Ramona
Hammerly

SITKA SPRUCE

Picea sitchensis, Pine family—Pinaceae

During their encampment at the mouth of the Columbia River in 1805–06, explorers Lewis and Clark suffered through the dreary, wet, cold, and stormy winter characteristic of a Sitka spruce habitat. Even in midsummer, Sitka spruce seldom has to cope with significant drought.

The robust Sitka spruce is an icon of the rain-lashed North Pacific coast, where it provides a perch for bald eagles as they scan the beach and surf. Much as the giant redwood epitomizes California's coastal fog belt, Sitka spruce dominates the broader and colder wet belt that envelopes the coast from Oregon to Alaska. Another common name, "tideland spruce," denotes how this tree lines the shores and inlets. On storm-battered headlands and rock islands known as sea stacks, this irrepressible denizen of the salt air forms wind-sheared, stunted trees reminiscent of alpine timberlines. Along much of the ocean-side strip, Sitka spruce produces a dense forest of squat, limby trees. Farther back from the sea-wind onslaught, this tree attains gigantic proportions, equaling the largest coastal Douglas-fir. When not crowded, big spruce trees develop a thick canopy of long limbs extending nearly to the ground, the lower branches draped with hanging mosses.

Where It Grows

Sitka spruce lines 2000 miles (3200 km) of the North Pacific shore, but it seldom occurs more than a few dozen miles inland. Unlike several other coastal conifers, it does not spread east across the British Columbia Coast Range or the Cascades. Although small populations inhabit the northern coast of California, Sitka spruce gradually becomes much more abundant northward through Oregon, Washington, British Columbia, and Alaska. It reaches Kodiak Island, farther north and west along the coast into the maritime tundra than any other conifer. It dominates Alaska's coastal forest from sea level to timberline, which averages about 2500 feet (750 m) in elevation. In contrast to most conifers, which grow at progressively higher elevations to the south, Sitka spruce becomes restricted to a narrower band along the coastal lowlands southward from Alaska.

shoreline form of Sitka spruce

Sitka spruce on seastacks

From southwestern British Columbia to Oregon, this species seldom ascends above 1500 feet (450 m) in elevation, and it is abundant only in the oceanic environment along the western side of Vancouver Island and the western slope of the Olympics and other coastal mountains of Washington and Oregon. Sitka spruce forests are deluged with rain—averaging between 80 and 200 inches (2000 to 5000 mm) annually in different locations. The ocean's influence keeps the climate humid and cool year-round, with summer temperatures markedly colder and relative humidity higher than those in Vancouver, British Columbia; Seattle, Washington; or Portland, Oregon.

In the drier coastal region inland from the ocean, including the Strait of Georgia, Puget Sound, and the Willamette Valley, Sitka spruce is restricted to special, moist habitats. Stringers of spruce reach dozens of miles eastward along major rivers, including the Fraser and the Columbia, mostly in floodplains. They extend up the Snoqualmie River valley, along the route of Interstate 90, to within 5 miles (8 km) of the Cascade crest. Large second-growth Sitka spruce are seen where the highway crosses the Snoqualmie River at North Bend.

