

HADES CREEK RESEARCH NATURAL AREA¹

Pacific silver fir-western hemlock stands located at low elevations on the northwestern edge of the Olympic Peninsula.

The Hades Creek Research Natural Area was established to exemplify Pacific silver fir (*Abies amabilis*) - western hemlock (*Tsuga heterophylla*) forest as it occurs at lower elevations in the Olympic Mountains. The 227-ha. (560-acre) tract is located in Jefferson County, Washington, and is administered by Olympic National Park (Port Angeles, Washington). The natural area occupies the S 1/2 and S 1/2 NW1/4 of section 5 and N1/2 N1/2 of section 8, T. 27 N., R. 11 W., Willamette meridian. It lies at 47°52' N. latitude and 124°09' W. longitude.

ACCESS AND ACCOMMODATIONS

The natural area is reached via the Bogachiel River Road (which leaves U.S. Highway 101 about 10 km. or 6 miles south of Forks) and the Bogachiel River Trail. The tract is located about 10 km. (6 miles) from the end of the road near the Bogachiel Shelter; it is necessary to ford the river about 1/4 mile above the shelter since it is on the north side of the river and the natural area is on the south. The natural area is located on slopes west of Hades Creek (fig. HA-1). An abandoned trail extends from the river to the sum-

mit of Spruce Mountain and traverses a large part of the natural area.

Commercial accommodations are, of course, quite remote, the nearest being located in the vicinity of Forks, which is several hours away by trail and road. There are numerous good camp spots along the Bogachiel River in the vicinity of the natural area. When camping in undeveloped areas, one must obtain a fire permit from the Park Service.

ENVIRONMENT

Hades Creek Research Natural Area occupies the top and slopes of a spur ridge on the lower slopes of Spruce Mountain and extends down to the benches along the Bogachiel River. Moderately steep slopes are typical except along the southern edge of the natural area, where the topography drops steeply into the drainage of Hades Creek. The gentlest slopes are found on the benches just above the Bogachiel River. Elevations in the natural area range from about 145 to 582 m. (475 to 1,910 ft.) .

The natural area is located on upper Cretaceous - lower Tertiary sedimentary rocks belonging to the Soleduck formation (Hunting et al. 1961). This formation developed from marine sediments which were intensely folded and faulted and slightly metamorphosed (Danner 1955). The dominant, dark gray, massive to poorly bedded graywackes and sandstones are commonly interbedded with slate, argillite, and volcanic rock. The natural area was glaciated at least three times during the Wisconsin epoch and at least once even earlier (Crandell 1964).

A maritime climate, wet with muted temperature extremes, prevails. Winters are mild, and summers are cool with frequent cloudy days. Precipitation is heavy but highly seasonal, with January and December the peak months. Less than 10 percent of the annual

¹ Description prepared by Dr. J. F. Franklin, U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Forestry Sciences Laboratory, Corvallis, Oregon.

precipitation falls during June, July, and August, and some years a drought period of a month or more occurs. The following climatic data are from Forks, located about 19 km. (12 miles) to the northwest; temperatures are somewhat cooler and precipitation slightly higher on the natural area itself (U.S. Weather Bureau 1965):

Mean annual temperature 9.55°C. (49.2°F.)
 Mean January temperature 3.72°C. (38.7°F.)
 Mean July temperature 15.39°C. (59.7°F.)
 Mean January minimum
 temperature 0.17°C. (32.3°F.)
 Mean July maximum temperature 21.55°C. (70.8°F.)
 Average annual precipitation 2,974 mm. (117.10 in.)
 June through August
 precipitation 214 mm. (8.44 in.)
 Average annual snowfall 34 cm. (13.7 in.)

The soils on the area have not been mapped or described. At least a portion would probably be classed as Sols Bruns Acides.

BIOTA

All 227 ha. (560 acres) of the natural area can be classified as SAF cover type 226, Pacific Silver Fir - Western Hemlock (Society of American Foresters 1954). The area would probably fall within Kuchler's (1964) Type 3, Silver Fir - Douglas-fir Forest, and the *Tsuga heterophylla* Zone as defined by Franklin and Dyrness (1969). A zonal assignment is difficult for this area since it is occupied by forests which are more typically found at much higher elevations.

Pacific silver fir and western hemlock dominate the Hades Creek Research Natural Area. The relative proportion of the tree species varies considerably throughout the tract. For example, silver fir composes about 80 percent of the stand volume on the ridge-top but only 20 percent near Hades Creek on the south side of the area and on the north end. The bulk of the area varies from about a 60-40 to a 50-50 mixture of Pacific silver fir and western hemlock, respectively. Pacific silver fir within the natural area averages 75- to 90-cm. (30- to 35-in.) d.b.h. and 46 to 53 m. (150 to 175 ft.) in height. The largest known Pacific silver fir specimen, which is 56.7 m. (186 ft.) in height and about 208- cm.

