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# Botanical Reconnaissance of Silver Lake Research Natural Area, North Cascades National Park, Washington

Robin Leshner

## Abstract

A botanical survey of Silver Lake Research Natural Area in the North Cascade National Park in northern Washington recorded 109 vascular plant taxa representing 27 families, including 2 sensitive species. This research note provides baseline information on the distribution, habitats, and abundance of vascular plants within the Silver Lake Research Natural Area.

Keywords: Plant communities, natural areas (research), scientific reserves, Silver Lake Res. Nat. Area--Washington, Washington (Silver Lake Res. Nat. Area), north Cascades, checklists (vascular plants).

## Environment

Silver Lake Research Natural Area (RNA) covers 682.7 hectares (ha) in the northeastern portion of North Cascades National Park (lat. 48°59'05" N., long. 121°13'45" W.). This RNA is administered by the superintendent, North Cascades National Park. The rugged and steep topography has been extensively modified by glaciers. Twelve active glaciers remain, covering about 320 ha. Silver Lake, elevation 2063 meters (m), occupies a cirque basin and is fed by the large glacier on the north slope of Mount Spickard, the highest point in the RNA, 2737 m. This alpine lake covers 65 ha, and its known maximum depth is about 159 m.<sup>1</sup>

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<sup>1</sup>Personal communication (1980) from Robert Wasem, Management Biologist, North Cascades National Park, Sedro Woolley, Washington.

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ROBIN LESHER was a graduate student in Biology at Western Washington University at the time this research was done; her address is 8700 S.W. Hillview Terrace, Portland, Oregon 97225. This research was supported by a contract with the Pacific Northwest Forest and Range Experiment Station.

According to Shideler (1965), the lake basin was formed by alpine ice controlled by the continental ice sheet; the apparent level of the alpine glacier can be seen as a break in the slope of the ridge sides around Silver Lake. The lower ridges were rounded by glacial action contrasting with the sharp and precipitous ridges at higher elevations. The size of the active glacier southwest of Silver Lake has changed since the area was mapped in 1904 and 1905 (Shideler 1965). At that time Silver Lake did not exist, and the ice extended to the northeastern end of the present lake.

The north shore of Silver Lake is characterized by moderate to steep talus slopes composed of intrusive granite. The south rim, upper slopes of the cirque, and exposed ridges are composed of Skagit Volcanics, probably of Oligocene age (Shideler 1965). Generally, soil in the entire basin is poorly developed.

Silver Lake RNA is located along the eastern portion of the western north Cascade Range. The climate of the north Cascades varies considerably from maritime on the western slopes to more continental on the eastern slopes. Within the Cascade Range, elevation has a primary effect on the local climate. Precipitation and snowfall increase and temperatures decrease rapidly with increasing elevation (Franklin and Dyrness 1973). Most of the precipitation at higher elevations in the region falls as snow or sleet during the fall and winter; the summer is relatively dry. Showers, however, are frequent during the summer (Douglas 1972).

## Methods

A botanical reconnaissance of the Research Natural Area was conducted from August 12 to 14, 1980. The main emphasis was on the alpine vegetation of the lake basin, inlet, east rim, and lower northern cirque walls up to 2320 m. The eastern slope of the outlet stream was also surveyed, but only to the lower subalpine areas, about 1830 m. The south rim was inaccessible because of extensive cliffs, glaciers, and steep talus slopes. The only visible vegetation on the south rim was on bluff sites of cliffs that had stable soils and better water retention. All distinct habitats were visited in the RNA, except the montane forest.

The RNA is divided into seven locations (fig. 1) for easier discussion. Descriptive information regarding habitats and vegetation is provided for each location. A total of 109 vascular plant taxa, representing 27 families, were recorded. A checklist of these species is included with notations about relative abundance, habitats, range of elevation, and associated species. Abundance of species was estimated in the field as rare, infrequent, occasional, frequent, or abundant. Families are arranged alphabetically, as are genera and species. Table 1 is a list of families with number of representative species indicated. Table 2 is a list of species with notations about locations and habitat.

Botanical nomenclature follows Hitchcock and Cronquist (1973). Most species were identified in the field and were not collected so as to minimize the impact on this fragile ecosystem. Questionable specimens were collected and identified by consulting Hitchcock and others (1955, 1959, 1961, 1964, 1969), and were verified by use of herbarium specimens at Western Washington University, Bellingham, Washington. Voucher specimens are deposited in the herbarium at North Cascades National Park Headquarters, Sedro Woolley, Washington.

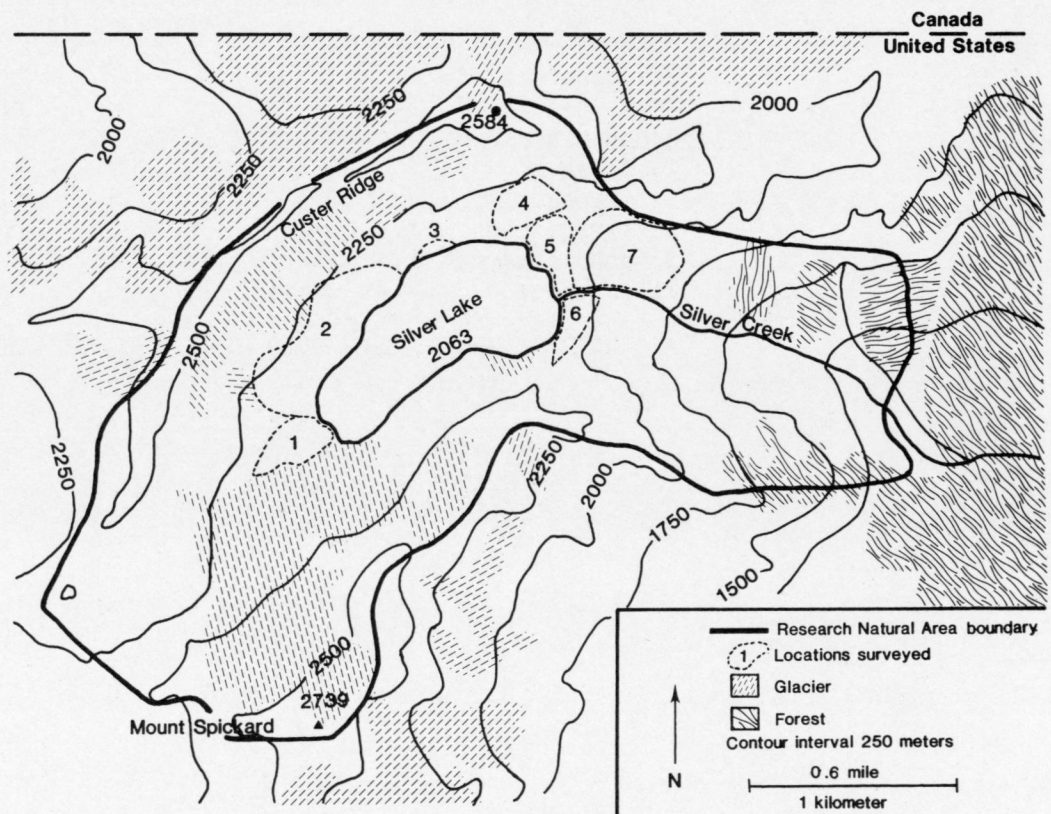


Figure 1.--Silver Lake Research Natural Area, with locations of glaciers, forests, and areas sampled.

