia californica (A. Gray) E. Greene. Grass-of-Parnassus.

Uncommon; in wet soil along streamlets in meadow areas at eastern end. Late May to June. [*P. palustris* L. var. *c*. A. Gray]

Scrophulariaceae. Figwort Family

Castilleja angustifolia (Nuttall) G. Don. Desert Indian Paintbrush.

Uncommon. Collected in sagebrush scrub in 1975 (*Howald, 561*). Not seen 1980 through 1998. June to July. [*C. chromosa* Nelson]

Castilleja miniata Hook. ssp. ***miniata***. Meadow Paintbrush.

Common along Convict Creek; occasional in wet areas of meadows. Late June to early August.

Mimulus floribundus Lindley. Floriferous Monkeyflower.

Occasional in wet areas, especially in openings between willow thickets and in aspen grove west of the laboratory. June to July.

Mimulus guttatus DC. Common Monkeyflower.

Common in wet areas near Convict Creek. June to August. [*M. nasutus* E. Greene]

Mimulus mephiticus E. Greene. Skunk Monkeyflower.

First identifed at SNARL in 1998. One plant found in sagebrush scrub in July, 1998, west of constructed stream channels. More common in open pumice soil from Mammoth area north to the Mono Basin. Late May to July.

Mimulus primuloides Benth. ssp. ***primuloides*****.** Primrose Monkeyflower.

Occasional in wet low-lying meadow areas, especially on the north side of Convict Creek. Late June to August.

Pedicularis crenulata Benth. forma ***candida*** Macbr. Scalloped-leaved Lousewort.

Listed as presumed extinct in California by Smith *et al.* (1980). First recorded at SNARL in 1978. Censused annually 1980 to 1985; 1990 to 1998. Searches in likely habitat have found no plants outside SNARL boundaries within Convict Creek drainage or elsewhere in California. Late June to early August. See illustration on back of cover.

Penstemon rostriflorus Kellogg. Scarlet Penstemon.

Uncommon at SNARL, a few plants have been observed along trail near western fork of Convict Creek (near control structure 1). July to August. [*P. bridgesii* A. Gray]

Penstemon rydbergii Nelson var. ***oreocharis*** (E. Greene) N. Holmgren. Meadow Penstemon.

Occasional in moist, higher areas of meadow, especially in northeast corner. More common just outside the northern boundary. Usually violet-flowered, but a few pink-flowered individuals have been seen in northeast corner near fence. Mid-June to July. [*P. o*. E. Greene]

Verbascum thapsus L. Woolly Mullein.

Native to Eurasia. Invasive weed. Common in disturbed areas, especially along entrance road, near buildings, in flood bypass channel, and near constructed stream channels. Observations indicate this species has the potential to invade relatively undisturbed meadows. Control efforts are ongoing. July to August.

Solanaceae. Nightshade Family

Nicotiana attenuata Torrey. Coyote Tobacco.

Occasional along entrance road and common in recently disturbed sites. July to August.

Violaceae. Violet Family

Viola adunca Smith. Western Dog Violet.

Occasional along banks of streamlets in northeastern meadow. June to July.

Viola purpurea Kellogg ssp. ***venosa*** (S. Watson) Baker & Clausen. Wild Mountain Violet.

Occasional in sagebrush scrub. More common outside of eastern boundary. Late May to June. [ssp. *geophyta* Baker & Clausen]

Zygophyllaceae. Caltrop Family

Tribulus terrestris L. Puncture Vine. Goats's Heads.

First collected at SNARL in 1998; one plant found west of laboratory. Native to Mediterranean region. Invasive weed. Toxic to livestock. Now biologically controlled by introduced weevils. July to early September.

DIVISION ANTHOPHYTA

Class Monocotyledonae

Cyperaceae. Sedge Family

Carex douglasii Boott. Douglas's Sedge.

Common in moist to dry open areas around western aspen groves and in disturbed soils; also in moister portions of sagebrush scrub.

Carex lanuginosa Michaux. Woolly Sedge.

Occasional in moist areas near Convict Creek and flood bypass channel. [*C. lasiocarpa* var. *i.* Kuk.]

Carex nebrascensis Dewey. Nebraska Sedge.

Occasional in wet soil along banks of flood bypass channel.

Carex utriculata Boott. Beaked Sedge.

Occasional in wet soil or standing water. [*C. rostrata* Stokes]

Cyperus squarrosus L. Umbrella-sedge.

Occasional along wet banks of flood bypass channel. [*C. aristatus* Rottb.]

Eleocharis acicularis (L.) Roemer & Schultes. Spike-rush.

Occasional in wet soil, especially in man-made depression near picnic area.

Hydrocharitaceae. Waterweed Family

Elodea nuttallii (Planchon) H. St. John. Nuttall's Waterweed.

Common in Convict Creek and constructed stream channels. July to August.

Iridaceae. Iris Family

Iris missouriensis Nuttall. Western Blue Flag. Wild Iris.

Common in meadows and sagebrush scrub bordering meadows. May to mid-June.

Sisyrinchium halophilum E. Greene. Nevada Blue-eyed Grass.

Common in low-lying meadows north of Convict Creek. May to June.

Juncaceae. Rush Family

Juncus macrandrus Cov. Long-anthered Rush.

