SILVER LAKE RESEARCH NATURAL AREA

Supplement No. 15 [1]

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The Research Natural Area described in this supplement is administered by the National Park Service, an agency of the U.S. Department of the Interior. Research Natural Areas located within National Parks or National Monuments are administered by the Superintendent of the Park or Monument. A scientist wishing to use one of the tracts should contact the Superintendent responsible and outline the proposed research.

Because of long involvement with scientific and educational use of National Parks and Monuments, the National Park Service has developed standard procedures regarding applications to use areas for research. A study proposal must be prepared by the principal investigators and approved by the Superintendent. Park Service research biologists will assist in preparing proposals. Collecting permits are necessary. There may be limitations on research activities.

The Research Natural Area described in this supplement is part of a Federal system of such tracts established for research and educational purposes. Each Research Natural Area constitutes a site where natural features are preserved for scientific purposes and natural processes are allowed to dominate. Their main purposes are to provide:

1. Baseline areas against which effects of human activities can be measured;
2. Sites for study of natural processes in undisturbed ecosystems; and
3. Gene pool preserves for all types of organisms, especially rare and endangered types.

The Federal system is outlined in "A Directory of the Research Natural Areas on Federal Lands of the United States of America." [3]

Of the 71 Federal Research Natural Areas established in Oregon and Washington, 45 are described in "Federal Research Natural Areas in Oregon and Washington: A Guidebook for Scientists and Educators" (see footnote 1). Supplements to the Guidebook describe additions to the system.

The guiding principle in management of Research Natural Areas is to prevent unnatural encroachments or activities that directly or indirectly modify ecological processes. Logging and uncontrolled grazing are not allowed, for example, nor is public use that might impair scientific or educational values. Management practices necessary for maintenance of ecosystems may be allowed.

Federal Research Natural Areas provide a unique system of publicly owned and protected examples of undisturbed ecosystems where scientists can conduct research with minimal interference and reasonable assurance that investments in long-term studies will not be lost to logging, land development, or similar activities. In return, a scientist wishing to use a Research Natural Area is obligated to:

1. Obtain permission from the appropriate administering agency before using the area; [4]

[1] Supplement No. 15 to "Federal Research Natural Areas in Oregon and Washington: A Guidebook for Scientists and Educators," by .Jerry F. Franklin, Frederick C. Hall. C. T. Dyrness, and Chris Maser (U.S. Department of Agriculture, Forest Service. Pacific Northwest Forest and Range Experiment Station, 498 p., illus .. 1972). The guidebook is available from the Superintendent of Documents, U.S. Government Printing Office. Washington. D.C. 20402: stock number 001-001-00225-9.

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[3] Federal Committee on Ecological Reserves. A directory of the Research Natural Areas on Federal lands of the United States of America. Washington, D.C.: U.S. Department of Agriculture, Forest Service; 1977.

[4] Six agencies cooperate in this program in the Pacific Northwest: U.S. Department of Agriculture-Forest Service; U.S. Department of the Interior-Bureau of Land Management, Fish and Wildlife Service, and National Park Service; U.S. Department of Energy, and U.S. Department of Defense.

2. Abide by the administering agency's regulations governing use, including specific limitations on the type of research, sampling methods, and other procedures; and
3. Inform the administering agency on progress of the research, published results, and disposition of collected materials.

The purpose of these limitations is to:

1. Insure that the scientific and educational values of the tract are not impaired;
2. Accumulate a documented body of knowledge about the tract; and
3. Avoid conflict between studies.

Research must be essentially nondestructive; destructive analysis of vegetation is generally not allowed, nor are studies requiring extensive modification of the forest floor or extensive excavation of soil. Collection of plant and animal specimens should be restricted to the minimum necessary to provide voucher specimens and other research needs. Under no circumstances may collecting significantly reduce population levels of species. Collecting must also be carried out in accordance with applicable State and Federal agency regulations. Within these broad guidelines, appropriate uses of Research Natural Areas are determined by the administering agency.