Table 1—Vascular plant families in Silver Lake Research Natural Area, North Cascades National Park, Washington

Family	Number of taxa
Campanulaceae	1
Caryophyllaceae	4
Compositae	14
Crassulaceae	1
Cruciferae	3
Cupressaceae	2
Cyperaceae	7
Empetraceae	1
Ericaceae	9
Gramineae	17
Hydrophyllaceae	2
Juncaceae	4
Lentibulariaceae	1
Liliaceae	2
Lycopodiaceae	1
Onagraceae	3
Orchidaceae	1
Pinaceae	4
Polemoniaceae	2
Polygonaceae	2
Polypodiaceae	3
Ranunculaceae	2
Rosaceae	5
Salicaceae	2
Saxifragaceae	9
Scrophulariaceae	6
Valerianaceae	1



Table 2--Distribution and habitat of plant taxa in Silver Lake Research Natural Area, North Cascades National Park, Washington

Taxa	Location 1/	Habitat 2/									
		R	T	SC	FF	H	SM	VM	K	SEEP	MOSS
<i>Abies lasiocarpa</i>	5,6,7	X			X				X		
<i>Achillea millefolium lanulosa alpicola</i>	2,4	X	X			X	X			X	
<i>Agrostis humilis</i>	2									X	X
<i>Agrostis scabra</i>	1,2,6	X			X					X	X
<i>Agrostis thurberiana</i>	7	X				X			X		
<i>Agrostis variabilis</i>	2									X	X
<i>Antennaria alpina media</i>	1,2,4,5,6,7	X		X	X	X		X			
<i>Antennaria lanata</i>	5,6,7	X				X			X		
<i>Antennaria umbrinella</i>	2		X								
<i>Arabis lyallii</i>	4		X								
<i>Arabis microphylla microphylla</i>	2		X								
<i>Arctostaphylos uva-ursi</i>	5,6	X			X						
<i>Arenaria capillaris americana</i>	7	X				X					
<i>Arenaria macrophylla</i>	1	X		X							X
<i>Arnica latifolia gracilis</i>	7					X					X
<i>Arnica mollis</i>	2									X	
<i>Calamagrostis canadensis canadensis</i>	6				X						
<i>Calamagrostis purpurascens</i>	6				X						
<i>Caltha biflora biflora</i>	7					X				X	
<i>Campanula rotundifolia</i>	2,4		X			X	X	X		X	
<i>Carex nardina</i>	2,5,7	X									
<i>Carex nigricans</i>	2,6,7	X				X	X			X	X
<i>Carex phaeocephala</i>	1,2,4,5	X	X	X	X					X	
<i>Carex pyrenaica</i>	2,7	X	X							X	
<i>Carex scirpoidea pseudoscirpoidea</i>	4		X					X			
<i>Carex scirpoidea stenochlaena</i>	2	X									
<i>Carex spectabilis</i>	1,2,4,6,7	X	X	X	X	X	X	X		X	X
<i>Cassiope mertensiana mertensiana</i>	2,5,6,7	X	X			X	X		X	X	X
<i>Cassiope tetragona saximontana</i>	2,6	X				X					X
<i>Castilleja parviflora albida</i>	7					X					
<i>Castilleja rupicola</i>	3,4,5	X	X		X			X			
<i>Chamaecyparis nootkatensis</i>	7	X							X		
<i>Cryptogramma crispa acrostichoides</i>	7	X									
<i>Cystopteris fragilis</i>	7	X									
<i>Danthonia intermedia</i>	7	X							X		
<i>Deschampsia atropurpurea</i>	2,7		X			X				X	
<i>Empetrum nigrum</i>	5,6	X			X	X					
<i>Epilobium alpinum clavatum</i>	1,2,7	X		X						X	X
<i>Epilobium alpinum lactiflorum</i>	7	X							X		
<i>Epilobium latifolium</i>	1,2,4	X	X	X		X	X			X	
<i>Erigeron aureus</i>	2,3,4,5,6	X	X		X			X			
<i>Erigeron compositus glabratus</i>	5	X			X						
<i>Erigeron peregrinus callianthemus scaposus</i>	2,7	X				X				X	
<i>Erigeron peregrinus peregrinus dawsonii</i>	2,3	X								X	
<i>Festuca ovina brevifolia</i>	1,2,4,5,6	X	X	X	X			X			
<i>Haplopappus lyallii</i>	1,2,6	X	X	X							
<i>Hieracium gracile</i>	2,7	X	X			X					
<i>Juncus drummondii subtriflorus</i>	1,2,7	X	X	X							X
<i>Juncus mertensianus</i>	1,2,4,7	X	X	X		X	X			X	X
<i>Juniperus communis montana</i>	2,5,6,7	X	X						X		
<i>Kalmia microphylla</i>	4,7					X		X		X	
<i>Ledum glandulosum glandulosum</i>	7								X		
<i>Leptarrhena pyrolifolia</i>	7									X	X
<i>Luetkea pectinata</i>	2,4,5,6,7	X	X			X	X			X	
<i>Luzula piperi</i>	1,2,4,7	X	X	X					X	X	X
<i>Luzula spicata</i>	1,2,5,6,7	X		X	X						X
<i>Lycopodium sitchense</i>	2,4,6,7	X	X			X				X	
<i>Mimulus tilingii caespitosus</i>	7									X	
<i>Mitella pentandra</i>	7									X	
<i>Oxyria digyna</i>	1,2,6	X	X	X	X						

1/See text for description of locations.

2/R=rock, T=talus, SC=scree, FF=fell-field, H=heather community, SM=sedge meadow, VM=vegetation mats, K=krummholz, SEEP=seepage, MOSS=moss mats.

**Table 2—Distribution and habitat of plant taxa in Silver Lake Research Natural Area, North Cascades National Park, Washington (continued)**

