

NORTH FORK NOOKSACK RESEARCH NATURAL AREA¹

Old-growth Douglas-fir, western hemlock, and western red-cedar growing on steep mountain slopes in the Northern Cascades of Washington.

The North Fork Nooksack Research Natural Area was established on April 10, 1934. It is an example of the Douglas-fir (*Pseudotsuga menziesii*) - western hemlock (*Tsuga heterophylla*) forests found at mid-elevations in the northern Cascade Range. The 605-ha. (1,495-acre) tract is located in Whatcom County, Washington, and is administered by the Glacier Ranger District (Glacier, Washington), Mount Baker National Forest. It is bounded on the south by State Highway 542, on the east by Welcome Creek, on the north by northern boundary line of sections 33, 34, and 35 and sections 26, 27, and 28, T. 40 N., R. 8 E., and on the west by the line between the W1/2 and E1/2 of the NW1/4 of section 33, T. 40 N., R. 8 E. (fig. NF-1). The natural area, therefore, includes parts of sections 33, 34, 35, and 36, T. 40 N., R. 8 E., and section 2, T. 39 N., R. 8 E., Willamette meridian. It lies at 48°54' N. latitude and 121°45' W. longitude.

ACCESS AND ACCOMMODATIONS

North Fork Nooksack Research Natural Area is reached via State Highway 542, the Mount Baker Highway. It lies about 16 and

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51 km. (10 and 32 miles) east of Glacier and Bellingham, Washington, respectively.

The natural area has no trails or roads within its boundaries. State Highway 542 bounds it for about 5 km. (3 miles). Remnants of an abandoned way trail may be found along the west boundary. A logging road cuts diagonally for about one-fourth mile across the extreme southeast corner of the area. At present the only way to penetrate the area is by traveling cross country. Care is required because of rock bluffs and the steep slopes. High elevations in the eastern portion of the tract are best reached via the Welcome Pass trail about 1 km. (0.5 mile) to the northeast and cross-country travel through subalpine meadows to the natural area itself.

Commercial accommodations are available in Bellingham or, to a limited extent, at Glacier. There are several public campgrounds in the vicinity along State Highway 542.

ENVIRONMENT

The North Fork Nooksack Research Natural Area covers a broad elevational span on the steep, south-exposed slope of a major mountain ridge. Elevations vary from 580 m. (1,900 ft.) along the highway to over 1,585 m. (5,200 ft.) along the northern boundary in section 35. Steep, broken slopes of 40 to 80 percent or more are common. Rock bluffs and small benches are occasionally encountered. The largest areas of gentle topography are the benches along portions of the highway and another near the center of section 35. O'Leary Creek, flowing through a rocky drainage and avalanche track (fig. NF -2), bisects the natural area. Welcome Creek forms the eastern boundary. Numerous seep areas and intermittent streams are present.

Geologically, the natural area is reportedly composed of sedimentary rocks (graywacke, argillite, and siltstones) of Upper Jurassic and Lower Cretaceous age (Hunting et al.

1961, Misch 1952). The region was, of course, heavily glaciated during the Pleistocene, and alpine glaciation has been a dominant geomorphologic process within the natural area.

A wet, cool maritime climate prevails.

Annual precipitation is heavy with maxima in December and January and minima in July and August. Summers are generally cool with frequent cloudy days, but only about 10 percent of the annual precipitation occurs from June through August. Annual snowfall increases rapidly with elevation. Climatic conditions can be interpolated from data for the Glacier and Mount Baker Lodge stations, 13 km. (8 miles) west and 8 km. (5 miles) southeast, respectively (U.S. Weather Bureau 1956,1965):

	<i>Glacier R.S.</i>	<i>Mt. Baker Lodge</i>
Elevation	286m. (937 ft.)	1,266 m. (4,150 ft.)
Mean annual temperature	8.4 °e. (47.2°F.)	4.5°e. (40.1°F.)
Mean January Temperature	-0.3°e. (31.4°F.)	-2.6°e. (27.3 of.)
Mean July temperature ..	16.9°e. (62.5°F.)	12.1°e. (53.8°F.)
Mean January minimum temperature .	-4.0°e. (24.8°F.)	_5.7°e. (21.8°F.)
Mean July maximum temperature ..	24.7°e. (76.5 of.)	17.5°e. (63.5 of.)
Average annual precipitation	1,474 mm. (58.03 in.)	2,821 mm. (111.08 in.)
June through August precipitation	155 mm. (6.09 in.)	313 mm. (12.32 in.)
Average annual snowfall	106 em. (41.9 in.)	1,398 em. (550.3 in.)