SILVER LAKE RESEARCH NATURAL AREA

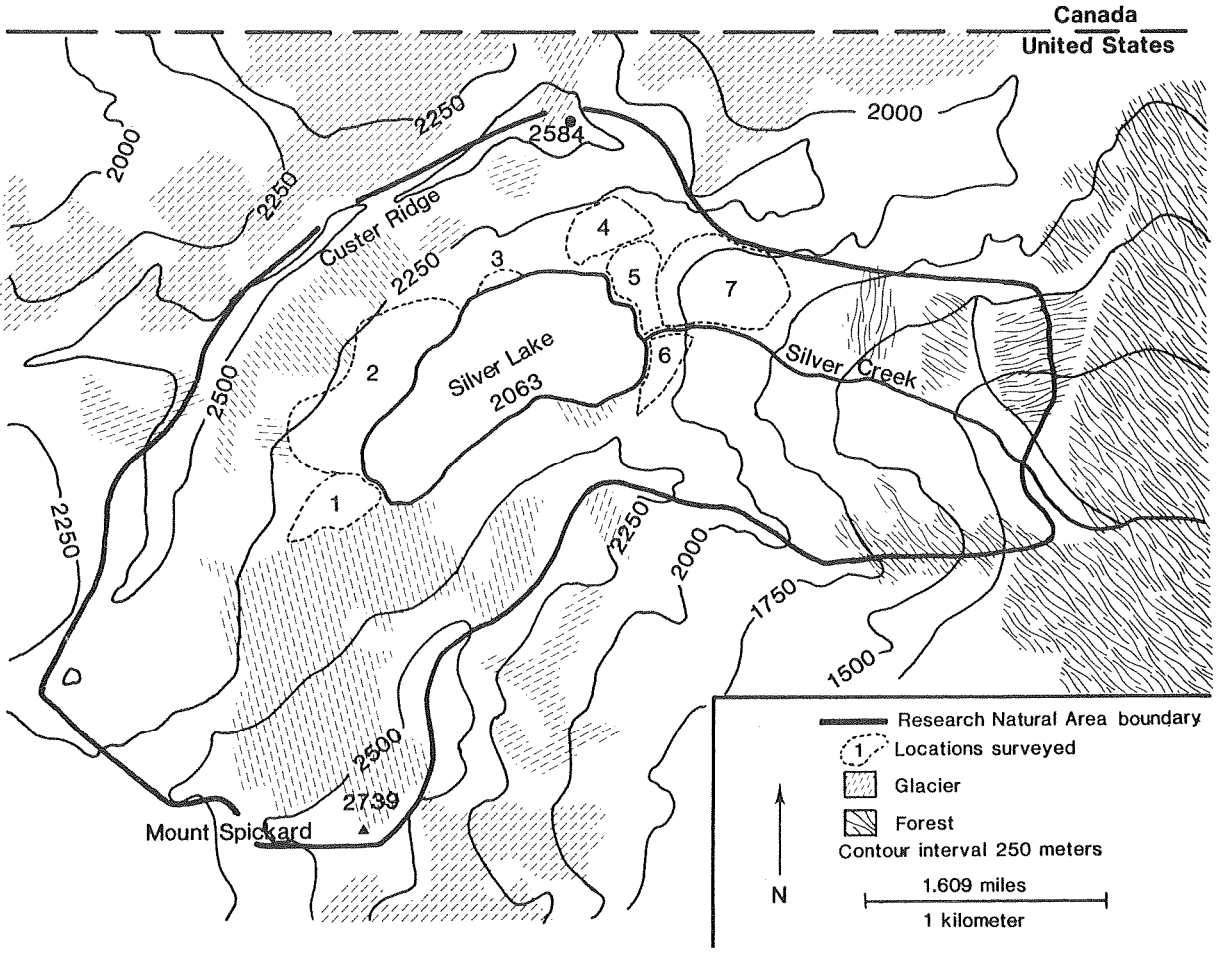
An alpine lake surrounded by glaciers, with alpine plant communities and a rapidly flowing stream.

4.

Silver Lake Research Natural Area (RNA) was established in March 1974 to exemplify an alpine cirque lake typical of those on the western slopes of the North Cascades in Washington. The 682.7-ha (l,687-acre) area includes twelve glaciers, the summit of Mount Spickard, alpine plant communities, a fastflowing outlet stream, and a lake with an approximate maximum depth of 159 m (525 ft). Elevations range from 2 720 m (8,979 ft) at the summit of Mount Spickard to 1125 m (3,712 ft) below the lake (fig. 1).

Silver Lake RNA is in the northeast corner of North Cascades National Park, Whatcom County, Washington, 1 kilometer south of the Canadian border. It is located in portions of sections 2, 3, 4, T. 40 N., R. 12 E., and portions of sections 34 and 35, T. 41 N., R. 12 E., Willamette meridian (lat. 48°59'05" N., long. 121°13'45" W.). It is bounded on the south by Mount Spickard and on the north by Custer Ridge.

Figure SI-1.—Topographic and vegetation map of Silver Lake Research Natural Area.



Access and Accommodations

Silver Lake RNA is accessible by helicopter or by an arduous 2- to 3-day cross-country hike. There are no trails. Anyone planning to enter the area should notify Park Service headquarters at Sedro Woolley, Washington. The nearest commercial accommodations are at the Diablo Lake Resort, 48 km (30 mi) east of Marblemount on State Highway 20 (fig. 2).

Environment

Silver Lake occupies a cirque basin which was subjected to extended periods of ice-scouring of bedrock during the Pleistocene glaciations and post-Pleistocene neoglaciation (fig. 3). The lake is fed by the large glacier on the north slope of Mount Spickard. There are twelve active glaciers covering 320 ha (800 acres) in the Research Natural Area. The one on the north slope of Mount Spickard is the largest. It covers 0.9 km^2 (0.6 mi2) and is 1.8 km (1.1 mi) long. It is moderately crevassed and is retreating slightly. The other glaciers are smaller cirque glaciers ranging from 0.2 to 0.5 km (0.1 to 0.3 mi) in width and 0.3 to 0.8 km (0.2 - 0.5 mi) in length