Taxa	Location 1/	Habitat 2/									
		R	T	SC	FF	H	SM	VM	K	SEEP	MOSS
<i>Parnassia fimbriata fimbriata</i>	7									X	
<i>Penstemon davidsonii menziesii</i>	1,2,5,6	X		X	X						
<i>Penstemon procerus tolmiei</i>	2,4,7		X			X	X				
<i>Phacelia sericea sericea</i>	1,2		X	X							
<i>Phleum alpinum</i>	4,7		X			X					
<i>Phlox diffusa longistylis</i>	2,4,5,6,7	X	X		X	X		X			
<i>Phyllodoce empetrifomis</i>	2,4,5,6,7	X	X		X	X	X	X	X	X	X
<i>Phyllodoce glanduliflora</i>	2,4,5,6,7	X	X		X	X	X	X	X	X	X
<i>Picea engelmannii</i>	2,5,6,7	X	X		X				X		
<i>Pinguicula vulgaris</i>	2							X		X	
<i>Pinus albicaulis</i>	2,5,6,7	X	X		X				X		
<i>Poa alpina</i>	1,2,4,7	X	X			X		X		X	
<i>Poa cusickii epilis</i>	4,7			X		X	X				
<i>Poa grayana</i>	4,6				X			X			
<i>Poa incurva</i>	1,2	X									X
<i>Poa leptocoma paucispicula</i>	2	X								X	X
<i>Poa tettermannii</i>	1,2	X									
<i>Polemonium elegans</i>	1,2,4,5	X	X	X	X						X
<i>Polygonum viviparum</i>	2,6	X			X						
<i>Polystichum lonchitis</i>	2	X								X	
<i>Potentilla flabellifolia</i>	4,7		X			X					X
<i>Potentilla fruticosa</i>	2,4,5	X	X		X	X	X	X		X	
<i>Potentilla villosa parviflora</i>	2,6	X									
<i>Ranunculus verecundus</i>	2	X								X	
<i>Romanzoffia sitchensis</i>	1			X						X	X
<i>Salix cascadiensis</i>	2,6	X	X		X	X		X			
<i>Salix nivalis nivalis</i>	2,4,6	X	X		X	X		X		X	
<i>Saxifraga bronchialis austromontana</i>	5,6	X			X						
<i>Saxifraga debilis</i>	1			X						X	
<i>Saxifraga ferruginea macounii</i>	1,2,6,7	X	X							X	X
<i>Saxifraga oppositifolia</i>	2	X									
<i>Saxifraga punctata cascadiensis</i>	2,7	X									X
<i>Saxifraga tolmiei tolmiei</i>	1,2,6,7	X	X	X						X	X
<i>Sedum lanceolatum lanceolatum</i>	2		X					X			
<i>Senecio fremontii</i>	1,2,4	X	X								
<i>Sibbaldia procumbens</i>	2,4,6,7	X	X			X				X	
<i>Silene acaulis</i>	1,2,4,5,6	X	X		X			X			
<i>Smelowskia ovalis</i>	1,2,4,5,6	X	X	X	X						
<i>Solidago multiradiata</i>	2,4,5,6	X	X		X			X			
<i>Spiranthes romanzoffiana romanzoffiana</i>	2									X	
<i>Stellaria longipes</i>	6	X									
<i>Tofieldia glutinosa brevistyla</i>	4,7		X					X		X	X
<i>Trisetum spicatum</i>	1,2,4,6	X	X		X			X		X	
<i>Tsuga mertensiana</i>	7	X							X		
<i>Vaccinium caespitosum</i>	2,4,6,7		X		X	X		X			
<i>Vaccinium deliciosum</i>	4,5,6,7	X	X			X			X		
<i>Valeriana sitchensis</i>	7									X	
<i>Veratrum viride</i>	7									X	
<i>Veronica wormskjoldii</i>	2,4,7	X	X			X				X	

1/ See text for description of locations.

2/ R=rock, T=talus, SC=scree, FF=fell-field, H=heather community, SM=sedge meadow, VM=vegetation mats, K=krummholz, SEEP=seepage, MOSS=moss mats.

## Taxa of Special Interest

Several species of special interest occur within the Silver Lake Research Natural Area. An extension of the range of Carex scirpoidea var. pseudoscirpoidea has been documented in the RNA, as this is the farthest west occurrence known for this taxon in Washington. Saxifraga debilis and Poa grayana are listed as sensitive in "Endangered, Threatened and Sensitive Vascular Plants of Washington" (Washington Natural Heritage Program 1982): a vascular plant taxon with small populations or localized distribution within the State, that is not presently endangered or threatened, but whose populations and habitats will be jeopardized if current land use practices continue. Regional herbaria (Washington State University, University of Washington, Western Washington University, and University of British Columbia) and the Washington Natural Heritage Program provided information on collections and localities of these three taxa in Washington.

The primary range of Poa grayana is British Columbia to southwest Alberta, south in the Rocky Mountain States to Utah and New Mexico (Hitchcock and Cronquist 1973). Poa grayana approaches the geographical limits of its continuous range in Washington and is known from two sites in Okanogan County and from two sites in the Olympic Mountains in Clallam and Jefferson Counties. This documentation of Poa grayana at Silver Lake RNA represents the farthest west occurrence of this taxon in the north Cascades. Poa grayana occurs in a fell-field on the east rim of Silver Lake and is an occasional grass in vegetation mats on talus slopes.

Saxifraga debilis is widely distributed outside Washington, occurring in British Columbia south to the Cascades of Washington, the Blue and Wallowa Mountains of northeastern Oregon, the Sierra Nevada of California, the San Francisco Mountains of northern Arizona; east in British Columbia to the Rocky Mountains; and south through Montana to eastern Utah and Colorado (Hitchcock and others 1961). Saxifraga debilis is sporadically distributed across part of Washington, with reported sightings in the Olympic Mountains, the north Cascades south to Glacier Peak and Mount Rainier, and in Okanogan County. This distribution is probably due to habitat specialization within the alpine zone, favoring damp cliffs, rock crevices, and talus near snowbanks (Washington Natural Heritage Program 1981). Saxifraga debilis is rare in the RNA and is restricted to the outwash area of the inlet stream; only a few plants are found in moist, mossy sites of glacial silt and scree.

Carex scirpoidea var. pseudoscirpoidea is the common variety in the southern Rocky Mountains, occasionally west to California, and north to the Little Belt Mountains of Montana, and the mountains of central Idaho and southeastern Oregon (Hitchcock and others 1969). According to Taylor and others (1973), Carex scirpoidea var. pseudoscirpoidea was not reported for the Cascade Range until it was collected by George W. Douglas in Okanogan County. Early botanists in Washington, however, found Carex scirpoidea var. pseudoscirpoidea in the Cascade Range; the Marion Ownbey Herbarium at Washington State University has two collections of this taxon from Stuart Pass in Chelan County made by Harold St. John and L. A. Thayer in 1925. Carex scirpoidea var. pseudoscirpoidea was infrequent in the Silver Lake RNA; the only sighting was in a vegetation mat on a moderately steep talus slope, elevation 2160 m. This taxon is not included on the Washington list (Washington Natural Heritage Program 1982), although it is apparently rare in Washington.

Another species of interest at Silver Lake is Ranunculus verecundus. According to Taylor and others (1973), there have been only two collections of this taxon in Washington: Crater Mountain in the western portion of the Pasayten Wilderness Area east of Ross Lake and Mount Adams in southern Washington. Although distributed from Alaska to the Cascades in southern Washington (Hitchcock and others 1964), this species has rarely been collected in Washington. This taxon is rare in the Silver Lake basin; occasional plants occur along a rocky seepage area just above the north shore of Silver Lake, elevation 2065 m.

Poa leptocoma var. paucispicula and Cassiope tetragona var. saximontana are on the "monitor list" (Washington Natural Heritage Program 1982), a list of taxa that are more abundant or are less threatened in Washington than was previously assumed. Taxa on this list are not used by the Washington Natural Heritage Program in environmental assessment or impact analysis, but data on these plants are stored to monitor any changes in population size, threats to habitat, or future changes in status.



## Habitats and Vegetation

### Location 1 (Fig. 1)

The lake inlet (fig. 1) is a rocky outwash area of north-northeast aspect that supports sparse vegetation (table 2). Glacial silt and scree adjacent to the inlet stream retain a great deal of water. Several meters from the stream the substrate is coarser and drainage is better, allowing a greater diversity of plant species, although plant cover is still sparse. Large rocks carried downslope by glacial action, runoff, and slides provide microsites for the establishment of seedlings. Vegetation in the inlet region occurs in moist areas and in sites protected from outwash during peak runoff periods. Graminoids are dominant, including such bunchgrasses as Festuca ovina var. brevifolia, Trisetum spicatum, Poa alpina, Juncus mertensianus, J. drummondii var. subtriflorus, Carex spectabilis, and C. phaeocephala. The rare Saxifraga debilis occurs adjacent to the inlet stream.

