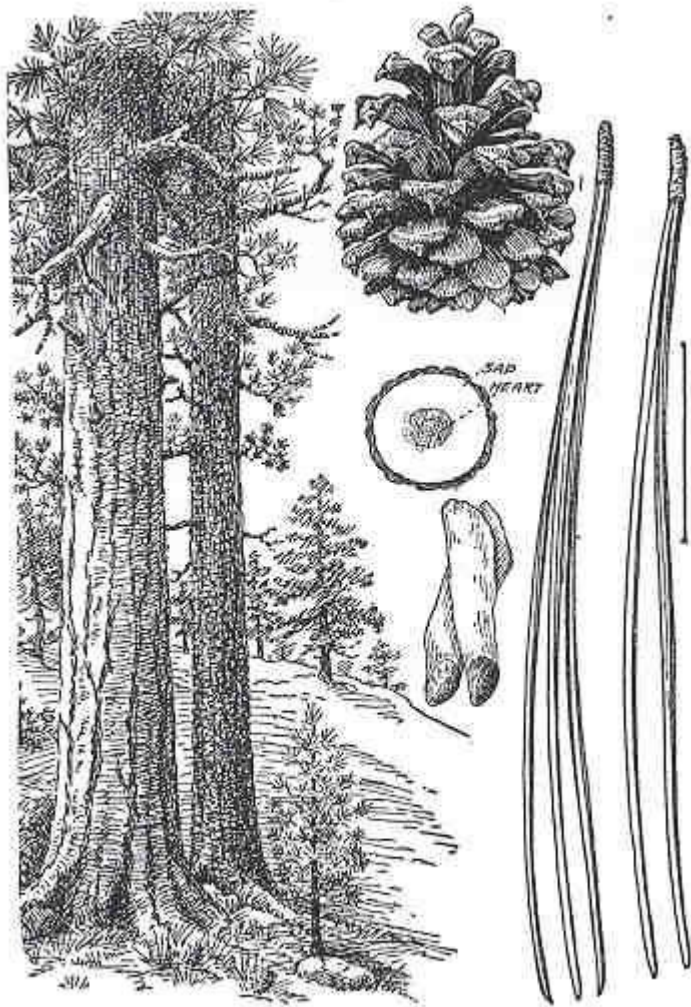


Ponderosa Pine



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Its dry and spacious groves invite you to camp among them. Its shade is never too thin and never too dense. Its great boles and boughs frame many of the grandest views, of snow-capped cones, Indian-faced cliffs, nostalgic mesas, and all that bring the world to the West's wide door.... If you have been long away from the sound of the Western Yellow Pine, you may, when at last you hear it again, close your eyes and simply listen, with what deep satisfaction you cannot explain, to the whispered plain-song of this elemental congregation. - Donald Culross Peattie

Ponderosa pine is one of the best-known trees of the American West, and covers a more extensive area than any other American conifer. Ponderosa grows from Mexico to British Columbia, and from the Pacific Coast to South Dakota. In the southern Rockies it grows in sunny and fairly dry locations at 5500 to 8000 feet (1680 to 2400 m) elevation, and occasionally to 10,000 feet (3050 m) elevation.

Ponderosa pine can endure drought and high temperatures, suiting it to locations where many other kinds of conifers could not survive, including south-facing and west-facing slopes. In such cases it has a stout and rounded form. In a very dry setting a Ponderosa 10 inches (25 cm) thick may be 120 years old.

Ponderosa has the longest needle of conifer trees in the southern Rockies, and the needles make a musical sighing when the wind blows. On warm summer days the resin in bark and twigs gives forth a delightful odor. When the wind is right on a warm summer evening Ponderosa forests can be scented miles downwind. The trees' natural fragrance is chemically close to vanilla.

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Ponderosa is the common tree of the lower mountain foothills and slopes along the eastern side of the Colorado Rockies, in parts of the San Juan mountains, and elsewhere. In the lower foothills the Ponderosa forests are typically open and parklike. The trees usually reach only moderate size and are separated by fields of grass and low shrubs.