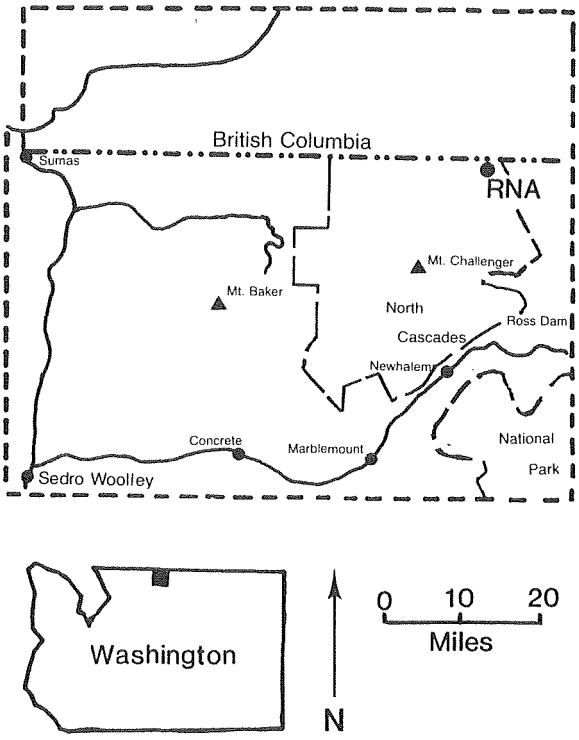


Figure SI-2.—Location of Silver Lake Research Natural Area within North Cascades National Park in northern Washington.

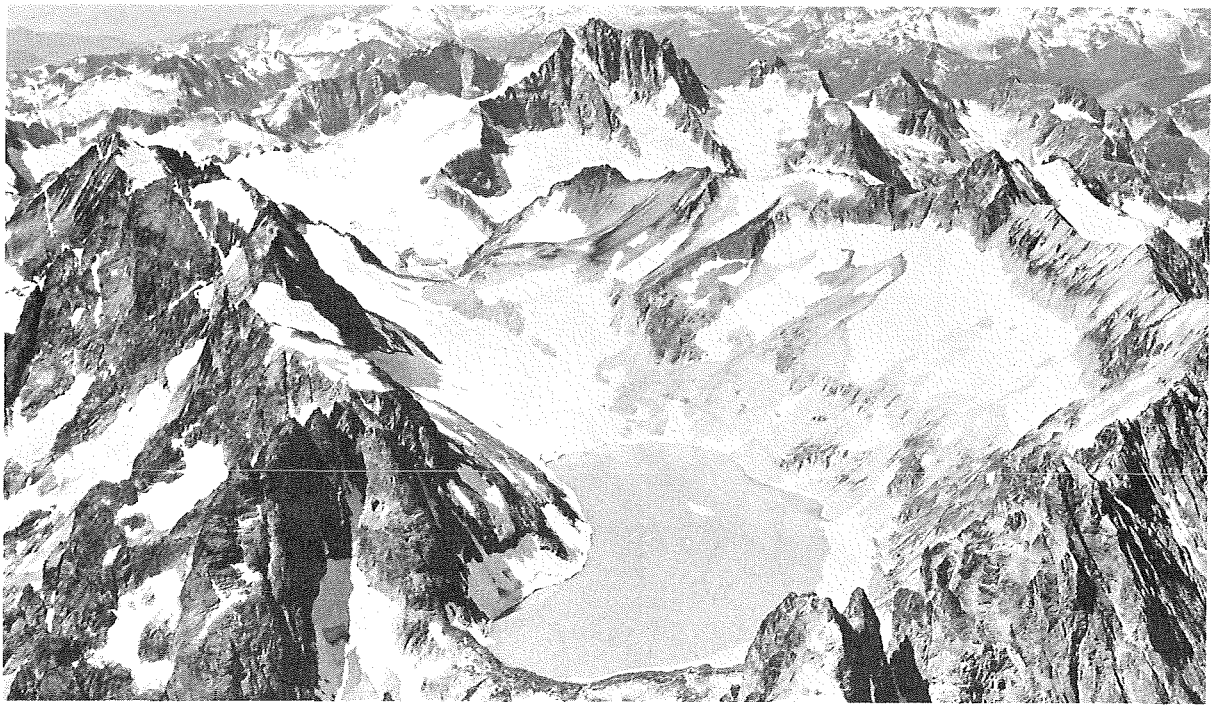


Figure SI-3.—View of Silver Lake looking west. Mount Spickard is to the south, Custer Ridge on the north.

and varying in number of crevasses. All glaciers are stationary, and the source of snow and ice accumulation is direct snowfall and minor snowdrift (Post and others 1971).

Silver Lake is unusually deep for a lake with such a small surface area-0.16 km^2 (0.26 mi^2). Table 1 shows how it compares with other lakes in the United States. The continental ice sheet around Silver Lake may have reached up to 2121 m (7,000 feet) in this area, but around Silver Lake alpine glaciers were more prominent. The extreme depth of Silver Lake is the result of extensive, erosive action by these alpine glaciers.