In the valley above the delta, little vegetation is found. The north slope of Mount Spickard is covered by glacier, and snowfields persist in the ravine. The east-facing slope of Custer Ridge is characterized by glacier, cliffs, and steep talus slopes. Vegetation is found in seepage areas adjacent to rock outcrops and cliff faces.

### Location 2 (Fig. 1)

Above the northwest shore of Silver Lake are moderate to steep talus slopes, extending to 2350 m. At this elevation, precipitous cliffs blackened with lichen growth rise to Custer Ridge which forms the northern boundary of the RNA (fig. 1). Persistent snowfields cover the steep slope below the cliffs. Vegetation is sparse because runoff and erosion prevent plant establishment.

The talus slopes from lakeshore to 2320 m were extensively surveyed (fig. 1, table 2). Large outcrops that interrupt the slope provide sites of greater stability and are colonized by plants. Outcrops protect vegetation from rockslides and avalanches, function as barriers to erosion, and allow soil and moisture to accumulate; thus, they support different flora than do adjacent talus slopes. Different communities occupy the bluff and base of outcrops because of differences in the moisture regime resulting from snow accumulation and time of snowmelt. The bluff supports mats of Salix cascadenis, Phyllodoce glanduliflora, and occasionally Cassiope tetragona var. saximontana. Winter snow accumulates at the base of outcrops which results in late season snowmelt. These sites support lush communities dominated by Carex spectabilis and C. nigricans, along with P. glanduliflora, various graminoids, and herbs.

Moisture is limited on talus slopes, and the vegetation generally follows seepage and streams. Senecio fremontii and Phacelia sericea var. sericea, however, are commonly scattered on talus, occupying pockets of soil among the rocks. Communities of Epilobium latifolium colonize sites of early season seepage and are abundant in some locations.

Occasional rocky plateaus support lush meadows dominated by Potentilla fruticosa and associated species: Epilobium latifolium, Phyllodoce glanduliflora, and Carex spectabilis. Snow melts early in the season on these gently sloping sites.

A Phyllodoce glanduliflora community occurs in areas of slight slope that accumulate soil and retain water. This community occupies sites that become free from snow later in the season than sites supporting the Potentilla fruticosa community. Carex spectabilis and P. fruticosa are important associates of P. glanduliflora.

#### Location 3 (Fig. 1)

The eastern section of the north rim of Silver Lake is extremely rugged and inaccessible. Steep slopes are composed primarily of shear cliffs and talus. Only rock ledges along the lakeshore were sampled (fig. 1).

Vegetation follows drainage patterns and occupies stable sites where landslides and avalanches are less likely to occur. These sites were dominated by shrubs. Infrequent krummholz clumps are established in sites of stable substrate where moisture is retained. Textured rock, cracks, ledges, and microsites of less extreme relief also support plant growth. Vegetated areas extend to about 2290 m.

#### Location 4 (Fig. 1)

This location occupies the south-facing slope above the east rim of Silver Lake (fig. 1). Talus slopes of moderate to steep relief were surveyed from 2130 to 2230 m (table 2). Extensive vegetation mats are established in stable sites where soil and water accumulate. These mats are composed of a diversity of species, commonly Potentilla fruticosa, Carex spectabilis, Salix nivalis var. nivalis, and Silene acaulis, as well as various graminoids and herbaceous perennials. Seepage sites support a lush growth of moss, Pinguicula vulgaris, Tofieldia glutinosa var. brevistyla, Kalmia microphylla, Spiranthes romanzoffiana var. romanzoffiana, and Phyllodoce glanduliflora. Communities of Carex spectabilis and Potentilla fruticosa also occur in this area.

#### Location 5 (Fig. 1)

This location encompasses the bench along the east rim of Silver Lake, north of the outlet stream (fig. 1). A fell-field habitat with frequent boulders occupies the crest of the bench, and an extensive boulder field covers the west slope to the lakeshore.

The fell-field is characterized by sprawling, low-growing shrubs: Juniperus communis var. montana, Arctostaphylos uva-ursi, Penstemon davidsonii var. menziesii, and Potentilla fruticosa, and occasional graminoids and herbaceous perennials (table 2). Krummholz trees of Pinus albicaulis, Abies lasiocarpa, and Picea engelmannii occur along the eastern flank of the bench and in sites protected by large boulders.

The extensive growth of lichen along the east rim is impressive; no rock is left bare. Umbilicaria is the dominant lichen and is responsible for the blackened appearance of the boulder field on the western slope and along the bench. Crustose lichens inhabit rock where they can successfully compete with Umbilicaria. Thamnolia and Cetraria are common fruticose forms in the fell-field.

#### Location 6 (Fig. 1)

The east rim of Silver Lake south of the outlet stream is sparsely vegetated (table 2). Boulder- and fell-field habitats predominate on the bench; to the east are barren talus slopes and on the western slope, terraced cliffs extend to the lakeshore.

Empetrum nigrum is an important shrub in rocky exposed sites and is often associated with Arctostaphylos uva-ursi and Salix nivalis var. navalis. Salix nivalis var. navalis also forms vegetation mats in sites that are rockier and more exposed than those inhabited by E. nigrum.

A Phyllodoce glanduliflora community occurs in concave, less rocky areas of the fell-field, where soil accumulates and moisture is more abundant. Occasional mats of Salix cascadiensis are associated with this community. On the eastern slope below the crest of the bench are protected basins that support heather communities of P. empetrifloris and Cassiope mertensiana var. mertensiana.



#### Location 7 (Fig. 1)

This location covers the east-facing slope of Silver Lake north of the outlet stream, from 2040 to 1830 m (fig. 1). The upper slopes are predominantly barren talus; yet creeks, seepage areas, basins, rock outcrops and stable sites are favorable for establishment of vegetation (table 2). Frequent avalanches and rock slides perpetuate the barren nature of this slope.

The vegetation is dramatically influenced by topography, micro-relief, snowpack, and seepage. Heather communities predominate in sites on higher ground and of better drainage. Cassiope mertensiana var. mertensiana and Phyllodoce empetriflora are dominants, with Phyllodoce glanduliflora as a codominant species at higher elevations. Sites of late snowmelt support sedge meadows of Carex spectabilis, C. nigricans, or both. Saxifraga tolmiei var. tolmiei and Luzula piperi occur in thick moss mats in seepage areas at higher elevations, whereas at lower elevations a greater diversity of species is found (table 2).

Extensive krummholz stands of Abies lasiocarpa sprawl along steeper parts of the slope in well-drained sites of stable rock. Ledum glandulosum is often associated with A. lasiocarpa. Tsuga mertensiana may also occur in these krummholz stands. Dense stands of krummholz--composed of A. lasiocarpa, T. mertensiana, Pinus albicaulis, and Chamaecyparis nootkatensis--occur near Silver Creek.

#### Summary

Generally, the flora of Silver Lake Research Natural Area is typical of the western and central north Cascades; however, several species occur primarily in the eastern north Cascades: Carex scirpoidea var. pseudoscirpoidea, Poa grayana, Cassiope tetragona var. saximontana, Calamagrostis purpurescens, Carex nardina, and Salix nivalis var. nivalis (Douglas and Bliss 1977, Taylor and Douglas 1978).

