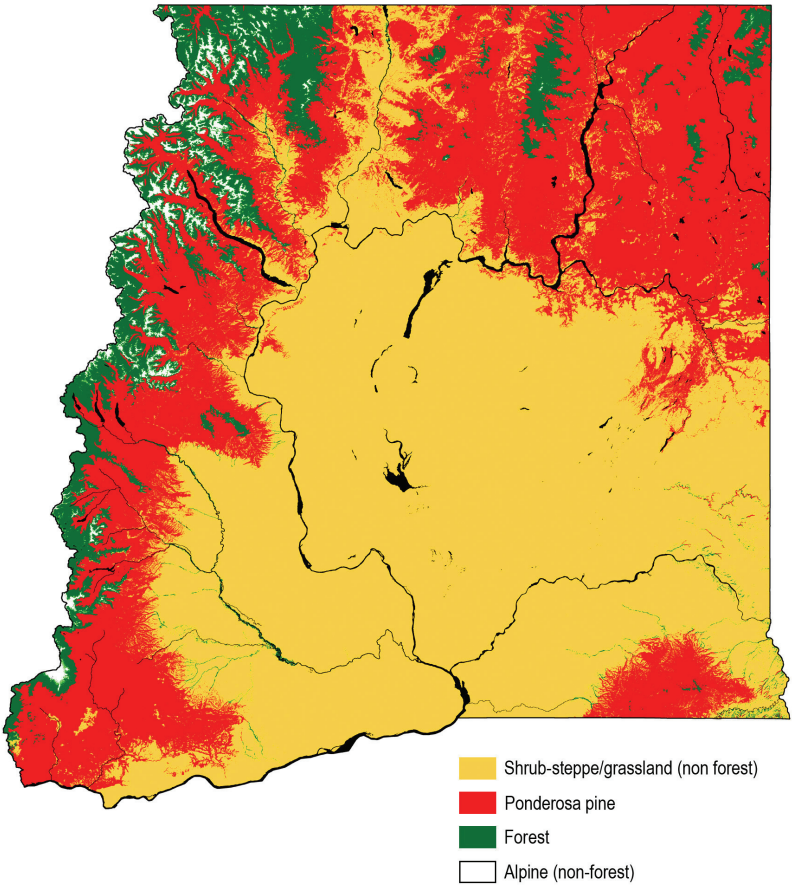
Ponderosa Pine (*Pinus ponderosa*)

Throughout most of western North America, ponderosa pine is the first tall tree encountered as one travels up into the mountains. Whether it is from the Great Plains into the Colorado Front Range, from the Nevada deserts into one of the

Figure 53. Ponderosa pine is the first tree encountered as one leaves the Columbia Basin and ascends into the mountains. Scattered trees in woodlands often occur before one reaches the forest.

Figure 54. Range of ponderosa pine in eastern Washington.



Great Basin ranges, or from the sagebrush steppe of eastern Washington into the Okanogan Mountains, the tall stature and orange-yellow bark of the ponderosa pine is unmistakable (Figure 53). Having a drought tolerance only exceeded by piñons, junipers, and other steppe and desert plants, ponderosas are emblematic of the American west.