Daly (1912) mapped the area around Silver Lake in 1904 and 1905, but the lake was not shown on the map he published in 1912. Ice is shown extending into the area now occupied by the northeast end of the present lake. A 1:62,500-scale topographic map published by the U.s. Geological Survey in 1913 shows Silver Lake (then known as Glacier Lake) with about one third of its present surface covered by the Mount Spickard Glacier.

Table SI-1—Surface area and depth of natural lakes known to exceed 75.7 meters (250 ft) in depth [1]

Lake	Location	Surface area		Maximum depth	
		Square kilometers	Square miles	Meters	Feet
Crater	Oregon	34	21	585	1,982
Tahoe	California, Nevada	309	193	498	1,645
Chelan[2]	Washington	88	55	486	1,605
Deer	Alaska	3	2	266	877
Seneca	New York	107	67	187	618
Silver[3]	Washington	.42	.26	159	525
Tokatz	Alaska	16	40	144	474
Cayuga	New York	106	66	132	435
Flathead	Montana	301	188	125	411
Jackson	Wyoming	43	27	123	406
Champlain	New York, Vermont	784	490	121	400

[1] Table based on information from Bue (1963).
[2] Depth was about 480 m (1,584 ft) before a hydroelectric dam was built in 1927.
[3] Sounded by K. Mullen and R. Wasem in 1979, and by J. Bjorklund and R. Wasem in 1980.
[4] Size and depth before Kerr Dam was built:
[5] Size and depth before a dam was built in 1916.

Aquatic Features

Silver Lake covers 65 ha (162.5 acres) and reaches a depth of 159 m (520 ft). At 2 065-m (6,763-ft) elevation, it is one of the highest lakes in the North Cascades National Park. The lake is classified as glacial because the glacial flour held in suspension frequently restricts visibility, as measured by the Secchi disk, to less than 4 m (13.2 ft). The water is extremely oligotrophic and has low values of specific conductance, bicarbonate alkalinity, and hardness, with slightly acid pH values (table 2). Most of the lake is homothermous, with no well-defined thermal layers of epilimnion, metalimnion (thermocline), and hypolimnion (fig. 4). Water temperature at the surface, near the outlet stream, measured 8.3°C (46.9°F) at 0945 P.d.t. on August 21, 1979, and 4.5°C (40.1°F) at 30 m (99 ft). The temperature at maximum depth was estimated to be 4.0°C (39.2°F).

Both the inlet and outlet streams flow across rock and gravel. The inlet stream on the southwest side of the lake comes from the large Mount Spickard glacier and contains substantial sedimentary deposits up to 70 m (231 ft) in width. Water temperature at the inlet measured 1.7°C (35°F) at 1630 P.d.t. on August 21, 1979. The outlet stream contains rough cobbles of fairly uniform size which do not extend into the lake. Except for sporadic sedges, there is very little riparian vegetation along either the inlet or the outlet.

Table SI-2—Physical characteristics of Silver Lake by location, time, and depth of sampling on August 21, 1979

		Lake outlet		Lake head	Main inlet
Characteristic	Unit	1000 P.d.t. 0.2 m	2010 P.d.t. 50 m	1600 P.d.t. 0.2 m	1630 P.d.t. Stream
Water temperature	°C	8.30	[1]4.00	9.00	1.70
Air temperature	°C	13.00	11.10	12.80	12.20
pH		6.65	6.60	6.65	6.40
HCO_3 alkalinity	mg/liter $CaCO_3$	2.50	2.25	2.50	2.00
Specific conductance	μs/cm	5.90	6.30	5.70	4.30
Total hardness	mg/liter $CaCO_3$	1.77	1.96	1.67	[2]2.65
Ca hardness	mg/liter $CaCO_3$	1.26	1.53	1.35	[2]1.61
Ca	mg/liter	.50	.61	.54	.64
Free CO_2	mg/liter	.89	.90	.89	1.27
Dissolved O_2	mg/liter	10.20	10.60	9.60	11.20
Dissolved O_2	% saturated	112.00		107.00	104.00
Turbidity	[3]N.T.U.	1.90	1.55	1.80	123.00
Secchi-disk visibility	meters	[4]3.45		[4]3.00	

[1] Estimated 4.0 °C at 50 m depth.
[2] Possibly inaccurate because of turbidity.
[3] Nephelometric turbidity unit.
[4] Only one reading was taken at each location.

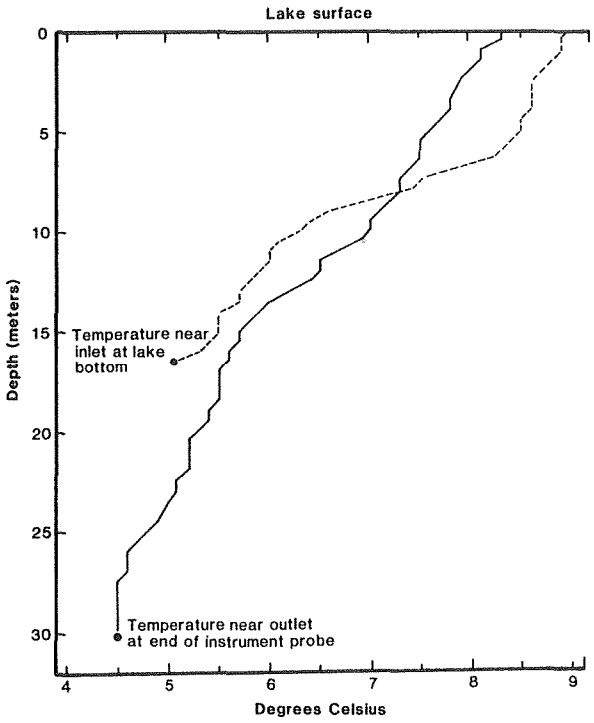


Figure SI-4.—Thermal profile of Silver Lake measured at two locations on August 21, 1979.