Vegetation in the Silver Lake basin is sparse. Except for occasional vegetated sites, a large portion of the basin is inhospitable for seedling establishment and plant colonization. Silver Lake basin is characterized by rugged topography, glaciers, cliffs, rock outcrops, steep and unstable talus slopes with frequent avalanches and rock slides, and poor soil development. These factors are important in preventing plant establishment. Because of the extensive glacial disturbance of this area in recent geologic time, the flora of Silver Lake RNA appears relatively young.



## Partial Checklist of Vascular Plants

### CAMPANULACEAE

Campanula rotundifolia L., bellflower--occasional plant, common in some sites at elevations of 2070 to 2260 m; found on talus, vegetation mats on talus slope, drier sites above and in meadows of Carex spectabilis, and in seepage areas associated with C. nigricans, C. spectabilis, Phyllodoce glanduliflora, and P. empetrifoliosa.

### CARYOPHYLLACEAE

Arenaria capillaris Poir. var. americana (Mag.) Davis, mountain sandwort--occasional plant, commonly associated with Phyllodoce glanduliflora and Luetkea pectinata; 1980-2040 m.

Arenaria macrophylla Hook. (L263),<sup>2</sup> bigleaf sandwort--found at only two restricted locations near lake inlet--on a moist level site among rocks with moss, and under ledges of rock outcrop associated with liverworts.

Silene acaulis L., moss campion--occasional to frequent cushion plant in rocky sites at elevations of 2070 to 2200 m; rock outcrops, ledges on cliff face associated with Saxifraga oppositifolia, talus, lake inlet, fell-field, and vegetation mats on talus slope.

Stellaria longipes Goldie, longstalk starwort--infrequent, found at only one location on top of rock cliff (2070 m), associated with Antennaria alpina var. media and Saxifraga bronchialis var. austromontana.

### COMPOSITAE (ASTERACEAE)

Achillea millefolium L. ssp. lanulosa (Nutt.) Piper var. alpicola (Rydb.) Garrett (L264), yarrow--occasional on talus, seepage sites, and communities dominated by Phyllodoce glanduliflora; common in sedge meadow dominated by Carex spectabilis and Potentilla fruticosa; north side of lake at elevations of 2070 to 2260 m.

Antennaria alpina (L.) Gaertn. var. media (Greene) Jeps., alpine pussy-toes--occasional plant throughout area; scree in drier sites near lake inlet, fell-field, rock cliffs, vegetation mats on moderately steep talus slope, and heather communities; 1890-2160 m.

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<sup>2</sup>Letters and numbers in parentheses after the taxon are collection numbers that correspond to the voucher specimens deposited in the herbarium at North Cascades National Park Headquarters, Sedro Woolley, Washington.

Antennaria lanata (Hook.) Greene, woolly pussy-toes--occasional on east rim of lake and down east slope of outlet stream, mostly in drier sites of heather community dominated by Phyllodoce glanduliflora and Cassiope mertensiana var. mertensiana; rare occurrence in fell-field along north exposure above outlet stream.

Antennaria umbrinella Rydb. (L232), umber pussy-toes--infrequent along north lakeshore in moist sites, rocky and gravelly soil, and talus; 2070 m.

Arnica latifolia Bong. var. gracilis (Rydb.) Cronq. (L256), mountain arnica--infrequent on moss mats in community dominated by Phyllodoce empetriformis and Carex spectabilis; 2010 m.

Arnica mollis Hook. (L240), hairy arnica--occasional in rocky seepage areas and moist sites along north lakeshore, associated with Poa alpina, P. incurva, and Erigeron peregrinus; 2070 m.

Erigeron aureus Green (L239), golden fleabane--common in rocky sites of lake basin, such as fell-fields, rock outcrops, and boulder fields; also found on talus slopes in areas of soil accumulation, vegetation mats, and along periphery of Salix nivalis mats.

Erigeron compositus Pursh var. glabratus Macoun, dwarf mountain fleabane--occasional in fell-field and rockier sites on east bench.

Erigeron peregrinus (Pursh) Greene ssp. callianthemus (Greene) Cronq. var. scaposus (T. & G.) Cronq. (L241, L258), subalpine daisy--occasional plant in protected sites on rock cliffs associated with Cystopteris fragilis, moist protected sites under rock along creek, and heather community; 1830-2260 m. (L241 approaches var. angustifolius regarding narrow basal leaves.)

Erigeron peregrinus (Pursh) Greene ssp. peregrinus var. dawsonii Greene (L253, L254), subalpine daisy--occasional plant found at only two locations--ledge of rock outcrop along north lakeshore at 2070 m, and rocky seepage site at base of large rock outcrop. (L254 possesses involucre and ray characteristics that more closely fit var. thompsonii, yet range and habitat are incompatible.)

Haplopappus lyallii Gray, Lyall's goldenweed--occasional to frequent plant scattered on north lakeshore, nestled among rocks in areas of soil development, also common on unstable talus with Senecio fremontii, scree sites near lake inlet, and rock outcrops on east bench of lake; 2070 m.

Hieracium gracile Hook., alpine hawkweed--occasional plant on talus slope in sites of soil accumulation, and among rocks in heather community; 1980-2320 m.

Senecio fremontii T. & G., dwarf mountain groundsel--abundant, one of the most common plants scattered on open talus slopes, nestled among rocks in areas of slight soil development, associated with Epilobium latifolium and Carex phaeocephala; 2070-2260 m.

Solidago multiradiata Ait., northern goldenrod--occasional to frequent plant in rocky sites with some soil accumulation, fell-field, and vegetation mats on moderately steep talus slope; 2070-2160 m.

#### CRASSULACEAE

Sedum lanceolatum Torr. var. lanceolatum, lanceleaved stonecrop--infrequent, found at only one location in large mats of Salix nivalis var. nivalis on talus slope; 2100 m.

#### CRUCIFERAE (BRASSICACEAE)

Arabis lyallii Wats. (L243), Lyall's rockcress--rare, found at only one site on steep unstable, rocky slope (2230 m), associated with Phlox diffusa var. longistylis.

Arabis microphylla Nutt. var. microphylla (L242), littleleaf rockcress--rare plant in rocky sites of slight soil development (2260 m), associated with Epilobium latifolium and Potentilla fruticosa.

Smelowskia ovalis Jones (L237), shortfruit Smelowskia--occasional to frequent plant in rocky sites; fell-field, talus, boulder fields, from lake inlet to open slopes, and east bench of lake; 2063-2200 m.

#### CUPRESSACEAE

Chamaecyparis nootkatensis (D. Don) Spach, Alaska yellow cedar--frequent in dense stands of krummholz near Silver Creek on north side of drainage (elevation up to 1950 m), associated with Abies lasiocarpa, Tsuga mertensiana, and Pinus albicaulis.

Juniperus communis L. var. montana Ait., mountain juniper--occasional to frequent sprawling shrub in rocky sites; rock outcrops, ledges, fell-field, commonly associated with Pinus albicaulis, Picea engelmannii, and Penstemon davidsonii var. menziesii; 2070-2130 m.



## CYPERACEAE

Carex nardina Fries, spikenard sedge--occasional plant in rocky sites above 1950 m.

Carex nigricans Retz., black alpine sedge--frequent to abundant in moist sites and seepage areas, from rocky slopes to moss mats, and heather community dominated by Phyllodoce empetrifomis and Carex spectabilis. This sedge forms dense stands in snow bed areas where snow melts late in the season, 1890-2260 m.

Carex phaeocephala Piper (L262), mountain hare sedge--frequent sedge in rocky sites of lake basin, scattered on talus slopes in areas of soil development, ledges of rock outcrop, fell-field, and scree near lake inlet, occasionally found along seepage areas; above 2070 m.