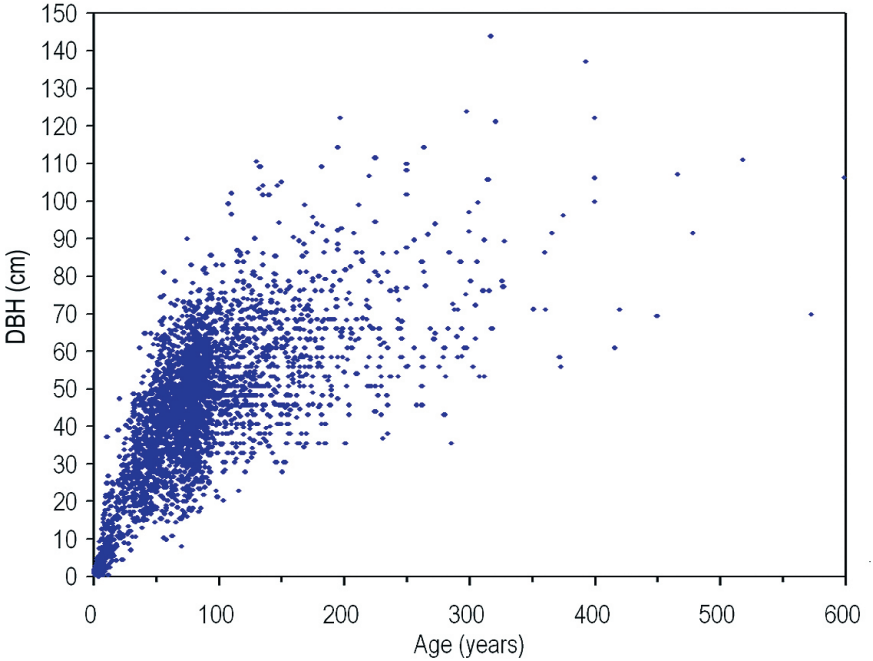
In eastern Washington, the distribution of ponderosa pine defines the lower treeline on all sides of the Columbia Basin (Figure 54). The few exceptions include woodlands of Oregon white oak or western juniper in the South Cascades and the sparse stringers of valley bottom hardwoods that occasionally stray further

into the shrub-steppe or grasslands. The ability to tolerate harsh conditions, including drought, heat, and surface fire, allows ponderosa pine to occupy most habitats (Figure 55)—the species is a component in most forest types in eastern Washington, including some at fairly high elevations. Its competitive ability is limited primarily by its low relative shade tolerance. The presence of Douglas fir or grand fir in the main canopy, or any closed canopy situation, prevents young pine seedlings from thriving.

As with many tree species with wide distributions and ***ecological amplitudes,*** age and size of ponderosa pine are not closely correlated. Because ponderosa pine can grow in most of the vegetation zones in eastern Washington, from rocky cliffs to riparian zones, the size of a tree reveals little about its age (Figure 56)—an 80 cm (31 in) diameter tree in eastern Washington could be 60 years old or 600.

Figure 55. The remarkable adaptability of ponderosa pine will occasionally allow a tree on a rocky cliff to live for centuries, such as this tree in the South Cascades.

Figure 56. Poor correlation between size and age for ponderosa pine. Data are all from eastern Washington and include data from the Washington State DNR, the U.S. Forest Service, and the author.



Ponderosa pine is one of the ***hard pines*** (subgenus *Pinus*), characterized by heavy (ponderous), somewhat decay-resistant, resinous wood. Abundant resins in healthy trees help defend against attacks by the mountain or western pine beetle. Ponderosa pine has been a very important timber tree. The wood of old trees is strong, often clear, and has been used to produce products ranging from lumber to much higher-quality finished products such as moldings.

The sapwood of ponderosa pine is thicker than any of its associated trees (Figure 57). In many species, sapwood is often weak and prone to decay and contrasts sharply with heartwood. Sapwood comprises a large portion of young ponderosas as well as trees close to maturity, dramatically decreasing their market value. In addition, the wood of young-to-mature trees is knotty, containing the embedded remains of lower branches. These young trees are often called ***bull*** or ***blackjack*** pines, a reference to their poor lumber value. Therefore, the difference in timber value between an old and a young pine is substantial.

Figure 57 above. Thick sapwood is a characteristic of ponderosa pine. Young trees, which consist of nearly all sapwood, have little commercial value.

Figure 58 right. The strange and lovely puzzle-piece bark of ponderosa pine.

Bark characteristics

The orange-yellow bark, comprised of a myriad of small, puzzle-piece flakes, is characteristic of older ponderosa pines (Figure 58). When warmed by the sun, the bark has an aroma of vanilla, butterscotch, pineapples, or even cream soda, caused by the presence of terpenes – complex hydrocarbons that are the source of scent for many herbs, spices, and perfumes.