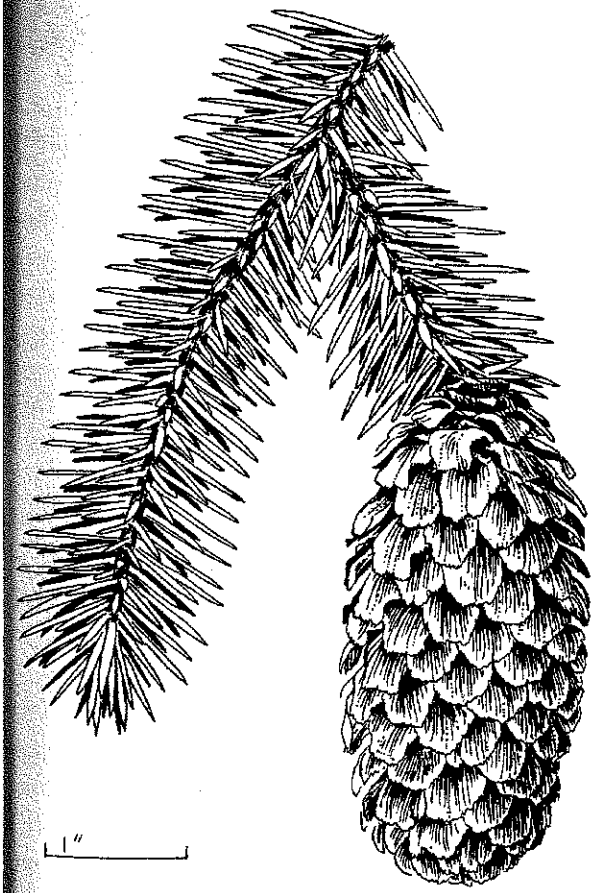
Appearance

Sitka spruce needles are stiff and prickly to the touch and about 1 inch (2.5 cm) long. They differ from needles of other Northwest spruces in being flattened so they do not readily roll between one's fingers. The tan-colored cones are 2½ to 4 inches (6 to 10 cm) long and are composed of thin, papery scales with jagged edges. The seeds are tiny—averaging 210,000 per pound (460,000 per kg) and can be carried long distances in the wind. Sitka spruce bark is thin and distinct from other coastal trees in

that its surface consists of large, loose scales, which are easily pulled off to reveal the purplish or reddish brown inner bark.

Abundant moisture allows Sitka spruce to grow prodigiously. On favorable sites, it can produce a trunk 4 feet (1.2 m) thick and 170 feet (52 m) tall in 100 years. Under moderately open conditions, young trees support a thick canopy of long, spreading limbs. Big, open-growing spruce with huge, limby canopies, called "wolf trees," make good shelter from the rain, although it might be futile to wait out the rain in winter. The great, outreaching branches often have secondary branchlets hanging down in a weeping appearance. As trees in dense stands grow tall, lower limbs die out, eventually baring the smooth, round trunk.

Old Sitka spruce trees often have immense root buttresses and a swollen base extending up several feet above the ground. Even above butt swell, however, old-growth spruce in valley sites are commonly more than 7 feet (2 m) thick, and several record-sized trees 12 to 17 feet (3.7 to 5.2 m) in diameter inhabit coastal areas from the Queen Charlotte Islands to northern Oregon (Van Pelt 2001). Each of these behemoths contains between 9000 and 12,000 cubic feet (250 to 340 cubic meters) of wood—enough to build three or four average houses. The most accessible record-sized spruce are the Klootchy Creek Giant in a wayside park on US 26 a few miles west of Seaside, Oregon, and the "Big Tree" along the drive to the Hoh Rain Forest Visitor Center in Washington's Olympic National Park. On Vancouver Island, the giant San Juan spruce can be reached by road and is visible immediately upstream from the San Juan River bridge 12 miles (19 km) east of Port Renfrew (Stoltmann 1987).



Sitka spruce

The original tops of most record-sized Sitka spruce have been broken by winter storms, but in some wind-sheltered valleys the tallest spruces stretch 300 feet (90 m) into the humid air. Such a feat is achieved by only four other tree species in the world: coastal Douglas-fir, redwood, giant sequoia, and a species of Australian eucalyptus. The ability of some trees to pull water and nutrients up through microscopically thin capillary tubes to such heights has amazed physicists.

Along the exposed oceanfront, Sitka spruce's resilience and vitality are pitted against recurrent gale- and hurricane-force winds. Stout, gnarled, limby trees result. The most extreme of these is the Octopus Tree at Cape Meares State Park near Tillamook, Oregon—a single spruce with many great trunks that sprawl across the top of an oceanside bluff. Trunks of oceanfront Sitka spruce sometimes support huge bulbous burls, the cause of which remains unknown. One spruce on the Olympic Peninsula is 36 inches (90 cm) in diameter but has a burl 84 inches (213 cm) across.