Carex pyrenaica Wahl., Pyrenaean sedge--infrequent, found at only two locations: moist site on talus slope along creek (2260 m), and protected site on rock cliff (1890 m).

Carex scirpoidea Michx. var. pseudoscirpoidea (Rydb.) Cronq. (L212), single-spike sedge--infrequent, found only in vegetation mat on moderately steep talus slope; 2160 m.

Carex scirpoidea Michx. var. stenochlaena Holm (L226), single-spike sedge--infrequent, found at only one location on terraces of large rock outcrop (2100 m), associated with Salix cascadenis.

Carex spectabilis Dewey, showy sedge--locally abundant and found in most habitats throughout the area; 1890-2260 m. Common in moist sites on talus, rock outcrops, scree of lake inlet, and fell-field; abundant in sites contiguous with rock outcrops where soil and moisture accumulate, mossy sites, and vegetation mats on steep talus slope. Carex spectabilis dominates localized communities, primarily seepage sites on talus, is a common associate in communities dominated by Phyllodoce glanduliflora, P. empetrifomis, or Cassiope mertensiana var. mertensiana, and is associated with Carex nigricans along creeks and seepage and in basins.

## EMPETRACEAE

Empetrum nigrum L., crowberry--occasional to frequent in rocky sites, fell-field, rock bluffs, and outcrops along east bench; often associated with Arctostaphylos uva-ursi. Dominant shrub in fell-field in sites less rocky and exposed than sites inhabited by Salix nivalis; also found in higher heather meadows at 2100 m in association with Phyllodoce glanduliflora and Salix cascadenis.



## ERICACEAE

Arctostaphylos uva-ursi (L.) Spreng., kinnikinnick--occasional to frequent sprawling shrub in rocky sites and fell-field on east rim of lake.

Cassiope mertensiana (Bong.) G. Don var. mertensiana, white mountain heather--occasional to abundant throughout most areas; 1830-2130 m. Occurs on talus in stable sites of soil accumulation, moist sites in fell-field, along seepage areas, and associated with krummholz. Dominant shrub in heather communities in certain locations, usually associated with Phyllodoce empetriformis and P. glanduliflora.

Cassiope tetragona (L.) D. Don var. saximontana (Small) Hitchc. (L227), four-angled mountain heather--limited in distribution to three known sites: frequent plant in lush, moist sites with moss buildup on large rock outcrop, associated with Potentilla fruticosa and Phyllodoce glanduliflora, east aspect, 2100 m; occasional plant on small ledges of rock wall along east rim of lake south of outlet; also upslope in heather meadow, associated with P. glanduliflora, Empetrum nigrum, and Salix cascadiensis, north aspect, 2070-2100 m.

Kalmia microphylla (Hook.) Heller, alpine Kalmia--occasional plant in seepage site on talus slope above east rim, also in areas of greater stability where soil and water accumulate and support vegetation mats (2160 m); locally common in heather community on east slope (2070 m).

Ledum glandulosum Nutt. var. glandulosum, mountain labrador tea--dominant understory in krummholz stands of Abies lasiocarpa, with common associates Phyllodoce glanduliflora and P. empetriformis. This community covers extensive areas on steeper parts of the slope and in sites of better drainage.

Phyllodoce empetriformis (Sw.) D. Don, pink mountain heather--occasional to abundant throughout area; on talus among rocks in pockets of water retention, in basins on exposed rocky benches, understory of krummholz Abies lasiocarpa, moss mats, and along seepage areas. Dominant shrub in heather communities, associated with Cassiope mertensiana var. mertensiana and P. glanduliflora; 1830-2160 m.

Phyllodoce glanduliflora (Hook.) Cov., yellow mountain heather--occasional to abundant throughout area; seepage areas, sites of soil accumulation on talus slopes, lush sites with moss buildup, moist sites on rock outcrops, fell-field, and understory of krummholz Abies lasiocarpa. Dominant plant in heather community, associated with Potentilla fruticosa and Carex spectabilis from 2100 to 2230 m, and Cassiope mertensiana var. mertensiana and Phyllodoce empetriformis below 2070 m.

Vaccinium caespitosum Michx., dwarf huckleberry--occasional to frequent on talus slopes associated with Phyllodoce glanduliflora, and on higher, drier ground of heather communities, fell-field, and vegetation mats on moderately steep talus slope; up to 2160 m.

Vaccinium deliciosum Piper, Cascade huckleberry--occasional to frequent in heather communities on east slope of outlet stream, among rocks, on unstable talus slope, and understory of krummholz stands; up to 2230 m.

#### GRAMINEAE (POACEAE)

Agrostis humilus Vasey (L224), alpine bentgrass--rare, found at only one location in moss mat along seepage area, east slope; 2320 m.

Agrostis scabra Willd. (L220, L221, L245, L246, L255, L257, L259), winter bentgrass--occasional grass at higher elevations from lakeshore to 2320 m. Found in rocky sites along seepage areas, moist sites with moss mats on rock cliffs, scree near lake inlet, and fell-field on east bench. This species proved to be taxonomically difficult in this area, especially collections L220, L246, L255, L257, L259. The specimens are not clearly distinct from Agrostis borealis, and they exhibit overlapping characteristics. These specimens were not as robust as typical specimens of A. scabra, and the panicle was somewhat congested. Measurements of the glumes, lemma, and anthers of A. borealis and A. scabra overlap; however, the awn was not "consistently" strong and geniculate, which was the major characteristic favoring A. scabra over A. borealis. I made the only known collection of A. borealis in Washington in 1978 from Chapoka Peak. Therefore, I have been conservative and have classified these specimens as A. scabra, yet mention their close affinity with A. borealis.

Agrostis thurberiana Hitchc. (L265, L266), Thurber bentgrass--infrequent in heather community dominated by Phyllodoce empetriflora and Carex spectabilis (2010 m); also found on moist site of rock cliff beneath krummholz; (1890 m).

Agrostis variabilis Rydb. (L244), variant bentgrass--rare, found at only one location on moss mat of seepage area, east slope; 2320 m.

Calamagrostis canadensis (Michx.) Beauv. var. canadensis (L213), bluejoint reedgrass--infrequent in fell-field; 2070 m.

Calamagrostis purpurascens R. Br. (L214), pinegrass--infrequent in rocky site of fell-field, east aspect; 2070 m.

Danthonia intermedia Vasey (L267), timber oatgrass--infrequent, found at only one location in moist site on east-facing rock cliff beneath krummholz; 1890 m.

Deschampsia atropurpurea (Wahl.) Scheele (L236), mountain hairgrass--occasional in community dominated by Phyllodoce empetriformis and Carex spectabilis (2010 m); also in moist site along creek on talus slope (2260 m).

Festuca ovina L. var. brevifolia (R. Br.) Wats (L219, L268), alpine fescue--frequent at higher elevations (above 2070 m) throughout lake basin, and a common bunchgrass at lake inlet. Occurs in rocky sites, fell-field, talus, and vegetation mats on steep talus slope.

Phleum alpinum L., alpine timothy--occasional plant in community dominated by Phyllodoce empetriformis and Carex spectabilis (2010 m); also found at 2230 m on steep unstable rocky slope, associated with Epilobium latifolium and C. phaeocephala.