(82-in.) d.b.h. is located within the natural area (Pomeroy and Dixon 1966) (fig. HA-2). Occasional large, old-growth Douglas-fir (*Pseudotsuga menziesii* and western red-cedar (*Thuja plicata*) are also found throughout the natural area.

The major climax tree species within the natural area appears to be western hemlock. Seedlings and saplings of this species are typically much more common than those of Pacific silver fir, especially on drier sites. This is, of course, in direct contrast with the successional relationship between these species at middle and high elevations in the Olympic and Cascade Mountains (Fonda and Bliss 1969, Franklin and Dyrness 1969). Pacific silver fir is probably at least a minor climax species, as at least some reproduction of this species is present in most locations.

At least two major community types occur within the natural area: the *Tsuga heterophylla* - *Abies amabilis*/*Gaultheria shallon* *Vaccinium parvifolium*/*Hylocomium splendens* and *Abies amabilis*/*Tsuga heterophylla*/*Maianthemum bifolium* communities. The *Tsuga*/*Gaultheria*/*Hylocomium* community is typical of lower elevations and drier slopes within the natural area. Understory plant species include: *Gaultheria shallon*, *Viola sempervirens*, *Acer circinatum*, *Blechnum spicant*, *Vaccinium parvifolium*, and *Eurhynchium Oregonum*. The *Abies*/*Tsuga*/*Maianthemum* community appears to be typical of moister habitats within the natural area. The understory is dominated by herbaceous species such as *Maianthemum bifolium* var. *kamschaticum*, *Rubus pedatus*, *Oxalis oregana*, *Polystichum munitum*, *Disporum* sp., *Blechnum spicant*, *Tiarella trifoliata*, and *Trillium ovatum*.

Mammals believed to utilize the natural area either as residents or transients are listed in table HA-1.

Streams and streamsides are the only specialized habitats known to occur within the natural area.

HISTORY OF DISTURBANCE

There is no evidence of any unusual natural disturbance of the area during recent cen-

turies. Natural mortality such as that caused by wind-throw is scattered throughout the tract.

Human disturbances to the natural area are very minor. An abandoned trail was constructed and used during World War II to supply an air-warning station on Spruce Mountain.

RESEARCH

Ten Pacific silver fir "trend plots" were established on the natural area in 1954 to observe annual mortality of Pacific silver fir and western hemlock, particularly that associated with the silver fir beetle (*Pseudohylesinus* Spp.).² At the time of the first remeasurement in 1958, mortality of Pacific silver fir had been negligible (Buckhorn and Orr 1959).

The natural area provides interesting oppor-

² "Silver fir beetles" is a local name given to two species of *Pseudohylesinus*: *P. grandis*, the grand fir bark beetle, and *P. granulatus*, the fir root bark beetle.

tunities to study the ecology of low-elevation Pacific silver fir - western hemlock stands, e.g., the successional relationships between these tree species including variations associated with different types of microhabitats.

MAPS AND AERIAL PHOTOGRAPHS

Special maps applicable to the natural area include: *Topography* - 15' Spruce Mountain, Washington quadrangle, scale 1: 62,500, issued by the U.S. Geological Survey in 1956, and Olympic National Park and Vicinity, Washington, scale 1: 125,000, issued by the U.S. Geological Survey in 1957; and *geology* - *Geologic Map of Washington*, scale 1:500,000 (Hunting et al. 1961). The Superintendent, Olympic National Park (Port Angeles, Washington), can provide details on the most recent aerial photo coverage and forest type maps for the area.

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Table HA-1. — Tentative list of mammals for Hades Creek 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 obscurus</i>	dusky shrew	
	<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 borealis</i>	red bat	
	<i>Lasiurus cinereus</i>	hoary bat	
	<i>Myotis californicus</i>	California myotis	
	<i>Myotis evotis</i>	long-eared 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 Rodentia	<i>Lepus americanus</i>	snowshoe hare
<i>Aplodontia rufa</i>		mountain beaver	
<i>Castor canadensis</i>		beaver	
<i>Clethrionomys gapperi</i>		Gapper red-backed vole	
<i>Eutamias townsendi</i>		Townsend chipmunk	
<i>Glaucomys sabrinus</i>		northern flying squirrel	
<i>Microtus longicaudus</i>		long-tailed vole	
<i>Microtus oregoni</i>		Oregon or creeping vole	
<i>Microtus townsendi</i>		Townsend vole	
<i>Neotoma cinerea</i>		bushy-tailed wood rat	
<i>Peromyscus maniculatus</i>		deer mouse	
<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>Lutra canadensis</i>	river otter	
	<i>Lynx rufus</i>	bobcat	
	<i>Martes americana</i>	marten	
	<i>Martes pennanti</i>	fisher	
	<i>Mephitis mephitis</i>	striped skunk	
	<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>Cervus canadensis roosevelti</i> <i>Odocoileus h. columbianus</i>	Roosevelt elk black-tailed deer	

