Figure 90. A very dense stand of grand fir and Engelmann spruce has developed around this western larch, threatening its survival. Note the spiral scar – the result of an old lightning strike, indicating spiral grain in the wood beneath.

original and epicormic branches, a pattern that becomes accentuated as trees age. Because epicormic branches form on the outside of the trunk, they can grow in any direction, even tangential to the trunk. Original branches, in contrast, always form perpendicular (radially oriented) to the trunk. If many epicormic branches start from a common locus, a fan-shaped system of branches will result (Figure 89).

Susceptibility to high-severity fire dramatically increased in many of the forests of eastern Washington during the twentieth century as a result of increased stand density (Figure 90). The seeding and early growth habits of western larch on productive sites are adapted to maturing dense stands. Epicormic branching, combined with a deciduous growth form, provides western larch with a strong defense against crown scorch. As western larch produces new foliage each year, it is less impacted by foliage loss from late-season severe fire events than other evergreen conifers (Figure 91). Even if the crown scorch occurs earlier in the year, the larch's prolific ability to produce epicormic branches may be enough to enable the tree to survive.

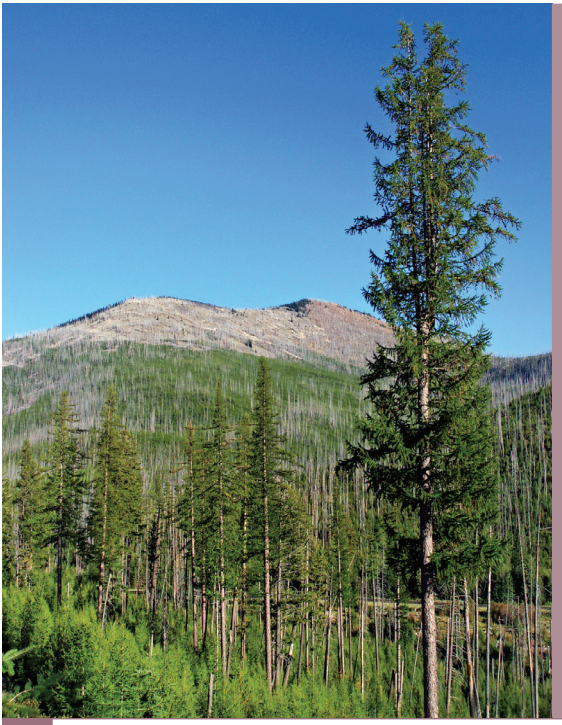


Figure 91. The White Mountain Fire of 1988, Okanogan Highlands. The late-season crown fire killed dozens of square kilometers of forest. The fire occurred as the larches were beginning to shut down for the year, and as result, many were able to grow a new crop of leaves the following year.

Figure 92. Large limbs with mature bark are a sign of an old tree. In this case, the twisted shape resulted from an old mistletoe infection.

Crown form and tree vigor

Crown complexity, arising from damage due to prolonged mistletoe infections or physical events, can assist in determining tree age (Figure 92). In a manner similar to the production of epicormic branches, larches have the ability to produce ***reiterated trunks*** following crown damage (Figure 93). Reiterated trunks have the appearance of small trees within the crowns of larger trees. While typically a response to the loss of the tree top, they also can spontaneously arise in structurally complex crowns.

A series of profiles have been prepared to illustrate the crown structures that can occur in western larch during its lifetime, including the variations imposed by site productivity and elevation (Figure 94).

Figure 93. Reiterated trunk formation in western larch. Old trees can recover from crown damage by producing secondary trunks, as illustrated here.

Figure 94. Western larch crown form and tree vigor in eastern Washington. Idealized forms represent three age and four vigor classes (A-high vigor to D-low vigor). Vigor is a function of site productivity and response to disturbance and environmental stress. More than one individual is shown for vigor classes B-D to illustrate possible variations. Competition-based mortality usually ensures that most trees in vigor classes C and D do not survive to the next age class. The trees depicted are the same scale in the first image, and at differing scales on the following pages.