Poa alpina L. (L261), alpine bluegrass--occasional to frequent plant from upper subalpine slopes to lake basin (2010-2160 m); in moist sites on talus and rock outcrops, seepage, vegetation mats on talus slope, common bunchgrass at lake inlet, and in heather community dominated by Phyllodoce empetriformis.

Poa cusickii Vasey var. epilis (Scribn.) Hitchc. (L269), skyline bluegrass--occasional plant in meadows of Carex spectabilis on gentle sloping talus (2160 m), and in community dominated by Phyllodoce empetriformis and Luetkea pectinata (2010 m).

Poa grayana Vasey (L215, L218, L225), Gray's bluegrass--occasional grass in vegetation mats on moderately steep talus slopes of south aspect (2160 m) and in fell-field habitat on east rim of lake.

Poa incurva Scribn. & Will. (L260, L261), curly bluegrass--occasional plant in wet, mossy seepage site just above north lakeshore; also found at rocky site near lake inlet.

Poa leptocoma Trin. var. paucispicula (Scribn. & Merr.) Hitchc. (L247, L250), bog bluegrass--infrequent plant in moist sites of upper lake basin (2100-2320 m), found on moss mat of seepage area, with moss on rock face, and along creek.

Poa lettermannii Vasey (L248, L249), Letterman's bluegrass--infrequent grass in rocky site at lake inlet, and on terraces of large rock outcrop (2070 m); associated with Salix cascadenis, Polygonum viviparum, and Carex scirpoidea var. stenochlaena.



Trisetum spicatum (L.) Richter, spike Trisetum--frequent grass in rocky sites of lake basin, and a common bunchgrass at lake inlet. Occurs in seepage site at base of rock outcrop, vegetated areas of talus slope, rock outcrops in microsites of soil buildup, and fell-field; 2070-2160 m.

#### HYDROPHYLLACEAE

Phacelia sericea (Grah.) Gray var. sericea, silky Phacelia--occasional to frequent on talus and on drier sites near lake inlet; associated with Senecio fremontii and Epilobium latifolium.

Romanzoffia sitchensis Bong. (L231), Sitka mistmaiden--rare, only a few plants in outwash area of inlet stream and in moist, mossy sites of glacial silt and scree.

#### JUNCACEAE

Juncus drummondii E. Meyer var. subtriflorus (Meyer) Hitchc. (L270), Drummond's rush--occasional to frequent in moist sites along creeks, rocky seepage areas, and lake inlet (1950-2260 m); able to colonize more stable, moist sites near lakeshore with Juncus mertensianus.

Juncus mertensianus Bong. (L271), Merten's rush--occasional to frequent rush (2010-2160 m): near lake inlet; in rocky seepage sites with moss, Carex nigricans and Juncus drummondii var. subtriflorus; and in community dominated by Phyllodoce empetriformis and Carex spectabilis.

Luzula piperi (Cov.) Jones, Piper's woodrush--frequent in seepage areas, often associated with Saxifraga tolmiei var. tolmiei (1950-2260 m); on talus, thick moss mats, snow bed areas, and lake inlet.

Luzula spicata (L.) DC. (L272), spiked woodrush--occasional plant in rocky sites and seepage areas from 1950 to 2130 m; moist sites on rock outcrops, lake inlet, and fell-field.

#### LENTIBULARIACEAE

Pinguicula vulgaris L. (L217), common butterwort--occasional to frequent in seepage areas on moderately steep talus slope above east rim of lake, also growing in moist vegetation mats on talus (2160 m); associated with Tofieldia glutinosa var. brevistyla and Spiranthes romanoffiana var. romanoffiana.

#### LILIACEAE

Tofieldia glutinosa (Michx.) Pers. var. brevistyla Hitchc. (L222), sticky Tofieldia--occasional plant in seepage areas and vegetation mats on talus slope above east rim of lake (2160-2230 m), associated with Pinguicula vulgaris and Spiranthes romanzoffiana var. romanzoffiana; also found in moist mossy sites (1890-1950 m), associated with Phyllodoce empetriformis and Carex spectabilis.

Veratrum viride Ait., false hellebore--occasional plant in moist seepage sites along creek below 1890 m.

#### LYCOPODIACEAE

Lycopodium sitchense Rupr., Alaska clubmoss--infrequent to occasional clubmoss on talus slopes in areas of stability and soil accumulation, associated with Phyllodoce glanduliflora; terraces on rock outcrop, rock cliffs, drier sites of heather communities, and fringes of seepage site associated with Salix nivalis var. nivalis.

#### ONAGRACEAE

Epilobium alpinum L. var. clavatum (Trel.) Hitchc. (L234), alpine willow-herb--occasional plant in rocky seepage sites, and scree of lake inlet (2010-2100 m).

Epilobium alpinum L. var. lactiflorum (Hausskn.) Hitchc. (L273), alpine willow-herb--occasional plant found at only one location, a moist site on east-facing rock cliff beneath krummholz; 1890 m.

Epilobium latifolium L., red willow-herb--common and abundant on talus slopes of lake basin (2070-2260 m), dominant in sites of early season seepage; occurs in Phyllodoce glanduliflora/Potentilla fruticosa community, on steep unstable slopes, seepage areas along creeks associated with Phyllodoce empetriformis, Carex spectabilis, C. nigricans, and in dry rocky sites and scree of lake inlet.

#### ORCHIDACEAE

Spiranthes romanzoffiana Cham. var. romanzoffiana, hooded pearl-twist--occasional plant found at only one location; seepage site on moderately steep talus slope above east rim of lake (2160 m), associated with Tofieldia glutinosa var. brevistyla and Pinguicula vulgaris.

## PINACEAE

Abies lasiocarpa (Hook.) Nutt., subalpine fir--occasional to abundant, occurring as krummholz species up to 2100 m. Occurs in protected sites on east rim of lake and down east slope of outlet stream, forming extensive stands on steeper slope in sites of better drainage; often associated with Tsuga mertensiana and also occurs with Chamaecyparis nootkatensis, Picea engelmannii, and Pinus albicaulis.

Picea engelmannii Parry, Engelmann spruce--occasional krummholz species up to 2100 m; occurs on rock outcrops of north lake-shore, protected sites on east rim, and down east slope of outlet stream; associated with Abies lasiocarpa and Pinus albicaulis.

Pinus albicaulis Engelm., white bark pine--occasional krummholz species up to 2100 m; occurs on rock outcrops of north lake-shore, along east rim in fell-field and protected sites adjacent to large boulders, and down east slope of outlet stream to 1830 m; associated with Juniperus communis var. montana (above 2070 m), Abies lasiocarpa, and Picea engelmannii.

Tsuga mertensiana (Bong.) Carr., mountain hemlock--occasional to frequent krummholz species on east slope of outlet stream below 2040 m; commonly associated with Abies lasiocarpa on steeper slopes in sites of better drainage, moist sites on rock cliff, and in dense stands of krummholz species near Silver Creek; also associated with Chamaecyparis nootkatensis and Pinus albicaulis.

## POLEMONIACEAE

Phlox diffusa Benth. var. longistylis (Wherry) Peck (L233), spreading phlox--occasional plant in rocky sites of lake basin and upper slopes of outlet stream (2040-2230 m); rock outcrops, fell-field, talus slope, vegetation mats on talus, and also in rockier sites of Phyllodoce glanduliflora community.