Sitka spruce on coastal headland

Sitka spruce burls

Ecological Role

Much of Sitka spruce's range near the ocean supports thick stands of young conifers that have arisen after logging. Conversely, numerous parks and other preserves contain old forests. Sitka spruce is considered shade tolerant and would thus be an able competitor for growing space except that its principal associates—western hemlock and western redcedar—are very shade tolerant. Hemlock regenerates abundantly in shady places and gradually replaces Sitka spruce—except when a major disturbance intervenes.

Logging that bares sizable areas of ground, forest fires, and extensive windthrow provide spruce seedlings an opportunity to get established. Sitka spruce bark is thin and provides little protection against forest fires that develop on the rare occasions when the luxuriant vegetation dries out and a fire is ignited. Dry lightning storms are unusual in Sitka spruce forests, but wildfires started by humans are more common. Sitka spruce has a shallow root system, and raging storms often wrench giant trees out of the ground or shatter their trunks. Even in areas that haven't experienced these disturbances in two centuries or longer, Sitka spruce has one advantage over hemlock: It grows larger and lives longer, and this allows spruce to persist in small numbers for prolonged periods.

An exceptional kind of old-growth spruce-hemlock forest graces broad valleys on the prodigiously rainy western slopes of Vancouver Island and the Olympic Peninsula. Although some vegetation scientists argue that true rain forests develop only in the tropics, these distinctive spruce-hemlock forests are commonly known as temperate rain forests (Franklin and Dyrness 1973; Kirk 1966). In Olympic National Park, they occupy river terraces and consist of massive Sitka spruce, western redcedar, and more numerous western hemlock growing in relatively open stands along with broad-crowned bigleaf maples half as tall and sprawling vine maples. Moss hangs from the maples and a thick carpet of moss and herbs blankets the forest floor. Foraging by herds of Roosevelt elk apparently prevents development of a dense shrub and hemlock understory. The rain forests are easily accessed by roads up the Hoh, Queets, and Quinault rivers. Recently, biologists have raised an intriguing question: Do the tons of spawning salmon that die along streams each year have a fertilizing effect in these riverside forests (Gende and others 2002)?

Most conifers cannot regenerate in moss-covered ground, but they can get established on rotting logs and stumps and even in the clods of soil clinging to roots of overthrown trees. Succulent new shoots on Sitka spruce

saplings are a favorite food of elk and Columbian black-tailed deer, thus growing high atop a rotten log or stump affords saplings protection. Only in such an ultrahumid environment is it possible or necessary for conifer seedlings to grow on these elevated microsites, but many of the big spruce trees in the rain forest stand off the ground on stilted root systems that centuries ago spanned a log or stump. Often, large trees are lined up in a row or colonnade revealing their origin as seedlings on the same rotten log.

Human History

Native peoples of the North Pacific coast made many uses of Sitka spruce (Moerman 1998). Its fine, pliable roots were woven into baskets and rain hats. The roots were also heated, softened, and pounded to make cord. Spruce gum was chewed for pleasure and used medicinally for sore throat and cough. Spruce resin served as glue, sealer, and waterproofing agent. Natives and pioneer settlers split shakes from spruce for siding and roofs.

The wood of this species is light, stiff, soft, and easily worked and painted, but it is also exceptionally strong and resilient for its weight. Thus it is well suited for a myriad of purposes ranging from ladders to racing shells. Its most storied use came during World Wars I and II when it supplied much of the wood used in American and British air forces. Sitka spruce forests were heavily logged during the war years to obtain the very small percentage of flawless wood that could qualify for airplane frames and propellers. In those days, wooden aircraft could be produced in less time than was needed for fabricating, riveting, and welding metal planes, and spruce wood was generally less vulnerable to shock and serious damage in combat. (Howard Hughes' famous postwar *Spruce Goose* airplane was, however, framed in birch.)

Sitka spruce is highly resonant, and select-grade logs are of great value for musical instruments. Appropriately, Sitka spruce wood is used for the sounding boards that are mounted like billboards at strategic points along narrow navigation channels, which are themselves often lined with spruce trees. Boat captains determine their location in fog or darkness in hazard-strewn passages by the spruce sounding board's echo in response to blasts from the vessel's horn.