LODGEPOLE PINE AND SHORE PINE

Pinus contorta, Pine family—Pinaceae

Lodgepole pine and shore pine are different subspecies within the same species, *Pinus contorta*, which is widespread and well known but much more diverse and complex than most people realize. In the Greater Northwest, we have an inland, mountain form called lodgepole pine (primarily *P. contorta* subspecies *latifolia*) and a coastal lowland form called shore pine (*P. contorta* ssp. *contorta*).

Lodgepole pine is best known as the small, straight, slender tree that dominates millions of acres among the inland mountain ranges, often growing in dog-hair stands—where the trees are crowded "as dense as the hair on a dog's back." Lodgepole is generally short-lived and depends on occasional fires to regenerate and maintain its abundance. Without disturbances, other tree species that are longer-lived, larger, and more effective competitors (shade-tolerant) tend to take over.

Shore pine has a different specialty. It colonizes infertile sites near sea level along the Pacific coast where other trees grow poorly, if at all. Shore pine contrasts from its inland cousin by being heavily limbed and crooked—hence fitting the scientific name *contorta* that acknowledges explorer David Douglas's original description of this coastal tree. Although shore pine along the coast clearly contrasts with

Opposite: lodgepole pine; above: shore pine

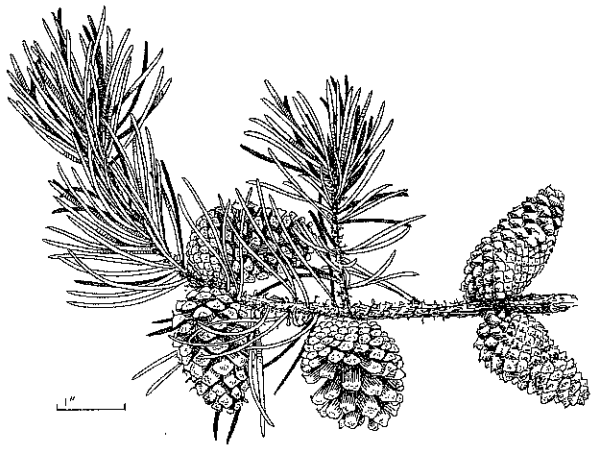
inland lodgepole pine, from the Puget Sound area northward the two subspecies meet and intergrade confusingly along the western slope of the Cascades and British Columbia coastal ranges.

A third form of this species, Sierra lodgepole pine (*P. contorta* ssp. *murrayana*), occupies the high mountains of California and evidently intergrades northward with lodgepole pine (ssp. *latifolia*) in Oregon. Sierra lodgepole can maintain its diameter growth for hundreds of years, thus achieving impressive girth, and it is not necessarily dependent on fires for its perpetuation (U.S. Forest Service 1990).

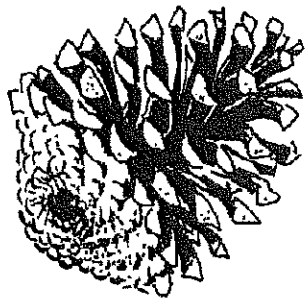
Comparative Appearance

Lodgepole pine and shore pine are the only native Northwestern pines with short needles—about 2 inches (5 cm) long—in bundles of two. Vigorous seedlings and small saplings have needles 3 to 5 inches (8 to 13 cm) long. The two subspecies bear similar needles and cones, except that foliage tends to be yellow-green in lodgepole pine and dark green in shore pine.

Lodgepole and shore pines also have distinctive little cones 1½ to 2 inches (4 to 5 cm) long with a prickle on the back of each cone scale. Often, closed and open cones remain on the trees for many years. In trees whose canopies are high overhead, the cones stand out like little burrs, aiding identification. Both shore



lodgepole pine



shore pine cone

pine and lodgepole are precocious and prolific cone bearers, usually yielding some viable seeds by about ten years of age—perhaps an adaptation to frequent fire.

Mature lodgepole pines usually have thin, scaly, gray-brown bark, which is easily peeled off with a pocket knife. In contrast, mature shore pines have moderately thick, corky, dark brown bark divided by deep fissures in a checkered pattern. Interestingly, low-elevation lodgepole pines near Priest Lake in northern Idaho have the thick, dark bark and other features of shore pine (Johnson 1995).

LODGEPOLE PINE

Where It Grows

Lodgepole pine is abundant across a broad range of elevations in the inland mountains of the Greater Northwest, including the eastern slope of the Cascades. It is ubiquitous throughout interior British Columbia and the Rocky Mountains of Alberta, save for extremely dry sites and the highest alpine areas. It also extends northward to the Yukon Territory. South of the Greater Northwest, lodgepole is confined to increasingly high elevations, commonly reaching 11,000 feet (3350 m) in southern Colorado.