Unpublished precipitation data for the Shuksan weather station, 0.8 km. (0.5 mile) east of the southeast corner of the natural area, can be obtained from the U.S. Weather Bureau.

Soils on the natural area have recently been mapped by U.S. Forest Service personnel as part of a soil survey of the Mount Baker National Forest (Snyder and Wade 1970). At lower elevations, along the southern boundary of the area, soils are derived

from glacial drift and are classed as coarse loamy, mixed Typic Fragiorthods. These soils have a brown to reddish brown gravelly loam to sandy loam surface layer which grades into a very gravelly loamy sand subsoil at 55 to 75 em. (22 to 30 in.). Soils in the northern portion of the area are classed as coarse loamy, mixed Typic Ferrods. According to the map, the northeastern section is occupied by soils derived from metasedimentary or metavolcanic rocks, and the northwestern portion contains soils derived from highly fractured igneous rocks, such as andesite. These soils have dark reddish brown to brown loam surface layers underlain by very gravelly loam to sandy loam at depths ranging from 25 to 55 em. (10 to 22 in.).

BIOTA

Areas by SAF forest types (Society of American Foresters 1954), so far as can be determined from the original inventory, are as follows:

No.	Name	Age	Area
230	Douglas-Fir - Western Hemlock	Old	195 ha. (482 acres)
230	Douglas-Fir - Western Hemlock	Young	54 ha. (133 acres)
227	Western Red-cedar - Western Hemlock	Old	177 ha. (437 acres)
224	Western Hemlock	Old	120 ha. (296 acres)
221	Red Alder		2 ha. (4 acres)
			548 ha. (1,352 acres)

There are, in addition, 58 ha. (143 acres) classed as non-forested. This includes rock outcrops, subalpine meadow areas, and streamside brush fields. Vegetation types, as defined by Kuchler (1964) appear to include: Type 2, Cedar - Hemlock - Douglas Fir Forest; Type 3, Silver Fir - Douglas Fir Forest; Type 4, Fir - Hemlock Forest; and Type 52, Alpine Meadows and Barren. The natural area spans three major vegetation zones (Franklin and Dyrness 1969) - the *Tsuga heterophylla*, *Abies amabilis*, and *T. mertensiana* Zones. The *T. mertensiana* Zone is most poorly represented occurring only at highest elevations.

The major tree species are Douglas-fir,

western hemlock, western red-cedar (*Thuja plicata*), and Pacific silver fir (*Abies amabilis*). Mountain hemlocks (*Tsuga mertensiana*) are encountered at highest elevations. Red alder (*Alnus rubra*) and black cottonwood (*Populus trichocarpa*) are sporadically represented in wet areas and along streams.

The bulk of the natural area is occupied by mixed old-growth forests of Douglas-fir, western hemlock, and western red-cedar growing on moderate to steep slopes. In these stands, the Douglas-fir are scattered veterans 125- to 175-cm. (50- to 70-in.) d.b.h. and exceeding 600 years in age. These specimens average five to 10 per acre and make up 30 to 50 percent of the forest volume. Western hemlock and western red-cedar are more numerous, but they are generally smaller in size and younger. Succession in these stands is toward a climax forest of western hemlock. It is the only species reproducing itself in significant numbers (fig. NF -2). Typical understory species are *Polystichum munitum*, *Berberis nervosa*, *Linnaea borealis*, Pacific yew (*Taxus brevifolia*), *Viola sempervirens*, *Chimaphila umbellata*, and *Pyrola minor*. *Acer circinatum* is scattered but locally abundant. On driest slopes, *Pyrola asarifolia* and *Gaultheria shallon* are found.

