

DIAMOND POINT RESEARCH NATURAL AREA¹

Second-growth western hemlock, Sitka spruce, and red alder growing on an island in a coastal estuary in southwestern Washington.

The Diamond Point Research Natural Area was established as an example of second-growth Sitka spruce (*Picea sitchensis*) - western hemlock (*Tsuga heterophylla*) forest growing on a peninsula in a coastal estuary. The 36-ha. (88-acre) tract is located in Pacific County, Washington, and is administered by the Bureau of Sport Fisheries and Wildlife. It is located at the northern tip of Long Island in Willapa Bay and is part of Willapa National Wildlife Refuge (Ilwaco, Washington). The natural area occupies a portion of the northern half of section 25, T.12 N., R. 11 W., Willamette meridian (fig. DP-1). It lies at 46°29' N. latitude and 123 °59' W. longitude.

ACCESS AND ACCOMMODATIONS

Access to the vicinity is via U.S. Highway 101 to headquarters of the Willapa National Wildlife Refuge, located approximately 21 km. (13 miles) north of Ilwaco, Washington. The headquarters site is opposite the southern end of Long Island, and the Bureau maintains a boat and docking facilities for the 0.5-km. (0.3-mile) trip to the island. On the island there is a limited logging road system which comes within 0.8 km. (0.5 mile) of the southern boundary of the natural area. The sole

means of transportation on Long Island is a jeep maintained by the Bureau of Sport Fisheries and Wildlife. An alternative approach is by boat, going from the headquarters dock directly to the natural area - a trip of perhaps 10 to 14 km. (6 to 8 miles). There are no trails in the natural area, so access is by cross-country hiking or walking along the shoreline at low tide.

A wide range of commercial accommodations are available at Ilwaco, Seaview, and Long Beach, about 19 to 22 km. (12 to 14 miles) south of Willapa National Wildlife Refuge headquarters. There are seven public campgrounds on Long Island, all of them reached by boat. One of them - Diamond Point Campground - is actually located within the boundaries of the natural area.

ENVIRONMENT

Topography on the Diamond Point Research Natural Area is, for the most part, composed of moderate slopes along several broad ridges which are interrupted by short drainage channels. There are small areas of steeper slopes, notably along the northwest-facing shore where slopes plunge abruptly to the bay. Elevations range from sea level to just over 30 m. (100 ft.). The natural area is bounded on the east, north, and west by approximately 1.2 km. (3/4 mile) of shoreline.

Geologically the Diamond Point Research Natural Area is made up of marine terraces of Pliocene to Pleistocene age (Hunting et al. 1961). These terraces are characterized by alternating beds of unconsolidated to partly consolidated silt, clay, and sand.

The area has a pronounced cool and wet marine climate. Although a large proportion of the total annual precipitation occurs during the winter, there is sufficient rainfall and foggy weather during the summer to maintain relatively high levels of soil moisture. Not only does fog reduce potential evapo-

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

transpiration, it also results in moisture accretion by "fog drip" from tree crowns. Temperature range throughout the year is minimal; winter temperatures are relatively mild and summers tend to be cool. The following climatic data are from the Willapa Harbor Climatic Station (D .S. Weather Bureau 1965):

Mean annual temperature..... 10.6°C. (51.1°F.)
 Mean January temperature 4.6°C. (40.3°F.)
 Mean July temperature 16.3°C. (61.4°F.)
 Mean January minimum temperature1.2°C. (34.1°F.)
 Mean July maximum temperature22.0°C. (71.5°F.)
 Average annual precipitation2,156 mm. (84.87 in.)
 June through August precipitation.....14H mm. (5.87 in.)

Even though the Willapa Harbor Climatic Station is located about 26 km. (16 miles) northeast of the natural area, climatic conditions should be roughly the same at both locations.