Biota

Most of the vegetation of Silver Lake RNA falls into the Alpine Zone of Franklin and Dyrness (1973), a zone of limited extent in the mountains of Washington and Oregon. The structure and composition of the plant associations at Silver Lake are determined by the basic features of alpine regions in the temperate zone-wind in relation to topography, snow accumulation, and time of snow melt, all in combination with various edaphic features. A survey of the plants in the lake basin, inlet, east rim, and lower nothern cirque walls, up to 2 320 m (7,656 ft) was conducted August 12-14, 1980. The survey also included the eastern slope ofthe outlet stream down into the Subalpine Zone (Franklin and Dyrness 1973) at 1 830 m (6,039 ft). Extensive cliffs, glaciers, and steep talus slopes prevented access to the south rim.

The lake basin is characterized by steep and unstable talus slopes, cliffs, rock outcrops, glaciers, and permanent snowfields. Generally the entire basin has poor soil development. The vegetation and habitats have been described for seven locations in the RNA (fig. 1). Vegetation is sparse; plants cannot become established in areas where erosion, rock slides, and avalanches frequently occur. Plants have colonized sites where the substrate is somewhat stable and soil and moisture are available.

A delta of glacial silt and scree surrounds the inlet to Silver Lake (Location 1, fig. 1). Vegetation occurs around this inlet in moist areas protected from the outwash. Graminoids dominate the area: *Festuca ouina* var. *breuifolia, Trisetum spicatum, Poa alpina,* and *Juncus mertensianus.*[5] The rare *Saxifraga debilis* is found adjacent to the inlet stream (Washington Natural Heritage Program 1982).

Above the northwest shore of the lake are steep talus slopes, extending to 2350 m (7,755 ft), which are often covered with snow at higher elevations (Location 2, fig. 1). Vegetation is sparse. The slopes are broken by large rock outcrops. The bluffs of these outcrops support mats of *Salix cascadensis, Phyllodoce glanduliflora,* and sometimes *Cassiope tetragona* var. *saximontana.* At the base of these outcrops, where snowmelt occurs late in the season, *Carex spectabilis,* C. *nigricans, Phyllodoce glanduliflora,* various graminoids, and herbs occur. On the talus itself vegetation is found around seepages and streams. *Epilobium latifolium* is common in sites of ephemeral seepage. The rocky plateaus support lush meadows of *Potentilla fruticosa.* On the more gentle slopes with later snowmelt a community dominated by *Phyllodoce glanduliflora* occurs

Steep slopes and cliffs characterize the eastern section of the north rim of the lake (Location 3, fig. 1). Only the rock ledges along the lake where occasional herbaceous perennials occur were surveyed. Vegetation of the higher cliffs, primarily in seepage sites, was presumably dominated by *Phyllodoce glandulifiora.* Krummholz clumps appeared on the occasional stable substrate where moisture is retained.

The south-facing talus slopes (Location 4, fig. 1) above the east rim of Silver Lake extend from 2130 to 2230 m (7,029 to 7,359 ft). Vegetation is found primarily in sites protected from avalanching and erosion, where soil and water accumulate. Vegetation mats on these areas are composed of *Potentilla fruticosa, Carex spectabilis, Salix niualis, Silene acaulis,* graminoids and herbaceous perennials.

5 Scientific names of vascular plants and authors are listed in table 3.

A bench along the east rim north of the outlet, about 30 m (100 ft) above the lake (Location 5, fig. l), is primarily a fell-field with boulders (fig. 5). An extensive boulder field covers the west slope down to the lake shore. Sprawling, low-growing shrubs inhabit the fell-field: *Juniperus communis, Arctostaphylos uva-ursi, Penstemon davidsonii,* and *Potentilla fruticosa. Pinus albicaulis, Abies lasiocarpa* and *Picea engelmannii* grow in krummholz clumps along the east flank of the bench. Lichens grow on the rocks.

Vegetation along the east rim south of the outlet stream is sparse (Location 6, fig. 2). The area is characterized by a bench of fell-fields and boulder fields, barren talus slopes to the east, and terraced cliffs on the west slope down to the lake shore. *Empetrum nigrum* is the dominant shrub found in rocky, exposed sites. *Salix nivalis* forms vegetative mats in rockier and more exposed sites than those inhabited by *Empetrum nigrum.* Various heather communities occur in the more protected sites with accumulated soil.