Appearance

Lodgepole pines in the Greater Northwest are usually small trees with a straight, slender trunk. On dry, rocky sites, mature trees may be only 8 inches (20 cm) in diameter and about 40

feet (12 m) tall, while on deep soils in sheltered valleys, they commonly surpass 16 inches (40 cm) in diameter and 90 feet (27 m) in height.

After fire or logging, lodgepole pine seedlings often become established more abundantly and grow more rapidly than other species; thus, lodgepole saplings on relatively open sites have narrow, pyramidal canopies. By the time young trees reach 15 feet (4.5 m) in height, their lower branches die. By about 70 years of age, lodgepole pines typically have a narrow, thin canopy that starts high above the ground, and their diameter and height growth has slowed dramatically. In stands more than 100 years old, lodgepole pines have usually been surpassed in height and diameter by associated western larch, Engelmann spruce, and Douglas-fir.

For other characteristics, see Comparative Appearance, above.

Ecological Role

Lodgepole pine can tolerate a very broad range of growing conditions, and it forms pure stands in habitats too adverse for other species, such as on the high-elevation volcanic substrates of central Oregon. At Crater Lake National Park, pure, even-aged stands of lodgepole pine grow on droughty pumice flats where ground-surface temperatures reach 140 degrees F (40 C) on sunny summer days but can plummet to freezing before dawn (U.S. Forest Service 1990).

On the eastern slope of the Cascades, lodgepole also occupies a thin layer of soil resting atop hardened clay. This band of soil is soggy for long periods because water cannot drain through the clay pan. Lodgepole develops a shallow rooting system and forms pure stands. Ponderosa pine occupies adjacent well-drained and thus droughty soils but gives way to lodgepole in low-lying frost-pocket sites. New lodgepole pine seedlings can withstand growing-season temperatures as low as 15 degrees F (–9 C) without injury (Cochran and Berntsen 1973).

Nevertheless, in most situations lodgepole pine must compete with other, more shade-tolerant trees. In these habitats, lodgepole depends upon fires to help it compete, and it can benefit from fires of contrasting intensities (Arno 2000). Historically, in some cold, dry mountain forests, creeping fires of low intensity killed lodgepole's principal competitor, the highly fire-sensitive subalpine fir. Lodgepole pine has a low level of fire resistance, vastly superior to that of the fir, and thus it often survived creeping fires.

Old lodgepole pines frequently bear scars from one or more historic fires. These appear as a narrow, upside-down V (or multiple, nested Vs) of bare, dead wood often extending several feet up from the ground. Fire scars are accompanied by charcoal on burned twigs, old bark, or other nearby wood, which helps differentiate them from the irregularly shaped scars caused by bark beetle attacks. Porcupines also leave telltale scars when they feed on the inner bark of lodgepole pines. In winter, these slow-moving creatures spend much of their time in tree canopies, chewing off bark in irregularly shaped patches scattered all along the tree trunk.

Often in the mountain forests, fires of variable intensities killed patches of trees, creating openings that allowed fast-developing lodgepole saplings to regain dominance despite an abundance of more competitive (shade-tolerant) trees. Lodgepole pine is commonly the most abundant seed source in a mixed forest because it produces and retains large numbers of both open and closed cones. The open cones rain thousands of small, winged seeds almost every year. The closed (serotinous) cones remain shut, storing and protecting viable seeds. Then, when a fire burns the trees, these cones open slowly in response to the heat, and seeds fall into the cooled, ashy seedbed.

On relatively productive sites, lodgepole pine tends to be short-lived and is largely replaced by other conifers within about 80 years. Cold, moist habitats such as high-elevation spruce-fir forests often have no lodgepole

because these habitats burned so infrequently. In cold, dry habitats, such as the 7500-foot (2300-m) Yellowstone Park plateau of northwestern Wyoming, lodgepole persists far longer—some trees surviving more than 300 years. Thus, lodgepole might continue to dominate even where intervals between fires averaged three centuries.

In addition to coping with competing tree species and fires, lodgepole pine is subject to two major plagues: the parasitic plant dwarf mistletoe (*Arceuthobium*) and mountain pine beetles. Both these agents were historically kept in check when fires were relatively frequent. Dwarf mistletoe is comparable to the Christmas mistletoe except that it has tiny, scalelike leaves. After the sticky dwarf mistletoe seed lands on a branch, it germinates and sends a rootlike growth into the branch, removing nutrients and causing the branch to swell and often to produce the bushy growth called a "witch's broom." The small, yellow dwarf mistletoe plant can be seen growing out of the limbs, especially in summer when its fruiting bodies form. These are little capsules that explode at maturity, hurling the seed several feet and thus allowing the infection to spread slowly. The sticky seeds can attach themselves to a bird's foot and thereby occasionally get transported a long distance to another tree.