Slightly higher up, Ponderosa pine is mixed with Douglas fir and may reach large and handsome dimensions. South-facing slopes are often dominated by Ponderosa and the adjacent cooler and wetter north-facing slopes covered with Douglas fir.

Extensive pure forests of Ponderosa grow in northern New Mexico, southern Colorado, and in the Black Hills. Ponderosa does not occur naturally in the western half of Wyoming including Yellowstone and the Tetons.

Mature trees often have wide upper crowns, and can be flat-topped, unlike many other Colorado conifers. The lower half of the trunk is generally free of limbs. Some Ponderosa are the largest trees in Colorado, reaching 80 to 100 feet (25 to 30 m) high, and 3 to 4 feet (0.8 to 1.2 m) in diameter, though usually they are not so tall as the firs and spruces of the high forests. The largest Ponderosa pine grows in Oregon. It was 161 feet (49 m) high and about 8 feet (2.4 m) in diameter when measured. Ponderosa pine generally lives to 250 years or more if conditions permit; the oldest trees are around 650 years old, but they rarely exceed 500 years. The oldest Ponderosa in Colorado now is about 850 years old; the oldest known Ponderosa in Colorado reached 1047 years, in Mesa Verde.

Low temperature inhibits Ponderosa growth, so it is generally not found in the higher forests. In southern and central Colorado Ponderosa pine grows on a few warm sites up to 10,000 feet in elevation. There is a fine grove at 9200 feet beside Twin Lakes, Colorado.

The most extensive forests of this tree in Colorado, with the largest individual trees, with favorable moisture and soil, occur in the southwestern portions of the state. Lumbering cut many of the large trees there. Since the end of lumbering some of this land has been reforested by natural reseeding of this tree.

Ponderosa on the western slope of the southern Rockies can be larger and more majestic than the trees of the eastern side of the mountains. Fine examples are found from Pagosa Springs to Bayfield on the south flank of the San Juan Mountains, on the Uncompahgre Plateau, and on the Blue Mountain Plateau.

Ponderosa pine has a deep taproot, unlike many other conifers in the southern Rocky Mountains. Young trees start by growing a taproot that may go down farther than the main stem grows upward. This allows the young tree to survive drought that can dry out the topsoil. Mature trees may have a taproot up to 36 feet (11 m) deep; they also grow a lateral root system that extends as much as 100 feet (30 m) from the tree to absorb surface moisture quickly from rain and snow. These roots make it very difficult for winds to uproot Ponderosa pine – and in some areas peak wind gusts may reach 100 mph (160 km per hour) every year or two.

Seed production is erratic and large seed crops are rare. And, it is difficult for Ponderosa seeds to germinate and to survive. Seedlings require above-normal precipitation, and that must continue for several years until the new trees are established. Grass, if present, can present a serious obstacle to seedling establishment by competition for moisture. It appears that fires which temporarily suppress or eliminate the grasses may provide the best opportunity for seedling survival.

Years of high moisture following both fire and high seed production seem to provide the best chance for new Ponderosa pine trees. The result of all these factors is that successful establishment of

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Ponderosa pine is infrequent, occurring only in the rare periods when all the factors are favorable. Various combinations of these factors in different degrees, such as the intensity of fire in an area, can produce various age distributions in Ponderosa pine forests. Some are even-aged stands, while others have groups of trees with a variety of ages in each group. In every case regeneration of Ponderosa pine is not common. Intervals as long as forty years or more may pass with few new trees.

Photographs made in early mining communities show widespread devastation in existing forests caused by logging and fires in the early days of settlement. The disruption in Colorado forests associated with early mining settlements extended all along the "Mineral Belt" where mining was active, along a belt from just south of Rocky Mountain Park, southwestward to the San Juan mountains, and in that region this process greatly increased the presence of pioneer tree varieties typical of early forest recovery from disturbances.