The east-facing slope north of the outlet stream is barren, with only a few refuge areas for plants (Location 7, fig. 1). Heather communities grow on sites of higher ground and better drainage (fig. 6). Sedge meadows of *Carex spectabilis* and/or C. *nigricans* occur where snowmelt is late. Seepage areas at higher elevations are dominated by lush carpets of moss, *Saxifraga tolmiei,* and *Luzula piperi. Abies lasiocarpa,* growing as krummholz, occupies steeper parts of the slope in well drained sites (fig. 7).

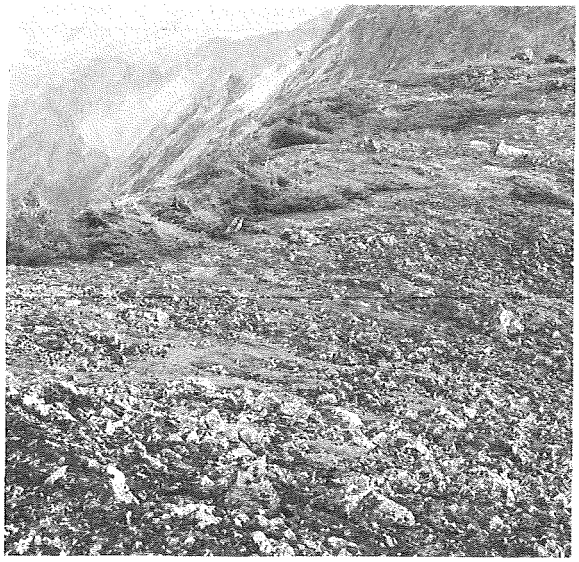


Figure SI-5.—Fell-field with boulders on east bench above lake. Note lichen on rocks and krummholz clumps (location 5, fig. 1).

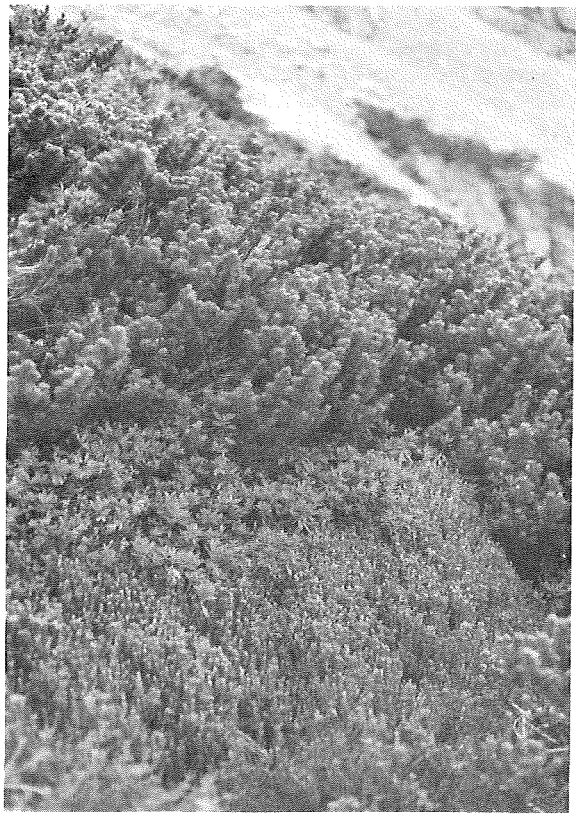


Figure SI-6.—Heather community with Phyllodoce empetriformis *and* Cassiope mertensiana *(location 7, fig. 1).*

Figure SI-7.—Area on north side of Silver Creek. Note talus, krummholz, and heather community (location 7, fig. 1).

History of Disturbance

There is no evidence of fire in the natural area. Because of high elevation and lack of fuels, fire is unimportant as a natural disturbance. Glaciation has provided the most significant disturbance. Snow and rock avalanches occur periodically. There is little sign of disturbance by either wild animals or humans. Current natural disturbances include rock and snow avalanching.

Research

Depth soundings and tests for water quality of Silver Lake are given in table 2 and figure 1. Results of a floral survey of the RNA are given in table 3. This RNA provides very good opportunities for additional research in alpine plant communities and works of glaciers.

Maps and Aerial Photographs

Special maps applicable to the natural area include: TOPOGRAPHIC-Mount Spickard, Washington, 7.5' quadrangle, scale 1:24,000 issued by U.S. Geological Survey in 1969; Mount Challenger, Washington, 15' quadrangle, scale 1:62,500, issued by U.S. Geological Survey in 1953; North Cascades National Park Map, scale 1:100,000, issued by U.S. Geological Survey in 1974; GEOLOGIC-map of Washington, scale 1:500,000 (Huntting and others 1961); and International Boundary from the Gulf of Georgia to the Northwesternmost point of the Lake of the Woods, Sheet 5, (Daly 1912). The Superintendent of North Cascades National Park (Sedro Woolley, Washington) can provide details on the most recent aerial photo coverage for the area.