The thick bark of ponderosa pine is key to its ability to survive fire. For the first century, the bark is dark brown to nearly black and begins to break up into thick, vertical fissures. During the second century, the outer layers of the bark ridges begin to flake off, revealing the reddish brown color characteristic of mature trees (Figure 59). As the tree ages, the outermost bark continues to flake off, causing the colorful plates of outer bark to get wider, while the width of the dark fissures

Figure 59. A maturing pine is just beginning to develop color in the outer bark.

in between remain relatively constant (Figure 60). By the third century, the bark plates have become substantially wider than the fissures, a sign of old age (Figure 61). Foresters often affectionately refer to these old, valuable trees as ***yellow-bellies***. Unlike trunk diameter, maximum plate width is well correlated with tree age—a feature we will use to help us in aging trees (Figure 62).

134 years 164 years 227 years

Figure 60. Bark patterns on mature ponderosa pine. Note residual charcoal in the center photo.

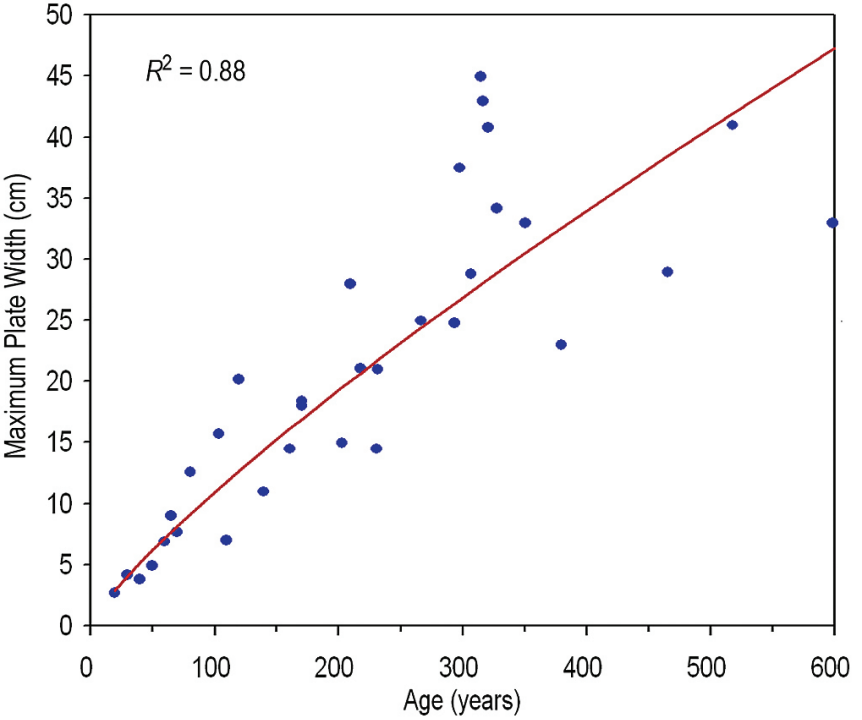
271 years 304 years

Figure 61. Bark patterns on old ponderosa pine. The colorful bark plates are generally more than three times wider than the darker fissures that separate them.

Lower crown characteristics

Ponderosa pine growth is ***whorl-based,*** like many members of the pine family. Whorl-based growth starts at the end of the growing season, when the terminal leader produces several buds at the tip. One of these buds will be the new terminal leader for the next growing season, while the remaining buds will become

Figure 62. Bark plate width is a better predictor of tree age than tree size.



branches. Each branch grows away from the others as it radiates out from the tree. Both the leader and the branches grow and elongate after the spring bud break, depending on the growing conditions. In most pine, fir, and spruce species, four to six branches are produced each year. This pattern repeats every year, so that over time the tree will consist of a series of branch whorls, separated by short sections of trunk. Each of these short sections of trunk represents the amount the leader grew in the year when that section was the top of the tree (Figure 63).