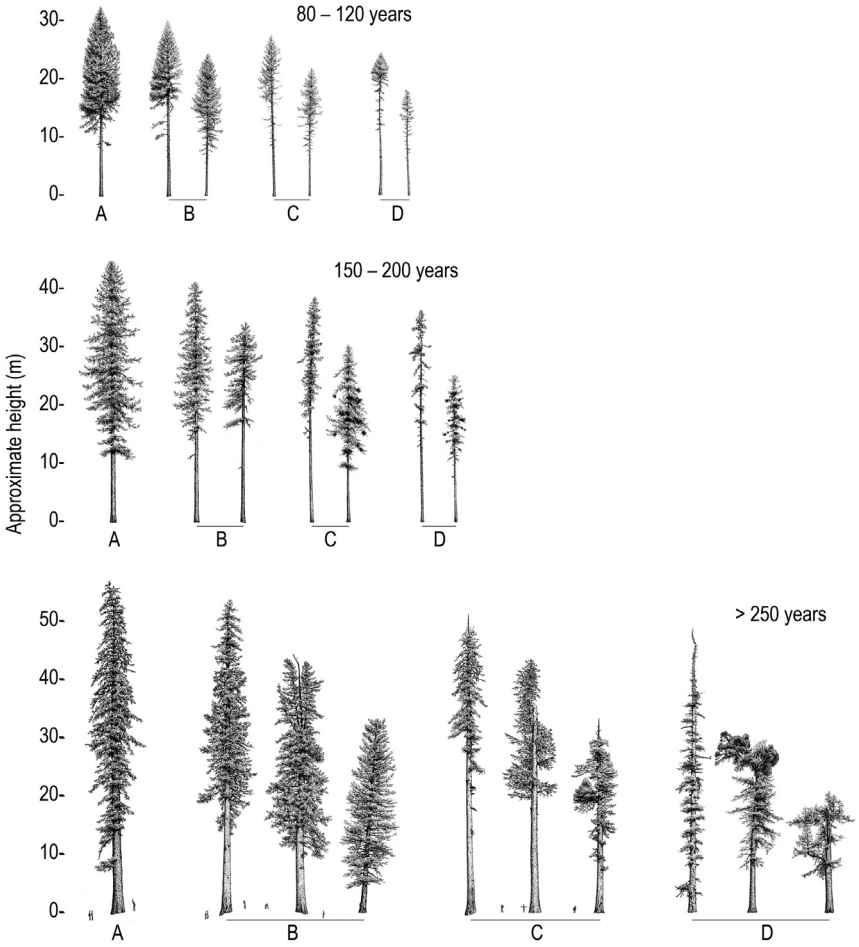


Figure 94. Continued

