Western Larch (*Larix occidentalis*)

Western larch signals its presence within the dense conifer forests that blanket the slopes of eastern Washington with bright yellow foliage each autumn (Figure 74) and a verdant flush of new growth each spring (Figure 75). Deciduous conifers are unusual and include only a few members of the Cupressaceae family (*Glyptostrobus, Metasequoia,* and *Taxodium*).

Figure 74. The golden glow of a western larch in autumn is unmistakable – and unforgettable.

Figure 75 above. The bright green of the new flush of larch foliage is a welcome sign of spring, and a nice contrast to the darker greens of the neighboring pines and firs.

Figure 76 left. The photosynthetically efficient foliage (with cones) of western larch. Shed each year, the soft foliage contains none of the lignins and toxins present in the perennial evergreen needles of other species. Interestingly, larch is also is relatively free of insect pests.

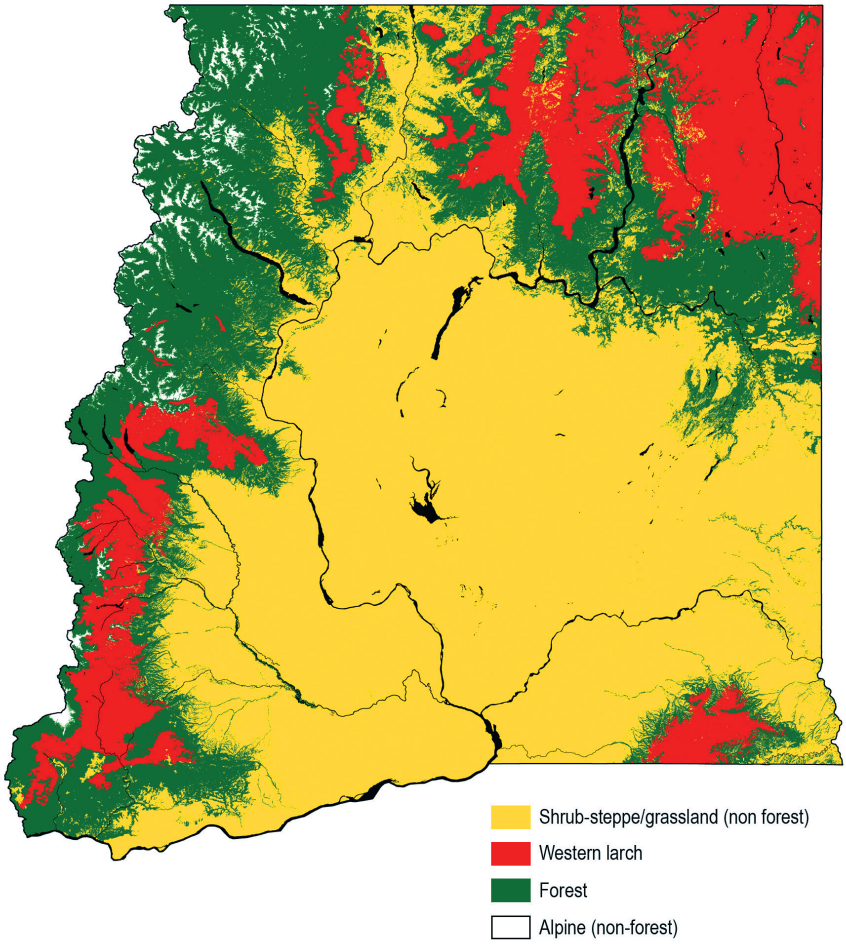
Plant physiologists have long puzzled over the advantages and disadvantages of evergreen and deciduous foliage, and leaf size and shape. The extreme environments of very high latitudes or altitudes tend to favor evergreen species. Foliage represents a considerable investment of the tree's resources, and the ability to retain foliage for many years, even decades, is advantageous in the cold environments where growing seasons are short. Substantial carbon and nutrient savings can be realized by dedicating only a small percentage of the carbon and nutrient budget to the annual production of leaves. Despite these advantages, the fact that the 11 species of larch persist in and even dominate many arctic and alpine environments in the Northern Hemisphere has led scientists to conclude that other advantages allow larches to compete in these harsh environments. Given that their crown shape and leaf size are similar to many of the evergreen conifers with which they grow, there must be something different with their leaf anatomy that gives larches an additional advantage.

Deciduous leaves are easier to produce than evergreen leaves. The lignins that enable evergreen leaves to persist for many years, and the toxins that reduce herbivory come at a high metabolic cost. In addition, the photosynthetic efficiency in larch may be twice that of neighboring evergreen associates (Figure 76). It is not necessary for the leaves of deciduous trees to be especially tough or durable, since leaf lifespan is so short. The penalty for this, of course, is that larches must replace *all* of their leaves annually. While evergreen conifers can grow during the part of the year when deciduous trees are bare, this advantage is reduced at high latitudes or altitudes by winters that are too harsh or light levels too low for efficient photosynthesis. Larches are highly efficient at translocating nitrogen prior to leaf drop, an important characteristic in the nitrogen-limited arctic and alpine environments. Western larch has a few other adaptations it uses to compete in an evergreen-dominated world. It has one of the fastest seedling growth rates among associated conifers, enabling the species to rise above neighboring trees where its low shade tolerance is no longer a limiting factor.