The young-growth forests dominated by Douglas-fir and western hemlock occur as small patches and stringers. They are most extensive along the western edge of the natural area.

A different community is found on cool, moist benches at lower elevations within the natural area (fig. NF -2). The overstory consists of western hemlock, Douglas-fir, western red-cedar, and Pacific silver fir. Reproduction consists of hemlock and Pacific silver fir indicating the climax forest will include at least a percentage of both. The understory is much richer including *Vaccinium alaskaense*, *Cornus canadensis*, *Rubus pedatus*, *Clintonia uniflora*, *Oplanax horridum*, *Athyrium filix-femina*, *Blechnum spicant*, *Polystichum munitum*, *Tiarella unifoliata*, and *Gymnocarpium dryopteris*.

At higher elevations, within the *Abies amabilis* Zone, the Douglas-fir and western

Red-cedar are largely absent, and stands of Pacific silver fir and western hemlock are typical. Pacific silver fir appears to be the climax species; hemlock reproduction is sparse. Typical understory species are *Cornus canadensis*, *Rubus pedatus*, *Clintonia uniflora*, *Vaccinium alaskaense*, and *Tiarellaunifoliata*.

Finally, above about 1,375 m. (4,500 ft.), mountain hemlock replaces western hemlock as the major Pacific silver fir associate. These stands vary in understory characteristics from a relatively dense condition with well-developed, ericaceous shrub layers to a relatively open condition with a herbaceous understory. Subalpine meadows of varying type are associated with these stands but have not been examined in detail (fig. NF-2).

Mammals believed to utilize the tract as transients or residents are listed in table NF-1.

HISTORY OF DISTURBANCE

Human disturbance of the natural area has been and will probably continue to be minor because of its rugged and inaccessible character. Removal of dead or hazardous trees has been carried out along the highway. A short nature trail from the highway to the base of several large trees has periodically been opened and human visitation has been confined to a hectare or so in this vicinity.

Recent natural disturbances appear to have affected only limited areas within the tract. The occurrence of young stands of Douglas-fir indicates that portions of the natural area have been burned by wildfires during the last century. Avalanches have occurred in at least one drainage - that of O'Leary Creek.

RESEARCH

The North Fork Nooksack Research Natural Area has been used as a sampling site in a study of the amount and composition of forest floors under medium-altitude, old-growth coniferous forests in Washington (Gessel and Balci 1965). No additional research is presently known to be in progress.

This Research Natural Area is particularly valuable for ecological studies on a variety of stand types typical of the northern Cascades. The broad range in elevations, spanning three major vegetation zones, also provides special opportunities for research concerned with environmental gradients.