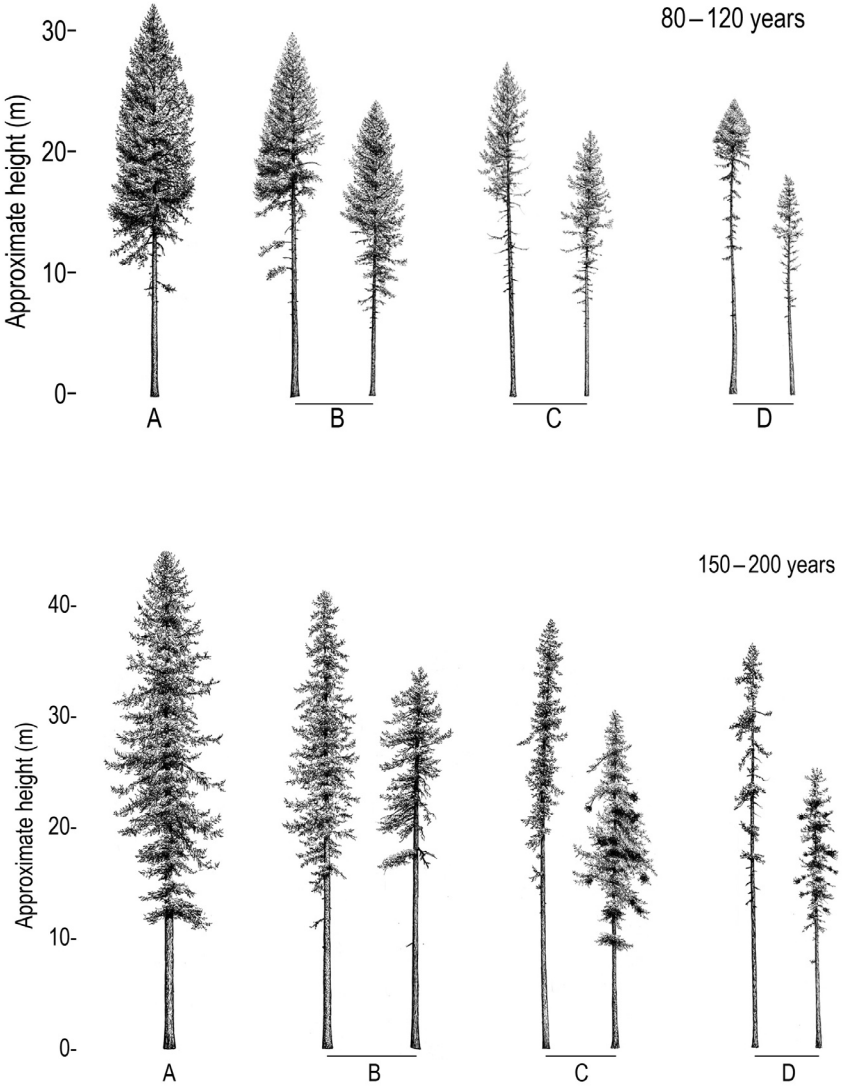
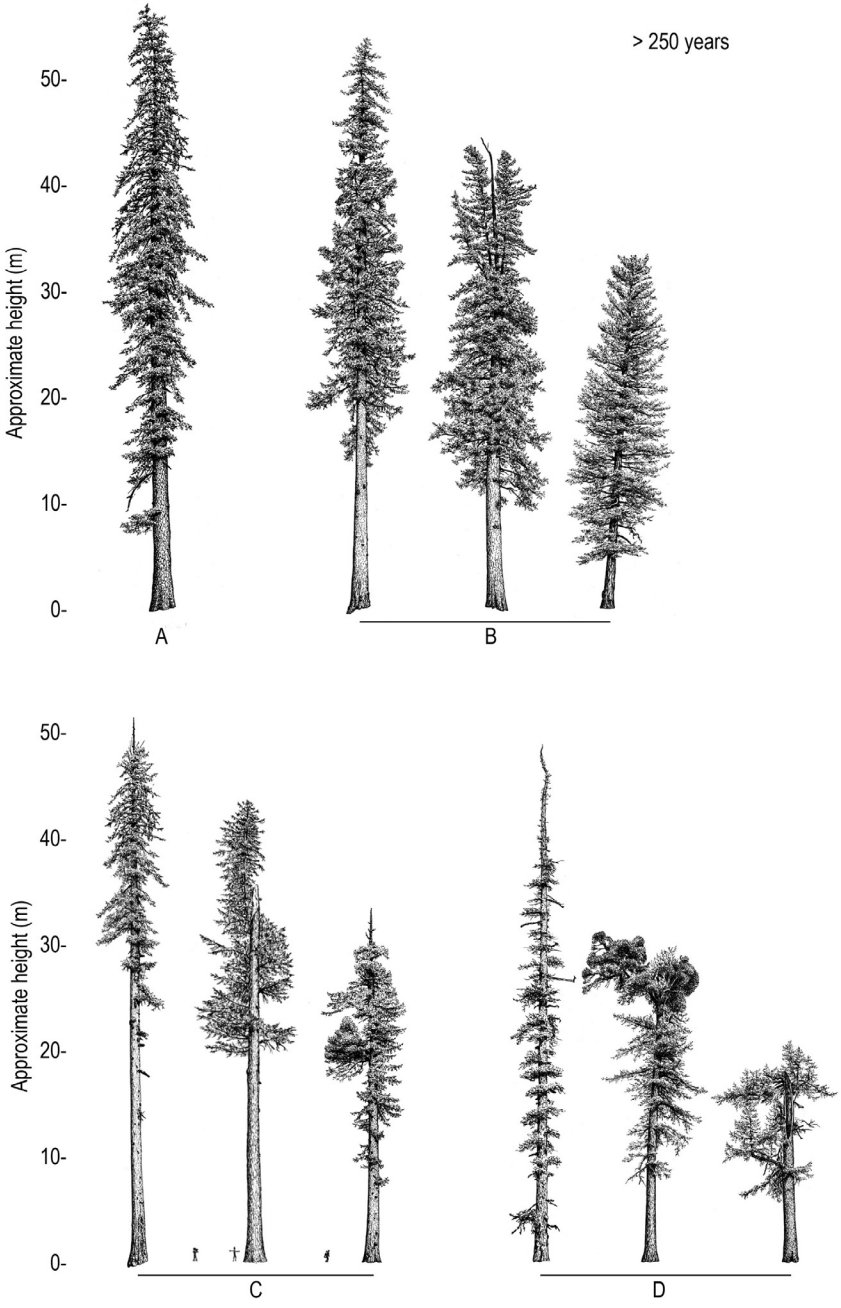