Soils information for the area is from a limited number of observations. Apparently most soils are Sols Bruns Acides with textural profiles largely inherited directly from the stratified parent material. Forest floor layers (01 and 02 horizons) are generally thick, ranging from 13 to 25 cm. (6 to 10 in.) in depth. These layers often contain a large proportion of the total root mass. The surface mineral horizon, averaging about 8 cm. (3 in.) in thickness, consists of very dark brown to black silt loam and obviously contains a large amount of incorporated organic matter. This is underlain by a dark brown, silt loam to silty clay loam horizon which ranges from 13 to 25 cm. (6 to 10 in.) in thickness. The subsoil material may vary from a partially indurated sand to a sticky clay, depending on parent material stratigraphy. In some locations the subsoil shows pronounced mottling, indicating impeded internal drainage.

The area falls within Kuchler's (1964) Type 1, Spruce-Cedar-Hemlock Forest, and the *Picea sitchensis* Zone of Franklin and Dyrness (1969).

There are only three tree species of any importance in the natural area: red alder (*Alnus rubra*), Sitka spruce, and western hemlock. Most of the stands appear to be approximately 70 to 80 years old, having resulted from logging of the area some time near the turn of the century. Composition of coniferous stands ranges from Sitka spruce, with minor amounts of hemlock on north and west facing slopes, to pure stands of western hemlock on ridge-tops and south slopes. Tree regeneration under spruce-hemlock stands usually consists of scattered stems of both spruce and hemlock. Red alder also occasionally occurs in small openings. In stands where hemlock is the dominant tree in the over-story, regeneration is dominantly western hemlock with very few Sitka spruce. Pure, even-aged stands of red alder occur in drainage-ways and in low areas along the shoreline.

Tree over-story coverage in coniferous stands varies from about 60 to 75 percent. In the denser alder stands it averages 90 to 100 percent. Typical western hemlock and Sitka spruce trees are from 30- to 46-cm. (12- to 18-in.) d.b.h., with the largest specimens ranging up to 91-cm. (36-in.) d.b.h.

There are two main understory community types in coniferous stands within the natural area: (1) the *Polystichum munitum* type found in moist areas where Sitka spruce is the dominant tree species, and (2) a *Gaultheria shallon* type generally associated with hemlock-dominated timber stands. The *Polystichum* community is characterized by only scattered shrub cover contributed mainly by *Vaccinium parvifolium*, *V. ovatum*, *Rhamnus purshiana*, *Sambucus melanocarpa*, and *Rubus spectabilis*. *Gaultheria shallon*, if present, is often restricted to rotten logs and stumps. The herb layer is dominated by a luxurious growth of *Polystichum munitum* which may cover as much as 80 percent of the ground surface. Other common herbaceous species include *Blechnum spicant*, *Athyrium filix-femina*, *Galium triflorum*, *Pyrola uni-*

BIOTA

Estimated areas by SAF cover types (Society of American Foresters 1954) are:

No.	Name	Area
225	Sitka Spruce - Western Hemlock	18 ha. (45 acres)
224	Western Hemlock	10ha.(25acres)
221	Red Alder	7ha.(18 acres)

flora, *Luzula parviflora*, *Maianthemum bifolium* var. *kamtschaticum*, *Lysichitum americanum*, *Dryopteris dilatata*, *Oxalis oregana*, *Tiarella trifoliata*, *Trillium ovatum*, and *Monotropa hypopitys*. A heavy growth of moss covers the ground in all coniferous stands. Average moss cover is generally 80 to 90 percent, with *Eurynchium oreganum* probably the most common species.

The *Gaultheria* community is dominated by large amounts of *Gaultheria shallon*, some of it up to 2 m. (6 ft.) in height. Other common shrubs are *Vaccinium parvifolium*, *V. ovatum*, *Rhamnus purshiana*, and *Menziesia ferruginea*. The herb layer is scattered and made up of species such as *Polystichum munitum*, *Blechnum spicant*, *Dryopteris dilatata*, *Polypodium scolieri* (both on the ground and as an epiphyte), *Galium triflorum*, *Luzula parviflora*, and *Osmorhiza nuda*.