Table SI-3—Vascular plants in Silver Lake Research Natural Area [1]

Family	Scientific name	Common name
Betulaceae	*Alnus sinuata* (Regel) Rydb.	Sitka alder
Campanulaceae	*Campanula rotundifolia* L.	Scotch bellflower
Caryophyllaceae	*Arenaria capillaris* Poir. var. *americana* (Mag.) Davis	mountain sandwort
	Arenaria macrophylla Hook.	bigleaf sandwort
	Silene acaulis L.	moss campion
	Stellaria longipes Goldie	longstalk starwort
Compositae	*Achillea millefolium* L. ssp. *lanulosa* (Nutt.) Piper var. *alpicola* (Rydb.) Garrett	yarrow
	Antennaria alpina (L.) Gaertn. var. *media* (Greene) Jeps.	alpine pussy-toes
	Antennaria lanata (Hook.) Greene	woolly pussy-toes
	Antennaria umbrinella Rydb.	umber pussy-toes
	Arnica latifolia Bong. var. *gracilis* (Rydb.) Cronq.	mountain arnica
	Arnica mollis Hook.	hairy arnica
	Erigeron aureus Greene	golden fleabane
	Erigeron compositus Pursh var. *glabratus* Macoun	dwarf mountain fleabane
	Erigeron peregrinus (Pursh) Greene ssp. *callianthemus* (Greene) Cronq. var. *scaposus* (T. & G.) Cronq.	subalpine daisy
	Erigeron peregrinus (pursh) Greene ssp. *peregrinus* var. *dawsonii* Greene	subalpine daisy
	Haplopappus lyallii Gray	Lyall's goldenweed
	Hieracium gracile Hook.	alpine hawkweed
	Senecio fremontii T. & G.	dwarf mountain butterweed
	Solidago multiradiata Ait. var. *scopulorum* Gray	northern goldenrod
Crassulaceae	*Sedum lanceolatum* Torr. var. *lanceolatum*	lanceleaved stonecrop
Cruciferae	*Arabis lyallii* Wats.	Lyall's rockcress
	Arabis microphylla Nutt. var. *microphylla*	littleleaf rockcress
	Smelowskia ovalis Jones	shortfruit smelowskia
Cupressaceae	*Chamaecyparis nootkatensis* (D. Don) Spach	Alaska yellow cedar
	Juniperus communis L. var. *montana* Ait.	mountain juniper

Table SI-3—Vascular plants in Silver Lake Research Natural Area [1] — Continued

Family	Scientific name	Common name
Cyperaceae	*Carex nardina* Fries	spikenard sedge
	Carex nigricans Retz.	black alpine sedge
	Carex phaeocephala Piper	dunhead sedge
	Carex pyrenaica Wahl.	Pyrenaean sedge
	Carex scirpoidea Michx. var. *pseudoscirpoidea* (Rydb.) Cronq.	single-spike sedge
	Carex scirpoidea Michx. var. *stenochlaena* Holm	single-spike sedge
	Carex spectabilis Dewey	showy sedge
Empetraceae	*Empetrum nigrum* L.	crowberry
Ericaceae	*Arctostaphylos uva-ursi* (L.) Spreng.	kinnikinnick
	Cassiope mertensiana (Bong.) G. Don var. *mertensiana*	Merten's mountain heather
	Cassiope tetragona (L.) D. Don var. *saximontana* (Small) Hitchc.	four-angled mountain heather
	Kalmia microphylla (Hook.) Heller	alpine kalmia
	Ledum glandulosum Nutt. var. *glandulosum*	mountain labrador tea
	Phyllodoce empetriformis (Sw.) D. Don	red mountain-heather
	Phyllodoce glanduliflora (Hook.) Cov.	yellow mountain-heather
	Rhododendron albiflorum Hook.	Cascade azalea
	Vaccinium caespitosum Michx.	dwarf huckleberry
	Vaccinium deliciosum Piper	Cascade huckleberry
	Vaccinium membranaceum Dougl.	thin-leaved blueberry
Gramineae	*Agrostis humilus* Vasey	alpine bentgrass
	Agrostis scabra Willd.	winter bentgrass
	Agrostis thurberiana Hitchc.	Thurber bentgrass
	Agrostis variabilis Rydb.	variant bentgrass
	Calamagrostis canadensis (Michx.) Beauv. var. *canadensis*	bluejoint reedgrass
	Calamagrostis purpurascens R. Br.	purple pinegrass
	Danthonia intermedia Vasey	timber oatgrass
	Deschampsia atropurpurea (Wahl.) Scheele	mountain hairgrass
	Festuca ovina L. var. *brevifolia (R. Br.)* Wats	alpine fescue
	Phleum alpinum L.	alpine timothy
	Poa alpina L.	alpine bluegrass
	Poa cusickii Vasey var. *epilis* (Scribn.) Hitchc.	skyline bluegrass