Figure 94. Continued



Rating system for determining the general age of western larch trees

(Choose one score from each category and sum scores to determine developmental stage)

	Score
Bark condition, tree base	
Hard, bony bark with small fissures	0
Hard bark with moderately deep fissures (4-10 cm – 2-4 in)	1
Deep fissures present (> 10 cm – 4 in)	3
Maximum fissure to fissure plate width ≥ 15 cm (6 in)	3
Knot indicators, lower one-third of tree	
Branch stubs present	0
Old knot/whorl indicators visible	1
No knot/whorl indicators visible	2
Lower crown indicators	
No epicormic branches	0
Small epicormic branches present	1
Large and/or gnarly epicormic branches present	2
Crown form (refer to Figure 94)	
Similar to a tree in top row	0
Similar to a tree in middle row	3
Similar to a tree in bottom row	5

Scoring Key

< 3	Young tree
3–6	Mature tree < 150 years
7–10	Mature tree ≥ 150 years
> 10	Old tree ≥ 250 years

Longevity and death

Several factors contribute to the longevity of western larch, including thick, fire-resistant bark, very resinous wood, and high, deciduous crowns with the ability to regenerate both trunks and branches. Even in the face of increased fire severity caused by fire suppression and overgrazing, old larches would still be a common feature of our eastern Washington landscapes if it were not for their valuable wood. This is the primary reason old larches, as depicted on these pages, are so difficult to find (Figure 95). Old larches are commonly 400 to 600 years old, with occasional trees in excess of 900 years.

Ultimately, decay from either velvet-top fungus (*Phaeolus schweinitzii*) or the quinine conk (*Fomitopsis officinalis*) will lead to death of old larches. A

large, swollen base is often a sign of infection by the velvet-top fungus (Figure 96), which infects the roots and lower stems of trees, but may take centuries before it weakens the stem enough to cause structural failure (Figure 97). Decay from the quinine conk often manifests itself in the middle or upper trunks of trees. On occasion, however, the hoof-like conks of this fungus occur on the lower trunk (Figure 98). Once infected, larches can live on for decades or even centuries, until the resin-filled tree base finally decays to the point where it can no longer support the weight of the crown (Figure 99).

Figure 95. An old-growth stand of western larch. As a consequence of the valuable lumber, stands such as this have become extremely rare.

Figure 96. The swollen base of an old western larch often indicates decay.

Figure 97. The classic barber chair stump of an old western larch – the tell-tale sign of the velvet top fungus.

Figure 98. Quinine conk on the stem of an old western larch. Such rotten trees can live for decades or even centuries, resting on the strength of the resin-filled wood in the lower stems.

Figure 99. A broken stem of an old larch indicating advanced decay from the quinine fungus.