The vegetation under pure stands of red alder in drainages and swampy swales is made up of the above mentioned ferns, *Lysichitum americanum*, *Montia sibirica*, *Carex* spp., *Cardamine* sp., *Melissa officinalis*, *Equisetum* sp., and a variety of other moisture-loving species. Several low-lying alder stands adjacent to the bay have an almost pure *Carex* understory which is unusually lush and dense (fig. DP-2).

Mammals believed to utilize the area as either residents or transient visitors are listed in table DP-1. Birds frequenting the area include band-tailed pigeons (*Columba fasciata*), bluegrouse (*Dendragapus obscurus*), and ruffed grouse (*Bonasa umbellus*).

HISTORY OF DISTURBANCE

As previously mentioned, the area was logged some 70 to 80 years ago. Since then, there appears to have been very little additional disturbance by man. There is a small,

primitive campground (Diamond Point Campground) reached only by water near the northwestern corner of the area, but so far the user-related disturbances do not extend very far inland. All of Long Island is a big-game, bow-hunting area, and hunters undoubtedly pass through the area, but effects of this use appear negligible. There is, however, considerable evidence of heavy browsing of shrubs and ferns by deer and elk in some of the more open stands.

In 1966 a clear-cut logging operation came close to the southern boundary of the natural area. Because of the lack of natural area boundary markers, it is difficult to tell exactly how much of a buffer, if any, remains between the clear-cut and the natural area.

RESEARCH

No research is currently being conducted in the area and, so far as is known, none has been conducted in the past. The natural area offers a good opportunity for studying the development of young second-growth stands of western hemlock, Sitka spruce, and red alder.

MAPS AND AERIAL PHOTOGRAPHS

Maps covering the natural area are: *Topography* - 15' Fort Columbia, Washington quadrangle, scale 1: 62,500, issued by the U.S. Geological Survey in 1938; 7 1/2' Long Island, Washington quadrangle, scale 1: 31,250, issued by the U.S. Geological Survey in 1949; *geology - Geologic Map of Washington*, scale 1:500,000 (Hunting et al. 1961). The Refuge Manager of the Willapa National Wildlife Refuge (Ilwaco, Washington) can provide information on recent aerial photographs and maps.

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Table DP-1. — Tentative list of mammals for Diamond Point 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	
Chiroptera	<i>Sorex vagrans</i>	wandering shrew	
	<i>Eptesicus fuscus</i>	big brown bat	
	<i>Lasiorycteris 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 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	
Rodentia	<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>Ondatra zibethicus</i>	muskrat	
	<i>Peromyscus maniculatus</i>	deer mouse	
	<i>Tamiasciurus douglasi</i>	chickaree	
	<i>Zapus trinotatus</i>	Pacific jumping mouse	
	Carnivora	<i>Felis concolor</i>	mountain lion or cougar
		<i>Lutra canadensis</i>	river otter
		<i>Lynx rufus</i>	bobcat
		<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	
<i>Spilogale putorius</i>		spotted skunk or civet cat	
Artiodactyla		<i>Ursus americanus</i>	black bear
	<i>Cervus canadensis</i>	wapiti or elk	
	<i>Odocoileus h. columbianus</i>	black-tailed deer	