Western larch distribution coincides with the boundaries of the Inland Empire, defined to the east as the portion of the Rocky Mountains drained by the Columbia River Basin. While the center of distribution is located in northwestern Montana, many of the largest and tallest specimens are found in the mixed forests of the South Cascades region (Figure 77). In eastern Washington, an anomalous gap

Figure 77. Some of the largest and tallest western larches in eastern Washington are found in the western hemlock zone in the South Cascades. While often a minor component of these diverse forests, the larch's successional status often indicates that they are among the oldest trees present.

Figure 78. Range of western larch in eastern Washington.



occurs in the North Cascades region, where conditions may be too dry for the larch to be competitive (Figure 78). Within its range, however, western larch grows in a wide variety of habitats, including near-alpine conditions within the subalpine fir zone (Figure 79). In some ways, western larch fills the niche occupied by ponderosa pine in environments too cold for the pine to tolerate, although there is considerable overlap in their distributions. Old, but slender trees can be found rising above canopies of Engelmann spruce and subalpine fir at the upper elevations of its dominance (Figure 80). Elsewhere, under more favorable conditions, the

Figure 79 above. Dwarf form of western larch in the Wenatchee Mountains. The remarkable adaptability of western larch allows it to grow in unexpected places. As a result, size and age are not well correlated in this species.

Figure 80 left. A 400+ year spruce-fir stand with emergent larch in the Okanogan Highlands. In such cold and dry forests, many of the larches have narrow crowns and small diameters; few trees exceed 60 cm (23.6 in) in diameter. Photo by Steve Curry, Washington DNR.

Figure 81. Within the grand fir zone, whole stands of western larch can live to great age. The thick bark, decay resistance, and longevity of the species occasionally allow such remarkable stands as this to develop.

larch can dominate forest stands with subordinate mixtures of grand fir, lodgepole pine, and Douglas fir (Figure 81).

Bark characteristics

Like its fire-resistant associates, western larch develops very thick bark with age, enabling it to survive frequent fire. Even young trees quickly develop bark thick enough to allow survival after light-to-moderate ground fires. Bark on mature and old trees can mimic that of Douglas fir or ponderosa pine, both of which are fire-resistant species often found growing alongside larch. Mature trees, between 100 and 250 years, often have the rugged, grayish-brown bark of a Douglas fir (Figure 82). Old trees, greater than 250 years, often develop the richly colored bark of a ponderosa pine (Figure 83). In old, mixed stands, it may be necessary to look to the crown to verify species identification. Very old larches can develop bark thicker than any of their associates—up to 35 cm thick (14 in) (Figure 84). The bark transformation from young to mature to old is not as consistent, nor

Figure 82 above. Mature western larch (left) will often have bark that is difficult to distinguish from Douglas fir (right).

Figure 83 below. The bark of very old western larches (left) is often a mimic for ponderosa pine bark (right).

Figure 84 left. Bark thicker than 30 cm (1 ft) is not uncommon on very old western larch trees.

Figure 85 right. The bright yellow wood visible beneath the bark in this fire-scarred larch is filled with resin, making it very decay resistant.

as predictable, as that of ponderosa pine. Ultimately, bark characteristics must be used with crown form, lower crown characteristics, charcoal and fire scars, and relationships to other trees in the stand in order to develop enough clues to determine approximate tree age.

Historic fires often left charcoal on the bark of mature larch trees, but actual wounding was much less common. Fire scars that do form cause heartwood formation in the vicinity of the wound to ***compartmentalize*** decay. Compartmentalization refers to the deposit of defense compounds in wood adjacent to the decay. In a healthy tree, this compartmentalization effectively isolates the decay and prohibits it from spreading to other parts of the tree. Fire-scarred larches often deposit excessive amounts of resin in the wood adjacent to a fire scar, which can greatly slow decay (Figure 85). As a result, larch stumps can be an excellent source of firewood—the resin-filled section within is the last to decay (Figure 86).

Figure 86 above. Nearly all that is left of this old western larch stump is the resin-filled wood near the fire scar. The wood was collected and polished – the remainder of the stump has long-since rotted away.

Figure 87 left. While not a whorl-based conifer like many other members of the pine family, western larch nonetheless grows tiers of branches in a predictable manner.

Figure 88. Epicormic branches developing below the main crown in a maturing western larch.

Lower crown characteristics

As with other rapidly growing pioneer trees, western larch often will form dense stands. While larches are one of the few groups within the pine family that do not grow in a whorl-based manner, young trees still develop tiers of original branches, just as the whorl-based pines and firs do (Figure 87). As the stand develops, lower branches are shed as they become shaded. Depending on the stand's density, the crown base often will recede at a rate comparable to the height growth of the stand. As the maturing stand thins, light is able to penetrate below the living crown. Larches often respond by producing ***epicormic branches*** below the base of the live crown. Epicormic branches, which start from the cambium and not from terminal buds, often occur at the axils of branches and twigs, the sites of old branch wounds, or other locations where the bark is thin (Figure 88). The crowns of mature western larches are often a combination of

Figure 89. Mature western larch. The graceful crown consists of original branches and an unmistakable radiating fan of epicormic branches adorning the base of the crown.