Since about 1900 successful fire-fighting efforts have prevailed, and in the twentieth century the frequency of fires in the mountains was much lower than before the first miners arrived. The suppression of fire in Ponderosa terrain since about 1900 has resulted in more trees but smaller, less robust ones. The weak trees can be infested by bark beetles and other pests.

While it is not true that all forest fires are "good" for forests, Ponderosa pine is adapted to benefit from frequent, low-intensity fires started in summer by lightning. Ponderosa has thick bark which prevents small low fires from killing the tree. These fires kill smaller plants which compete for moisture. Fires release nutrients in the litter, and prevent accumulation of abundant fuel later causing severe fires which can destroy the trees' bark defenses.

Despite these difficulties Ponderosa pines have spread into mountain sides and montane grasslands throughout the central Colorado mountains which were free of trees when the first mining prospectors and settlers arrived around 1850. Several reasons have been suggested, including changes in climate, more fires (eliminating competition for moisture by grasses), fewer fires (here regarded as killing seedlings), and changes in grazing. Areas heavily grazed and then protected from grazing have regenerated well.

Ponderosa is attacked by some 16 kinds of bark beetles among about 100 sorts of insect pests. Other damaging agents include fungus, Dwarf mistletoe (described under the Lodgepole pine), and air pollution notably ozone.

The most serious pest of Ponderosa pine is the mountain pine beetle (*Dendroctonus ponderosae*). Beetle-infected wood is stained blue by a fungus which the beetle introduces into the tree and which then spreads and grows by itself. The combined attack of beetle and fungus can kill the tree in two growing seasons. In late summer the female beetle lays eggs in tunnel or "galleries" in the living tissue of the tree just below the bark. The larvae hatch and feed on the blue stain fungi growing in the galleries. In winter the cold larvae are inactive; a severe cold spell can kill them. In spring and early summer the larvae resume feeding on the tree tissue. They transform to adult beetles by midsummer. Female beetles - about 1/5 inch long - emerge in July and August and fly to new trees, and males follow them. The beetles carry fungi spores in depressions on the surface of their heads, which start new fungal colonies. The fungal growths stop fluid flow in the tree which would otherwise kill or drive out the beetles. Healthy trees respond to boring by the beetles by making resin that pushes the beetles from the hole. Resin blobs about an inch across are found on some trees, sometimes with a beetle

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embedded in them.

The blue fungus can kill a tree in a year by cutting off flow of water and nutrients through the sapwood. The beetle galleries also cut off nutrient flow to a lesser extent.

Beetle attacks are periodic, often coinciding with abundant weak trees lacking moisture resources to combat invasion. Drought and overgrown conditions can each cause a shortage of moisture in the trees, making them susceptible to beetle attack. When both occur, as has been the case in the first decade of this century, beetle attacks, and fire, become more severe. In other years smaller numbers of beetles survive in downed and weak trees.

Ponderosa pines seeds are eaten by quail, grouse, squirrel, Abert's squirrel, mule deer, and mountain sheep. This twigs and needles are browsed by deer, sheep, and elk. The inner bark of young trees is eaten by bears, and by porcupines in winter.

Abert's squirrel, also known as the tassel-eared squirrel, notable for its tasseled or pointed ears, relies almost entirely on the Ponderosa pine tree for its existence. They make large nests of twigs high in tree tops. In the early summer they eat buds, pine pollen, and fungi. In late summer and early autumn the seeds are eaten, and from late fall into spring they survive on the inner bark of twigs. Some trees where the squirrels prefer to dine have piles of litter - discarded twigs and cone scales - around the trunk. These squirrels have gray, brown, or black fur.

Not only Abert's squirrel and the porcupine eat the inner bark of the Ponderosa pine. Late in July of 1805 the Lewis and Clark party were traveling up the Missouri River, nearing the Three Forks in western Montana, when Lewis found pine trees stripped of their bark. Sacagawea explained Indians had done this to obtain the soft inner bark for food. The inner bark of the Ponderosa was eaten by the Indians in time of famine throughout the western continent.