Table SI-3—Vascular plants in Silver Lake Research Natural Area [1] — Continued

Family	Scientific name	Common name
	Poa grayana Vasey	Gray's bluegrass
	Poa incurva Scribn. & Will.	curly bluegrass
	Poa leptocoma Trin. var. *paucispicula* (Scribn. & Merr.) Hitchc.	bog bluegrass
	Poa lettermanii Vasey	Letterman's bluegrass
	Trisetum spicatum (L.) Richter	spike trisetum
Hydrophyllaceae	*Phacelia sericea* (Grah.) Gray var. *sericea*	silky phacelia
	Romanzoffia sitchensis Bong.	Sitka mistmaiden
Juncaceae	*Juncus drummondii* E. Meyer var. *subtriflorus* (Meyer) Hitchc.	Drummond's rush
	Juncus mertensianus Bong.	Mertens' rush
	Luzula piperi (Cov.) Jones	Piper's woodrush
	Luzula spicata (L.) DC.	spiked woodrush
Lentebulariaceae	*Pinguicula vulgaris* L.	common butterwort
Liliaceae	*Tofieldia glutinosa* (Michx.) Pers. var. *brevistyla* (Hitchc). Hitchc.	sticky tofieldia
	Veratrum viride Ait.	American false hellebore
Lycopodiaceae	*Lycopodium sitchense* Rupr.	Alaska clubmoss
Onagraceae	*Epilobium alpinum* L. var. *clavatum* (Trel.) Hitchc.	alpine willow-herb
	Epilobium alpinum L. var. *lactiflorum* (Hausskn.) Hitchc.	alpine willow-herb
	Epilobium latifolium L.	red willow-herb
Orchidaceae	*Spiranthes romanzoffiana* Cham. var. *romanzoffiana*	hooded pearl-twist
Pinaceae	*Abies amabilis* (Dougl.) Forbes	Pacific silver fir
	Abies lasiocarpa (Hook.) Nutt.	subalpine fir
	Picea engelmannii Parry	Engelmann spruce
	Pinus albicaulis Engelm.	white bark pine
	Tsuga mertensiana (Bong.) Carr.	mountain hemlock
Polemoniaceae	*Phlox diffusa* Benth. var. *longistylis* (Wherry) Peck	spreading phlox
	Polemonium elegans Greene	elegant sky-pilot
Polygonaceae	*Oxyria digyna* (L.) Hill.	mountain sorrel
	Polygonum viviparum L.	alpine bistort

Table SI-3—Vascular plants in Silver Lake Research Natural Area [1] — Continued

Family	Scientific name	Common name
Polypodiaceae	*Athyrium distentifolium* Tausch var. *americanum* (Butters) Cronq.	alpine lady-fern
	Crytogramma crispa (L.) R. Br. var. *acrostichoides* (R. Br.) Clarke	parsley-fern
	Polystichum lonchitis (L.) Roth	mountain sword-fern
Ranunculaceae	*Caltha biflora* DC. var. *biflora*	marshmarigold
	Ranunculus verecundus Robins.	modest buttercup
Rosaceae	*Luetkea pectinata* (Pursh) Kuntze.	partridgefoot
	Potentilla flabellifolia Hook.	fan-leaf cinquefoil
	Potentilla fruticosa L.	shrubby cinquefoil
	Potentilla villosa Pall. var. *parviflora* Hitchc.	villous cinquefoil
	Rubus pedatus J. E. Smith	strawberry bramble
	Sibbaldia procumbens L.	creeping sibbaldia
	Sorbus sitchensis Roemer	Sitka mountain-ash
Salicaceae	*Salix cascadensis* Cockerell	Cascade willow
	Salix nivalis Hook. var. *nivalis*	snow willow
Saxifragaceae	*Leptarrhena pyrolifolia* (D. Don) R. Br.	Leatherleaf saxifrage
	Mitella pentandra Hook.	alpine mitrewort
	Parnassia fimbriata Konig. var. *fimbriata*	fringed grass-of-parnassus
	Saxifraga bronchialis L. var. *austromontana* (Wieg.) Jones	spotted saxifrage
	Saxifraga debilis Engelm.	pygmy saxifrage
	Saxifraga ferruginea Grah. var. *macounii* Engl. & Irmsch.	rusty saxifrage
	Saxifraga oppositifolia L.	purple saxifrage
	Saxifraga punctata L. var. *cascadensis* (Calder & Savile) Hitchc.	dotted saxifrage
	Saxifraga tolmiei T. & G. var. *tolmiei*	alpine saxifrage
Scrophulariaceae	*Castilleja parviflora* Bong. var. *albida* (Pennell) Ownbey	small-flowered paintbrush
	Castilleja rupicola Piper	cliff paintbrush
	Mimulus tilingii Regel var. *caespitosus* (Greene) Grant	large mountain monkeyflower
	Pedicularis groenlandica Retz.	elephant's head
	Penstemon davidsonii Greene var. *menziesii* (Keck) Cronq.	Davidson's penstemon

Table SI-3—Vascular plants in Silver Lake Research Natural Area [1] — Continued

Family	Scientific name	Common name
Scrophulariaceae	*Penstemon procerus* Dougl. var. *tolmiei* (Hook.) Cronq.	small-flowered penstemon
	Veronica wormskjoldii Roem. & Schult.	alpine speedwell
Valerianaceae	*Valeriana sitchensis* Bong.	Sitka valerian

[1] Botanical reconnaissance of the lake basin, inlet, east rim, and lower northern cirque walls up to 2 320 m (7,656 ft) August 12-14, 1980. Nomenclature follows Hitchcock and others (1955-69).

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