MAPS AND AERIAL PHOTOGRAPHS

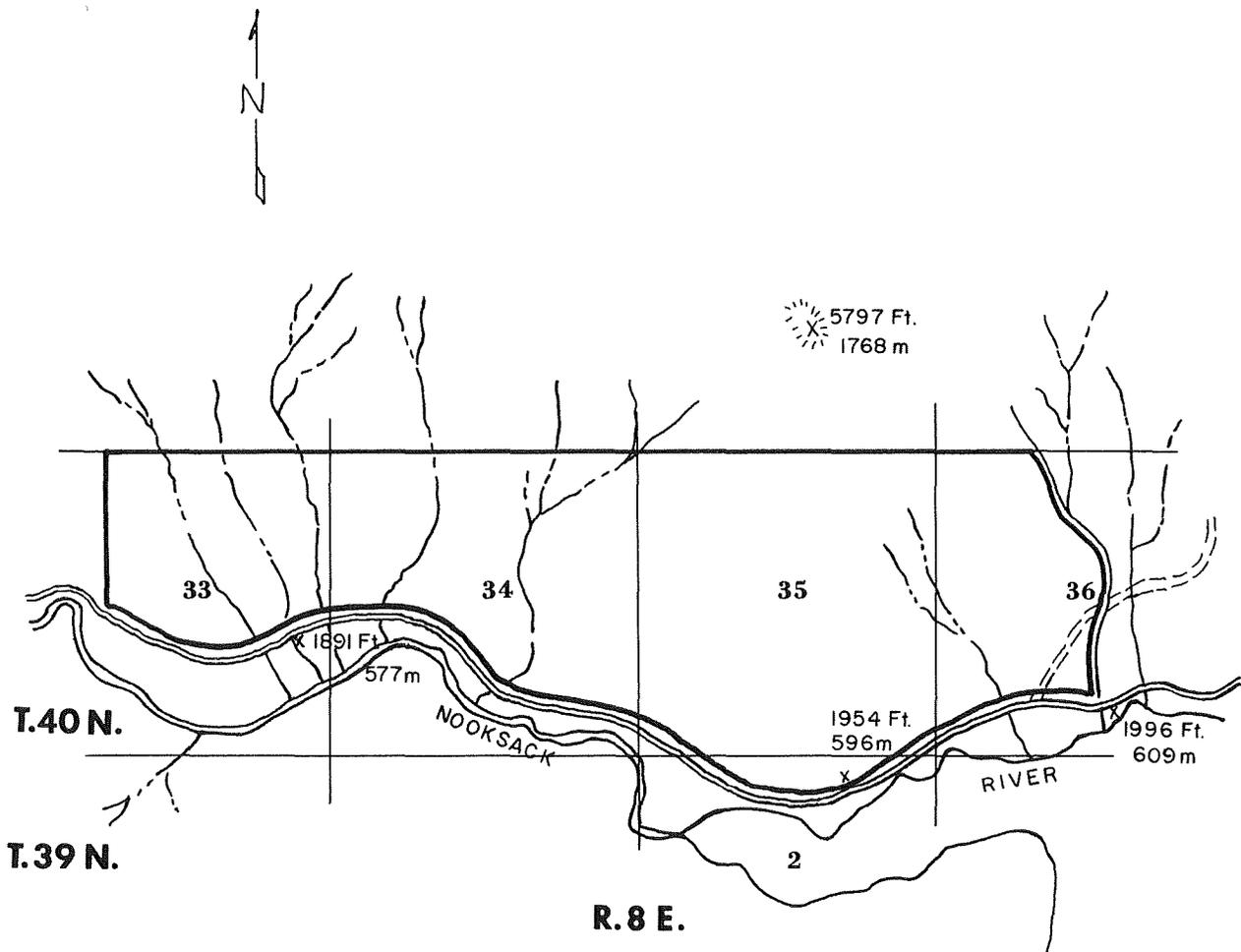
Special maps applicable to the natural area include: *Topography* - 15' Mount Shuksan, Washington, and Mount Baker, Washington, quadrangles, scale 1: 62,500, issued by the U.S. Geological Survey in 1953 and 1952, respectively; and *geology* - *Geologic Map of Washington*, scale 1: 500,000 (Hunting et al. 1961). Either the District Ranger (Glacier Ranger District) or Forest Supervisor (Mount Baker National Forest, Bellingham, Washington) can provide details on the most recent aerial photo coverage and forest type maps for the area.

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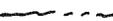
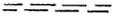
Table NF-1. — Tentative list of mammals for North Fork Nooksack Research Natural Area