Ponderosa pine was first described as a new or unknown tree (to science) by Meriwether Lewis on October 1, 1805, at "Canoe Camp" near the modern Orofino Idaho. After a very difficult crossing of the mountains from the Three Forks area on the Lolo Trail, "a stirring episode of heroic scale," Clark had found pines large enough to make dugout canoes on the Clearwater river. Canoe Camp was established at the mouth of the North Fork of the Clearwater. Here five large Ponderosa pines were cut and made into dugout canoes to carry the entire party and its goods down the Clearwater, Snake, and Columbia to the Pacific. Hollowing out the canoe hulls proved too difficult for the party, somewhat weakened by hunger and illness, and the explorers resorted to the Indian method of burning out trunks. Five boats were finished in short order. The rapids of the Clearwater, Snake and Columbia faced the expedition. For the next two weeks they daily ran what appears to have been class three whitewater in thick wooden canoes weighing hundreds of pounds. On the second day out one boat struck a rock, split open, and sank. After that they were more careful, but more than once a boat was overturned and equipment lost. Despite these difficulties, the canoes were surely the best way to cross so much rugged country with reasonable effort. In late November they reached the Pacific, Ponderosa pine dugout canoes carrying the Lewis and Clark expedition quickly through an important part of their journey.

On the return trip, back near the Canoe Camp in the Bitterroot Mountains in May 1806, Lewis and Clark learned of another starvation diet - the seeds of the Ponderosa. Lewis wrote in his journal "the seed of this species of pine is about the size and shape of the large sunflower; they are nutritious and not unpleasant when roasted or boiled." The same Indians were also eating the a lichen which grows in filaments from the pines, by pit roasting with wild onions.

In the ancient southwest Ponderosa provided roof beams and door lintels in Anasazi pueblos and cliff

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dwellings. One Ponderosa beam in a kiva roof at Chaco Canyon weighed over a ton; and there are hundreds of large pine beams in the Chaco pueblos. The nearest source for such wood was over 50 miles way. In more recent times pine logs, usually Ponderosa and Lodgepole, provided the numberless ties for the steam railroads that crossed the mountain passes and penetrated to all the boom towns and camps of the mining era. Today Ponderosa provides more timber than any other American pine tree, and is second only to Douglas fir for any tree.

The "common" name Ponderosa is fairly new: as recently as the 1920s that name was unknown – cattlemen in the old west did not name their ranches "The Ponderosa." Until then the large trees were called western yellow pine; the young dark-bark form was commonly called bull pine or blackjack pine. The current common name derives from the Latin name.

David Douglas, a young Scottish explorer and naturalist, published the first botanical description of Ponderosa pine in 1830. The species name *Pinus ponderosa* was given by Douglas, and refers to the heavy weight of the enormous Ponderosa pines on the Pacific coast where the tree was first identified by Douglas. Botanists name the Ponderosa pine variety of the Rocky Mountains and Colorado "*Pinus ponderosa* Douglas ex P. & C. Lawson subsp. *scopulorum* (S. Watson) W. A. Weber," *scopulorum* meaning "of the rocks." It differs from the species in having slightly smaller cones, shorter needles, smaller overall size, and often two-needle bundles. The Rocky Mountain variety intergrades with the species. Ponderosa pine is the state tree of Montana.

Identifying features of Rocky Mountain Ponderosa pine

Needles

Needles normally occur in bundles of two or three; rarely as one, four, or five. The needles grouped together in a bundle form a cylindrical shape, so each needle is, for example, one half or one third of a circle in cross section. Needle length is usually in the range of 4 to 7 inches (10 to 18 cm) long. Only Ponderosa pine has such long needles among the conifers of Colorado. Longer needles, up to 11 inches (28 cm), are occasionally found on trees in better conditions, such as moist sites. Needles stick out from the twigs in all directions and persist only a few years, and hence are concentrated at the ends of branches, giving the branches tufted ends. Young foliage tends to be dark green and the older trees have needles tending to yellow-green, though not quite so yellowish as in Lodgepole pine.