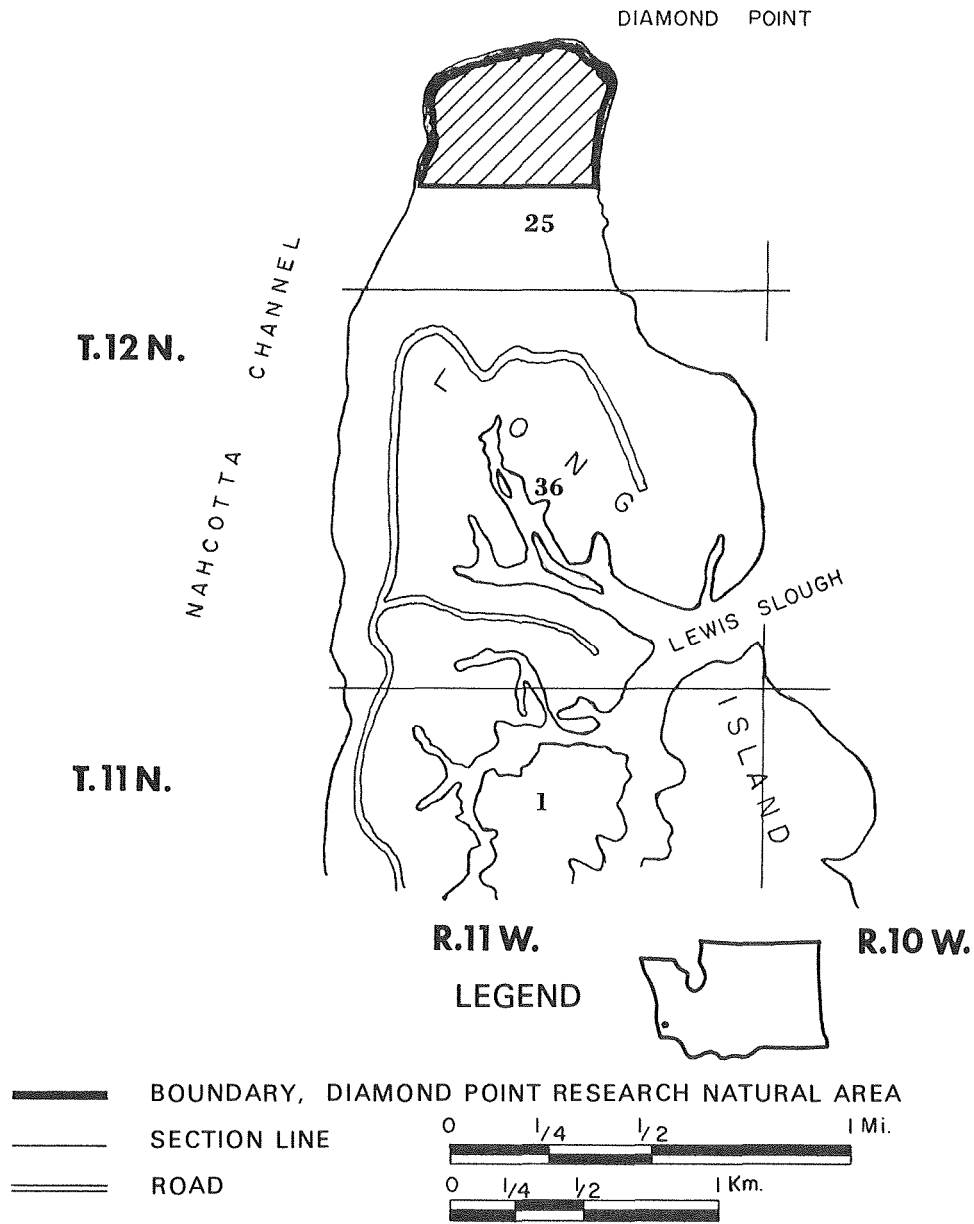


Figure DP-1.— Diamond Point Research Natural Area, Pacific County, Washington.

*Figure DP-2.-Communities of the Diamond Point Research Natural Area. Upper left: Shoreline of the natural area near Diamond Point Campground. Upper right: A red alder stand with a dense *Carex* understory. Lower left: Sitka spruce-western hemlock with a *Polystichum munitum* understory in the foreground, grading into a *Tsuga heterophylla/Gaultheria shallon* community in the background. Lower right: *Tsuga heterophylla/Gaultheria shallon* community on a ridge-top.*