Over time, branches in the lower crown die due to shading and the lower crown lifts as the tree grows taller (Figure 64). Dead branches are usually present in the

lower crown of 100 year old trees, but eventually fall off, leaving tell-tale signs of where the branches once were (Figure 65). As the tree grows, the bark begins to cover up the locations of these former branches—however, residual evidence may be visible on trees older than 200 years (Figure 66). Only in old age (trees greater than 250 years) are the scars of original branches completely covered (Figure 67).

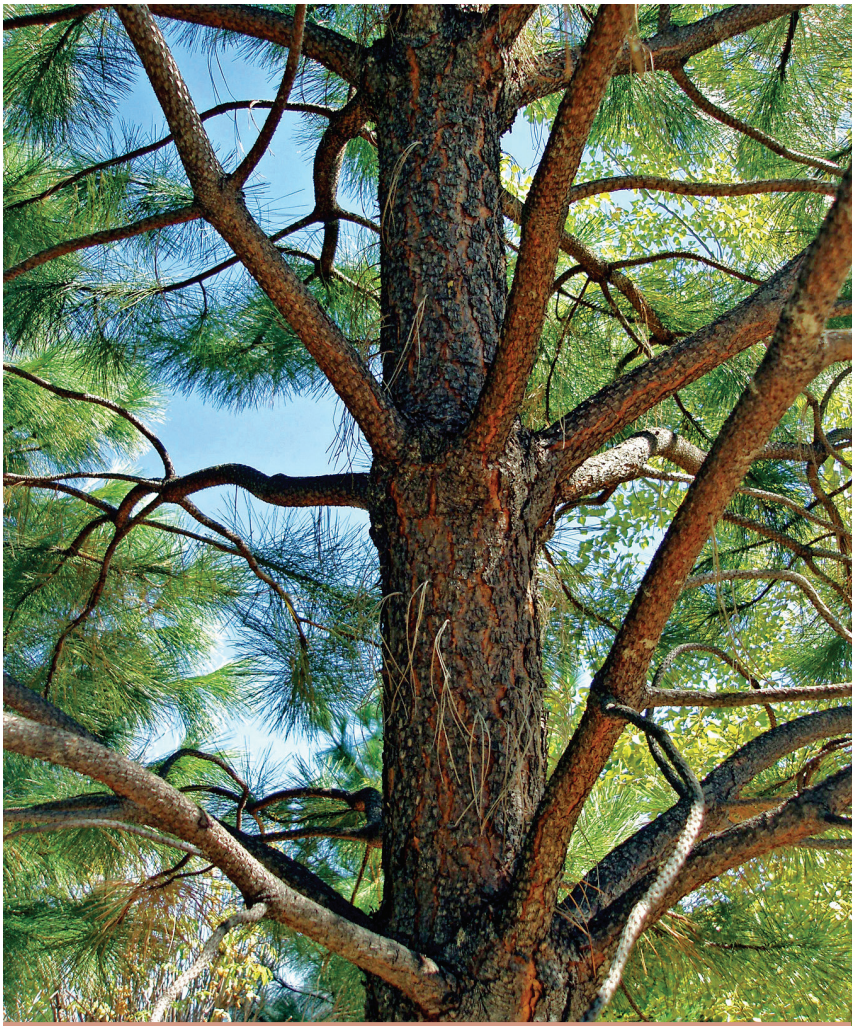


Figure 63. Whorl-based branch growth on a young ponderosa pine.

Figure 64 left. The whorl-based branch growth is clearly visible below the receding crown of this ponderosa pine.

Figure 65. Old branch whorls are still visible decades after the branches have fallen off.

In part due to the open nature of pine forests, ponderosas do not fill in their lower crowns with ***epicormic branches*** as do the more shade-tolerant associates Douglas fir and grand fir. As a result, the original branches are persistent and mature in much the same manner as the main trunk, especially in open-grown conditions (Figure 68).

Crown form and tree vigor

The appearance of a tree of a given age is affected by a number of factors, including site productivity and overall tree vigor. In general, differences become accentuated with age. To aid in their identification, a series of crown profiles of