Cones

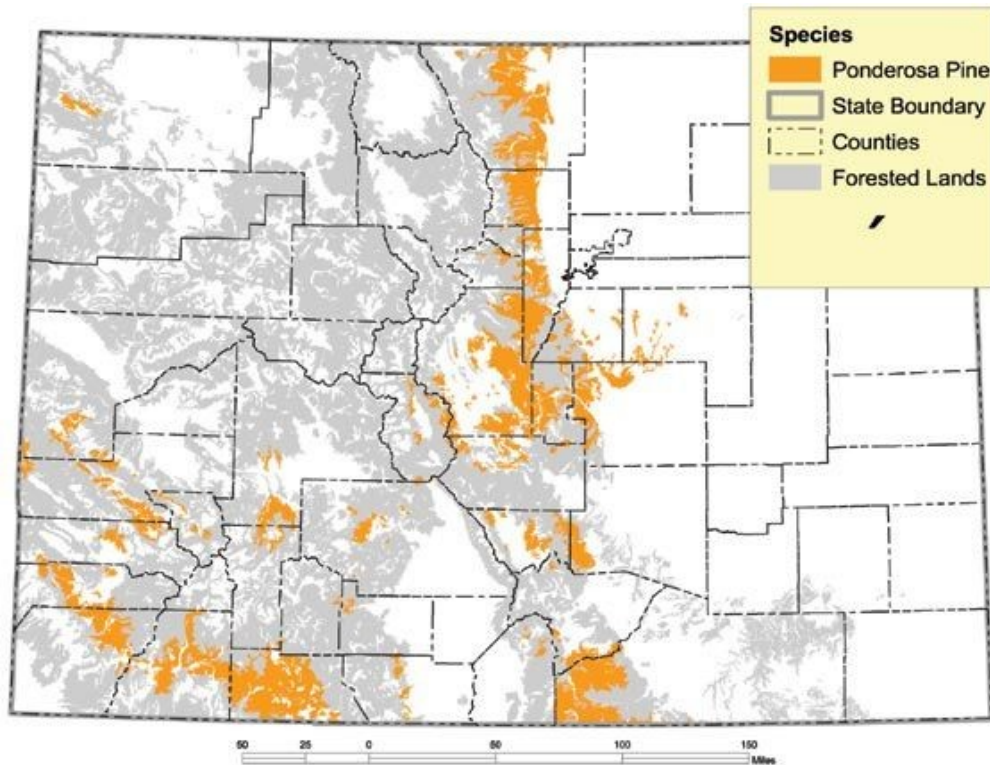
Mature cones are 2 1/2 to 6 inches (6 to 15 cm) long, and fairly broad. Each thick hard scale is tipped with a short bristle. The cones open before they fall from the tree. Seeds are about 1/4 inch long, brown or brownish-purple, with wings 1 inch long. When mature cones fall from the tree, they may leave a few scales from the base of the cone attached to the branch.

Bark

Very young trees (less than 1 1/2 inch (4 cm) diameter) have smooth gray bark rapidly becoming darker and broken into small scales. Older trees' bark is thick, dark brown or black, and furrowed. Bark of mature trees (over 100 years) is 2 to 4 inches (5 to 10 cm) thick, bright yellow-brown, orange-brown, or cinnamon-red, finally becoming yellow in very large old trees (rarely seen now), in broad irregular scaly plates, up to a hand's breadth across, separated by furrows. Even trees below twenty feet in height can have bark in large plates composed of smaller scales. The scales, smaller than an inch across, are pale orange-brown and have curved interlocking edges, and leave a flat shallow depression when they

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fall from the tree. Some large old trees are entirely covered by thin scales, lacking the plates and furrows. The orange-brown or reddish-brown bark color is similar to the color of the bark of some Lodgepole pine and mature Engelmann spruce, but the bark is not otherwise very similar. As usual, bark is not the best way to identify this tree, but a cut trunk will show the thick bark.



Map by Colorado State Forest Service

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