Occasional in low-lying marshy area at eastern end, also along borders of Convict Creek and meadow streamlets. July to August.

Juncus mexicanus Willd. Mexican Rush.

Common in wet clearings near aspen and willows in northwest corner and, formerly, around edges of fish observation ponds. June to August.

Juncus orthophyllus Cov. Straight-leaved Rush.

Common in moist to wet areas near Convict Creek. July to August.

Liliaceae. Lily Family

Allium atrorubens S. Watson var. ***cristatum*** (S. Watson) D. McNeal. Dark Red Onion.

Occasional in sagebrush scrub near southwestern corner. Late May to June. [var. *inyonis* (Jones) Ownbey & Aase]

Allium bisceptrum S. Watson var. ***bisceptrum***. Patis or Aspen Onion.

Common in aspen groves and moist areas at western end. May to July.

Calochortus bruneaunis Nelson & J.F. Macbr. Sego Lily.

Occasional in sagebrush scrub, especially along road to constructed stream channels. Specimen identified as *C. leichtlinii* in first edition probably is this taxon. Mid-June to July. [*C. nuttallii* Torrey var. *b*. (Nels. & Macbr.) Ownbey]

Fritillaria pinetorum Davidson. Mountain Fritillary.

Uncommon, a few plants found along eastern edge of aspen grove (west of laboratory) near tool shed. May to mid-June.

Lilium kelleyanum Lemmon. Kelley's Lily.

Occasional on wet banks of Convict Creek. July to early August.

Smilacina stellata (L.) Desf. False Solomon's Seal.

Very common, forming colonies in drier sites in meadows near Convict Creek. May to mid-July. [var. *stellata*]

Zigadenus paniculatus (Nuttall) S. Watson. Sand-corn.

Occasional in sagebrush scrub along southern border. May to June.

Orchidaceae. Orchid Family

Platanthera sparsiflora (S. Watson) Schltr. Sparse-flowered Bog-orchid.

Occasional in moist sites in meadows and in moist soil near irrigation ditch running beside trail from laboratory to western fork of Convict Creek. Specimen identifed as *Habenaria unalascensis* in the first edition probably is this taxon. June to July. [*Habenaria s*. S. Watson]

Poaceae. Grass Family

Achnatherum hymenoides (Roemer & Schultes) Barkworth. Indian Rice Grass.

Occasional in sagebrush scrub. May to June. [*Oryzopsis h*. (Roemer & Schultes) Ricker]

Achnatherum nevadensis (B. Johnson) Barkworth. Nevada Needlegrass.

Occasional in sagebrush scrub. June to August. [*Stipa n*. B. Johnson]

Bromus tectorum L. Cheat Grass. Downy Brome.

Native to Eurasia. Invasive weed that increases fire frequency in sagebrush scrub. Occasional in disturbed areas along edge of entrance road near buildings. May to June.

Deschampsia cespitosa (L.) ssp. ***cespitosa*** Beauv. Tufted Hairgrass.

Occasional in moist soil of large meadow at eastern end. Late July to September.

Elymus elymoides (Raf.) Swezey ssp. ***elymoides***. Bottlebrush Squirreltail.

Occasional in dry sites in sagebrush scrub near northern fence. May to August. [*Sitanion hystrix* (Nuttall) J.G. Sm.]

Hesperostipa comata (Trin. & Rupr.) Barkworth ssp. ***comata.*** Needle-and-thread.

Occasional in sagebrush scrub. May to July. [*Stipa c*. Trin. & Rupr.]

Leymus cinereus (Scribn. & Merr.) A. Love. Ashy Wildrye. Basin Wildrye.

Common in dry soil of sagebrush scrub and in open areas. June to July. [*Elymus c*. Scribn. & Merr.]

Leymus triticoides (Buckley) Pilger ssp. ***triticoides.*** Creeping Wildrye. Beardless Wildrye.

Common in moist to dry soil in sagebrush and riparian areas at western end. June to August. [*Elymus t*. Buckley]

Muhlenbergia andina (Nuttall) Hitchc. Hairy or Foxtail Muhly.

Occasional in sandy soil in sagebrush-meadow transition zone near northeastern corner. July to August.

Muhlenbergia asperifolia (Nees & Mey.) Parodi. Scratchgrass.

Common in moist soil near Convict Creek at western end; also in shade of aspen grove west of laboratory. July to August.

Muhlenbergia minutissima (Steud.) Swall. Small Muhly

Uncommon in moist sand near flood bypass channel. July to September.

Muhlenbergia richardsonis (Trin.) Rydb. Mat Muhly.

Occasional in sagebrush scrub and dry sites in meadows. July to September.

Phleum pratense L. Timothy Hay.

Native to Eurasia. Widely cultivated for forage. Uncommon in sandy soil of sagebrush-meadow transition area in northeastern corner. Late June to September.

Poa palustris L. Fowl Bluegrass.

Native to Europe. Common in moist soil at western end around aspens and willows. June to August.

Potamogetonaceae. Pondweed Family

Potamogeton filiformis Pers. Slender-leaved Pondweed.

Uncommon, in several very small seasonal "ponds" on the south side of control structure 4; with *Utricularia minor.* Flowering has not been observed.

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Index

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

Y

Z