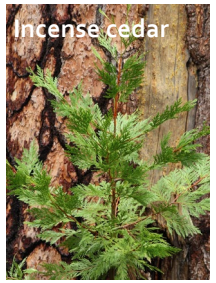
DIVERSE FORESTS for the 21st Century – SECONDARY CONIFERS for the US Pacific Northwest

Coastal Douglas-fir: There have been large investments for this dominant, valued and versatile species, with 3rd cycle programs well underway and sustained progress in seed orchards.

Many timberland owners like to plant a diversity of secondary conifers, due to **diverse environments** (from less than 500 mm rainfall per year to 5000, from 50 to 2,000 meters elevation) and the **varied markets** to serve (domestic and export, framing, large timbers, panels, and outdoor use) and with very minimal planting of hardwoods. Planting a variety of conifers on appropriate sites should enhance the resilience of forests under changing climatic conditions, fluctuating log markets, and the possible introduction of diseases and pests. **> 20% of planting appears to be with conifers other than Douglas fir.**

Breeding and testing of **western hemlock** continues with 3rd cycle tests to be planted in 2023; this species is competitive where coastal Douglas-fir is affected by **Swiss Needle Cast** disease. There is adequate seed production to reforest low elevation areas entirely with orchard seed.

Some sites west of the Cascades (especially in southern Oregon and northern California) are **too hot and dry,** or **too frosty** to support pure Douglas-fir stands, while ***laminated root rot*** affects significant areas and kills Douglas-fir and some other conifers. Douglas-fir on south slopes is particularly vulnerable during dry summers during the first few years. **Ponderosa pine** is **drought- and-frost tolerant** and planted quite widely but log values are low. **Incense cedar** is drought tolerant and has valuable timber but limited seed supply.



High-elevation areas with heavy wet snow tend to favor **Noble fir** (less snow break) over Douglas-fir. Several first-generation orchards have been established, with most of the production coming from the ***BLM's Walter Horning Seed Orchard.*** The blocks at Horning are over 40 years old but are the main source of improved orchard seed for small to medium landowners including Christmas tree growers .

Continuing with the **true firs**, there are plans to establish the first seed orchard for **White fir** in Oregon, for the Cascades of southern Oregon and Sierras of northern California. White fir is a valuable timber species which can grow to nearly **2,000**m elevation. Consistent seed supply is also sought **for *Pacific Silver Fir.***

Two orchards also produce **high elevation western hemlock** seed from the BLM's Cascade testing program.

Western red cedar is valued due to natural durability of the timber making it suitable for outdoor applications. The testing program is taking a very different path than for some other conifers: the main interest is in developing **high monoterpene seed sources** to reduce damage from deer browse, based on years of testing and breeding work in British Columbia. Western red cedar is very attractive to deer and elk so that the genetic ability to deter browse is far more important than growth rate.

Growing **coastal redwood** in the warmer wetter parts of Oregon shows promise; a cooperative testing program has been formed.

There is a small need for **white-pine-weevil-resistant Sitka spruce** for areas close to the ocean and subject to strong winds; seedlings planted are derived from the breeding program based in British Columbia

Successful disease resistance breeding programs supported by the US Forest Service (mainly at the Dorena Genetic Resource Center) and the Bureau of Land Management offer the promise of re-introducing more **sugar pine, western white pine,** and **Port Orford cedar** back to the landscape, after decades of disease impacts to these native species.

There are disease-resistant orchards for all three species.

Summary: 10-15 conifers are planted in the US PNW to some degree, and tree improvers are working hard to address that need.

Keith Jayawickrama (Oregon State University) and Mike Crawford (Bureau of Land Management)