Order	Scientific name	Common name	
Insectivora	<i>Neurotrichus gibbsi</i>	shrew mole	
	<i>Scapanus orarius</i>	coast mole	
	<i>Scapanus townsendi</i>	Townsend mole	
	<i>Sorex bendirii</i>	marsh shrew	
	<i>Sorex cinereus</i>	masked shrew	
	<i>Sorex obscurus</i>	dusky shrew	
	<i>Sorex palustris</i>	northern watershrew	
	<i>Sorex trowbridgii</i>	Trowbridge shrew	
	<i>Sorex vagrans</i>	wandering shrew	
	Chiroptera	<i>Eptesicus fuscus</i>	big brown bat
<i>Lasionycteris noctivagans</i>		silver-haired bat	
<i>Lasiurus cinereus</i>		hoary bat	
<i>Myotis californicus</i>		California myotis	
<i>Myotis evotis</i>		long-eared myotis	
<i>Myotis keeni</i>		Keen myotis	
<i>Myotis lucifugus</i>		little brown myotis	
<i>Myotis volans</i>		long-legged myotis	
<i>Myotis yumanensis</i>		Yuma myotis	
<i>Plecotus townsendi</i>		Townsend big-eared bat	
Lagomorpha	<i>Lepus americanus</i>	snowshoe hare	
	<i>Ochotona princeps</i>	pika	
Rodentia	<i>Aplodontia rufa</i>	mountain beaver	
	<i>Castor canadensis</i>	beaver	
	<i>Clethrionomys gapperi</i>	Gapper red-backed vole	
	<i>Erethizon dorsatum</i>	porcupine	
	<i>Eutamias amoenus</i>	yellow-pine chipmunk	
	<i>Eutamias townsendi</i>	Townsend chipmunk	
	<i>Glaucomys sabrinus</i>	northern flying squirrel	
	<i>Marmota caligata</i>	hoary marmot	
	<i>Microtus longicaudus</i>	long-tailed vole	
	<i>Microtus oregoni</i>	Oregon or creeping vole	
	<i>Microtus richardsoni</i>	Richardson vole	
	<i>Neotoma cinerea</i>	bushy-tailed wood rat	
	<i>Ondatra zibethicus</i>	muskrat	
	<i>Peromyscus maniculatus</i>	deer mouse	
	<i>Phenacomys intermedius</i>	heather vole	
	<i>Synaptomys borealis</i>	northern bog vole	
	<i>Tamiasciurus douglasi</i>	chickaree	
	<i>Zapus trinotatus</i>	Pacific jumping mouse	
	Carnivora	<i>Canis latrans</i>	coyote
		<i>Felis concolor</i>	mountain lion or cougar
<i>Gulo luscus</i>		wolverine	
<i>Lutra canadensis</i>		river otter	
<i>Lynx rufus</i>		bobcat	
<i>Martes americana</i>		marten	
<i>Mustela erminea</i>		short-tailed weasel or ermine	
<i>Mustela frenata</i>		long-tailed weasel	
<i>Mustela vison</i>		mink	
<i>Procyon lotor</i>		raccoon	
Artiodactyla	<i>Spilogale putorius</i>	spotted skunk or civet cat	
	<i>Ursus americanus</i>	black bear	
	<i>Vulpes fulva</i>	red fox	
	<i>Cervus canadensis</i>	wapiti or elk	
	<i>Odocoileus h. columbianus</i>	black-tailed deer	
	<i>Oreamnos americanus</i>	mountain goat	



LEGEND



-  BOUNDARY, NORTH FORK NOOKSACK RESEARCH NATURAL AREA
-  SECTION LINE
-  STREAM
-  HIGHWAY
-  SPUR ROAD
-  BENCH MARK

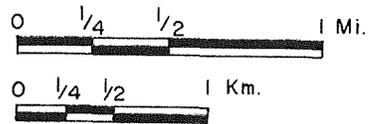


Figure NF-1.- North Fork Nooksack Research Natural Area, Whatcom County, Washington.

Figure NF-2.—Natural features of the North Fork Nooksack Research Natural Area. Upper left: Mixed stand of old-growth Douglas-fir, western redcedar, western hemlock, and Pacific silver fir on moist bench at low elevation in the natural area. Upper right: Dense reproduction of western hemlock, with smaller amounts of Pacific silver fir and western redcedar, developing in a small opening created by windthrow. Center left: Subalpine meadows and central portion of the natural area from the northern boundary; clearcuts are outside southern boundary. Center right: Typical old-growth Douglas-firs. Lower left: View down O'Leary Creek drainage which bisects the natural area, illustrating the steep stream gradient. Lower right: A portion of the upper drainage of O'Leary Creek showing damage caused by recurrent avalanches.