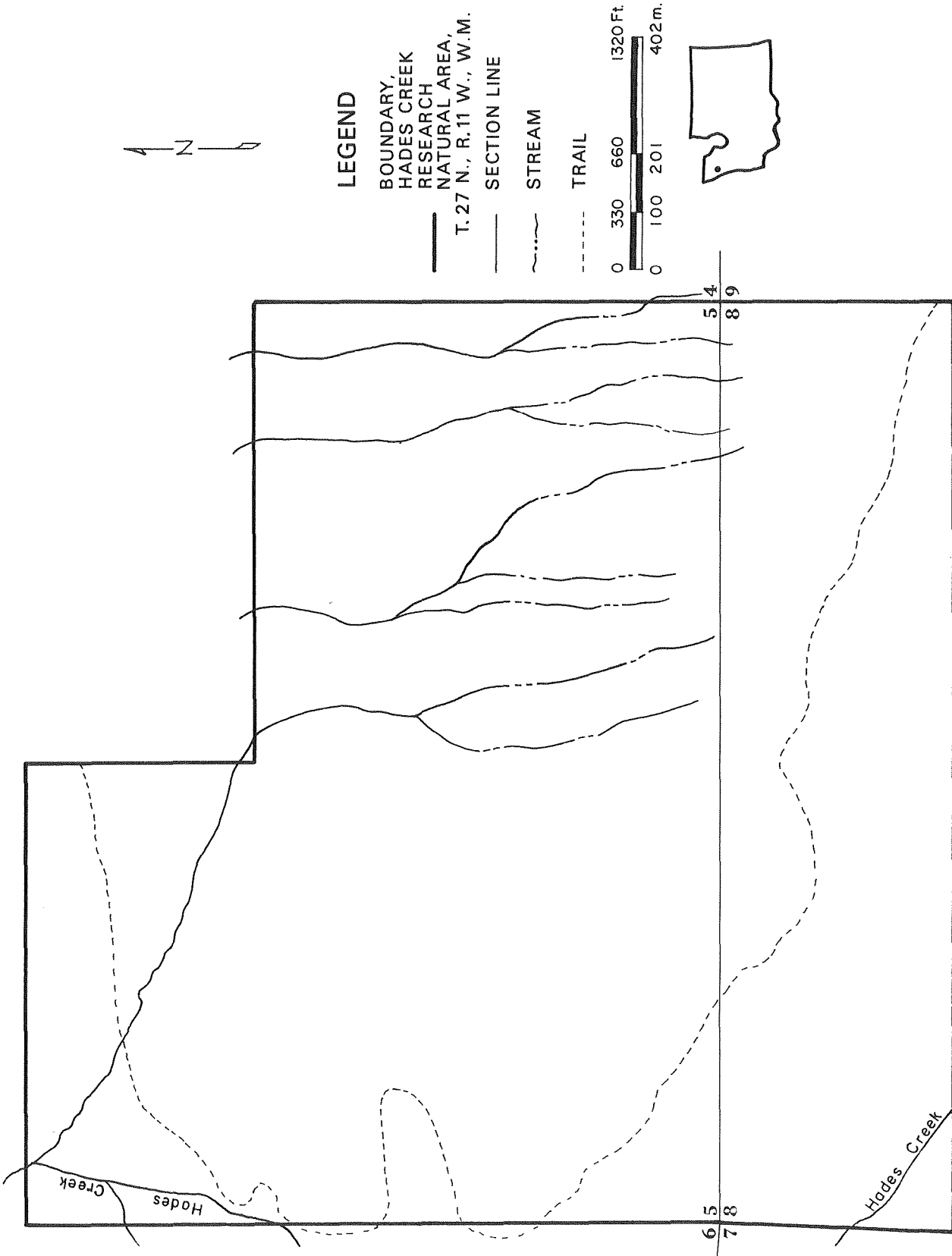


Figure HA-7.- Hades Creek Research Natural Area, Jefferson County, Washington.

Figure HA-2.-Natural features of the Hades Creek Research Natural Area. Upper left: Base of largest known Pacific silver fir, 268-cm. (82-in.) d.b.h. and 56.7 m. (186 ft.) in height. Upper right: Upper stem and crown of same Pacific silver fir and its associates. Bottom: Typical mixed community of Pacific silver fir and western hemlock; the relatively sparse understory here is dominated by herbaceous plants.