Polemonium elegans Greene (L223), elegant sky-pilot--occasional to frequent plant in rocky sites of lake basin (2063-2320 m); common on talus and dominant in some sites, fell-field, among rocks and scree near lake inlet, and moist, mossy sites on rock cliffs.

## POLYGONACEAE

Oxyria digyna (L.) Hill., mountain sorrel--occasional plant from lakeshore to 2100 m; in protected sites among rocks, talus, scree of lake inlet, and fell-field on east rim.



Polygonum viviparum L. (L238), alpine bistort--infrequent in moist sites (2070-2100 m); terraces of large rock outcrop, and fell-field on east rim of lake.

#### POLYPODIACEAE

Cryptogramma crispa (L.) R. Br. var. acrostichoides (R. Br.) Clarke (L228), parsley fern--infrequent plant in protected sites on rock cliff; 1920 m.

Cystopteris fragilis (L.) Bernh. (L257), brittle bladder fern--occasional plant in protected sites on rock cliffs; 1890-1920 m.

Polystichum lonchitis (L.) Roth, mountain sword fern--rare, found at only one location in moist, protected site under rock, along small creek; 2290 m.

#### RANUNCULACEAE

Caltha biflora DC. var. biflora, marshmarigold--occasional to frequent in moist sites associated with Phyllodoce empetriformis, and along seepage areas; 1890 m.

Ranunculus verecundus Robins. (L235), modest buttercup--occasional plant found at only one location, along a rocky seepage area, just above the north lakeshore; 2065 m.

#### ROSACEAE

Luetkea pectinata (Pursh) Kuntze., partridgefoot--occasional to abundant throughout area (2010-2320 m); on talus and rocky sites in areas of seepage or soil development, commonly found in heather communities dominated by Cassiope mertensiana var. mertensiana, Phyllodoce empetriformis, P. glanduliflora, and in moist sedge meadows with Carex spectabilis and C. nigricans.

Potentilla flabellifolia Hook., fanleaf cinquefoil--occasional in moss mats of community dominated by Phyllodoce empetriformis and Carex spectabilis (2010 m); also found on moderately steep talus slope in sites of soil accumulation, associated with P. glanduliflora and P. empetriformis (2230 m).

Potentilla fruticosa L., shrubby cinquefoil--locally abundant and important dominant in communities on stabilized talus slope in areas of soil accumulation and early season snowmelt, also found in seepage sites and fell-fields (2100-2260 m); an important associate in Phyllodoce glanduliflora communities on talus slopes, common in drier sites of Carex spectabilis meadows, and scattered on talus with Epilobium latifolium.

Potentilla villosa Pall. var. parviflora Hitchc. (L216), villous cinquefoil--rare in lake basin, a few plants found at two locations: rocky site with soil development below large rock outcrop, associated with Salix cascadiensis and Poa alpina; and on rock wall of north aspect on east rim of lake, associated with Cassiope tetragona var. saximontana; 2070 m.

Sibbaldia procumbens L., creeping Sibbaldia--occasional in moist sites from 2070 to 2160 m; seepage on talus, base of large rock outcrop, and in community dominated by Cassiope mertensiana var. mertensiana and Phyllodoce empetriformis, sometimes forming extensive mats.

#### SALICACEAE

Salix cascadiensis Cockerell (L274), Cascade willow--locally abundant, forming extensive mats in rocky sites, and important in stabilizing soil of rock slopes (2070-2130 m); moist areas of rock outcrops, fell-field, and rockier sites on fringe of Phyllodoce glanduliflora community.

Salix nivalis Hook. var. nivalis (L275), snow willow--locally abundant, forming extensive mats in rocky sites (2070-2230 m); talus--fringe of seepage or sites of soil accumulation; fell-field--common in rockier and more exposed sites than inhabited by Empetrum nigrum, and rocky sites on periphery of Phyllodoce glanduliflora community.

#### SAXIFRAGACEAE

Leptarrhena pyrolifolia (D. Don) R. Br., leatherleaf saxifrage--occasional plant in moist, mossy sites along seepage; 1860 m.

Mitella pentandra Hook. (L229), alpine mitrewort--occasional plant in seepage along creek, associated with Cassiope mertensiana var. mertensiana and Phyllodoce empetriformis; 1830 m.

Parnassia fimbriata Konig. var. fimbriata, fringed grass-of-parnassus--occasional plant in seepage sites along creek, associated with Mimulus tilingii var. caespitosus; 1830 m.

Saxifraga bronchialis L. var. austromontana (Wieg.) Jones, spotted saxifrage--occasional to frequent plant in rockier sites of fell-field, and rock cliff, east rim of lake; 2070-2100 m.

Saxifraga debilis Engelm. (L230), pygmy saxifrage--rare, restricted to outwash area of inlet stream, found in moist, mossy sites of glacial silt and scree.

Saxifraga ferruginea Grah. var. macounii Engl. & Irmsch., rusty saxifrage--abundant in seepage areas on talus slopes, moss ledges, and moist sites of rock outcrops; 2010-2100 m.

Saxifraga oppositifolia L., purple saxifrage--rare, only a few plants found on terraces of rock cliff near west end of lake; 2070 m.

Saxifraga punctata L. var. cascadensis (Calder & Savile) Hitchc. (L276), dotted saxifrage--occasional plant in moist sites on rock cliff, also on moss mats, associated with Phyllodoce empetriformis and Carex spectabilis; 1890-2070 m.

Saxifraga tolmiei T. & G. var. tolmiei, alpine saxifrage--frequent to abundant in seepage sites on talus, rock faces, moss mats, and glacial silt and scree at lake inlet; 1890-2130 m.

#### SCROPHULARIACEAE

Castilleja parviflora Bong. var. albida (Pennell) Ownbey, small-flowered paintbrush--occasional plant in moist subalpine areas, associated with Phyllodoce empetriformis and Carex spectabilis; 1890 m.

Castilleja rupicola Piper, cliff paintbrush--infrequent in rocky sites of lake basin (2070-2160 m); fell-field on east rim, rock ledges and cliffs above north shore of lake; more common on higher talus slope in vegetation mats, occasional in Phyllodoce glanduliflora community.

Mimulus tilingii Regel var. caespitosus (Greene) Grant, large mountain monkeyflower--occasional in seepage sites along creek, associated with Parnassia fimbriata var. fimbriata; 1830 m.

Penstemon davidsonii Greene var. menziesii (Keck) Cronq., Davidson's penstemon--occasional to frequent in rocky sites, fell-field, rock faces, and lake inlet; 2070-2260 m.

Penstemon procerus Dougl. var. tolmiei (Hook.) Cronq., small-flowered penstemon--occasional plant in areas of stability on talus slope (2230-2320 m); associated with Carex spectabilis or Phyllodoce glanduliflora; also occurs in heather community dominated by P. empetriformis and P. glanduliflora (2010 m).



Veronica wormskjoldii Roem. & Schult., alpine speedwell--frequent in certain locations along seepage and creeks, and on talus slope in communities of Phyllodoce glanduliflora and P. empetriformis; 2010-2260 m.

#### VALERIANACEAE

Valeriana sitchensis Bong., Sitka valerian--occasional in moist sites along creek below 1860 m.

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### English Equivalents

1 hectare (ha) = 2.471 acres  
1 meter (m) = 3.281 feet  
1 kilometer (km) = 0.621 mile

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Pacific Northwest Forest and Range  
Experiment Station  
809 N.E. Sixth Avenue  
P.O. Box 3890  
Portland, Oregon 97208