Mountain pine beetles kill trees by tunneling into the inner bark and then raising their brood (larvae) there. A vigorous lodgepole pine will "pitch out" attacking beetles, in effect drowning them in sticky pitch. However, beetles can gang up on a tree, using pheromones (chemical signals) to attract other beetles. Such attacks can overpower a tree's defenses when it is already weakened by drought or excessive competition. Beetles require larger trees—greater than 8 inches (20 cm) in diameter—for brood development and are particularly favored by extensive forests of old lodgepole pines where most trees have poor vigor. Thus, periodic fires that recycle lodgepole pine forests tend to keep beetle epidemics in check. In contrast, prolonged periods without fire allow forests to become old and vulnerable to attack. Unusually cold weather in summer or winter can also help control beetle populations.

Human History

The straight, slender stems of lodgepole pines have traditionally been a favorite material for housing (Hart 1976). Lodgepole was the prime source of tepee poles used by Native Americans in the Rocky Mountains and nearby high plains. Native peoples often traveled long distances to get the slender, strong, lightweight stems of small lodgepole pine trees that, when covered with animal skins, served as their mobile lodges. Women cut and peeled twenty-five to thirty poles about 25 feet (8 m) long for each tepee, then dried them in the sun. As the poles were dragged for many miles from one camp area to another, they wore out and thus had to be replaced annually.

Native peoples used the thin inner bark of lodgepole pine as an emergency food for themselves and especially for horses. At a meadow near Lolo Pass on the Idaho-Montana divide, large quantities of lodgepole pines, now dead, have bark-peeling scars dating from the 1877 Nez Perce escape from U.S. Army subjugation. These trees are artifacts from when Chief Joseph led his people along with perhaps 3000 ponies on their unsuccessful march toward Canada and freedom (Beal 1963).

The first European-American settlers also preferred the smooth, straight, easy-to-peel trunks of lodgepole pine for their log cabins. Today, builders of expensive log homes pay dearly to acquire large dead lodgepole pines with uniformly round stems and minimal taper. Rural residents favor lodgepole for posts and rail fences. Lodgepole pine is also sawn into lumber and is popular for firewood.

Recently, lodgepole pine became the focus

of a forest management conundrum. Suppression of fires for more than seventy years has allowed lodgepole pine forests to age across large landscapes and become highly susceptible to mountain pine beetle epidemics. Beetles killed most lodgepole pines on about 15 million acres (6 million ha) in British Columbia alone during the first few years of the twenty-first century. This glut of dead timber contributes to the hazard of large, severe wildfires—which would presumably trigger development of young forests of lodgepole pine.

Canadians have stepped up the harvest of beetle-killed lodgepole pine. Also, starting in 1983, managers in Banff National Park, Alberta, and neighboring national parks began conducting stand-replacement burns in selected areas as a substitute for historical fires, to help re-create a landscape mosaic that includes young forests and thereby restores biodiversity and reduces hazard of beetle epidemics and gigantic wildfires (Arno and Fiedler 2005). Prescribed fires are conducted after the snow melts off in spring, at a time when wildfire hazard is relatively low and seasonal tourism is in a lull.

There is a precedent for using human-ignited fires in these national parks. At several locations in the lodgepole pine forest in and near Banff National Park, remains of earth-sheltered pit houses and other artifacts indicate that humans have been part of this ecosystem for a few thousand years. Anthropological evidence indicates that human-caused fires have been important for hundreds of years or longer in Alberta's mountain valleys, which are within traditional hunting grounds of the Blackfeet and other Native peoples (Kay and others 1999; Stewart 2002). This burning evidently attracted plains bison up into mountain valleys, where they could be hunted (White and others 2001). Also, on the west slope of the Rockies in the Kootenay River valley, explorer David Thompson noted that tribal people frequently set surface fires to clear brush and attract game to the subsequent new growth (Nisbet 1994).

In U.S. national forests, environmental concerns and litigation have largely prevented timber harvesting in aging or dead lodgepole pine. However, managers of wilderness areas and national parks in Idaho and Montana have allowed lightning-ignited fires that do not threaten developed areas to burn and restore historic natural patterns in lodgepole pine forests.

SHORE PINE

Where It Grows

Shore pine occupies sand dunes, swamp, muskeg, bedrock, and other extremely infertile sites in the coastal lowlands from northern California northward through the Alaska Panhandle. Shore pine also colonizes logged, burned, or otherwise disturbed habitats on poor-quality mineral soils, such as compacted glacial gravels or hardpan.

Appearance

In hostile substrates, shore pine grows stunted, contorted, and bushy but seldom has to compete with other trees. On less-severe sites, shore pines grow straight but are squatty and with relatively large limbs often extending nearly to the ground. For additional characteristics, see Comparative Appearance, above.

Ecological Role

In some places in the Puget Sound basin, fires were frequent enough in centuries past to perpetuate shore pine, Oregon white oak, and other shade-intolerant species that without disturbance are replaced by Douglas-fir or other more competitive trees.

Human History

Shore pine was historically sought out for pitch (as a fastener and sealant) and resinous gum (for chewing and medicinal use) by coastal tribes, evidently in much the same manner as was western white pine (Moerman 1998).