

Forest epidemic is unprecedented phenomenon, still getting worse

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New research has found that older Douglas-fir trees in Oregon are just as susceptible to Swiss needle cast as younger ones, suffering the same needle loss and in some cases almost stop growing. (Photo courtesy of Oregon State University)

The Swiss needle cast epidemic in Douglas-fir forests of the coastal Pacific Northwest is continuing to intensify, appears to be unprecedented over at least the past 100 years, and is probably linked to the extensive planting of Douglas-fir along the coast and a warmer climate, new research concludes.

Scientists in the College of Forestry at Oregon State University have also found that this disease, which is affecting hundreds of thousands of acres in Oregon and Washington and costing tens of millions of dollars a

year in lost growth, can affect older trees as well as young stands - in some cases causing their growth to almost grind to a halt.

The newest findings were just published in *Forest Ecology and Management*, a professional journal.

Swiss needle cast is a native [fungal disease](#) specific to Douglas-fir that was first described in Europe. It rarely kills trees but causes discoloration, loss of needles and growth reduction, and is common in the Pacific Northwest wherever Douglas-fir grows. However, it caused significant problems only in recent decades along the coast.

Starting in 1984, an epidemic began to develop, and it significantly worsened after 1996.

"It's now clear that this epidemic is a new phenomenon, with far more severity and impact than anything we've observed from Swiss needle cast in the past," said Dave Shaw, an assistant professor at OSU and director of a cooperative designed to fight this disease. "We've known of this disease for decades but it was considered a non-issue in terms of forest health. A perfect storm of conditions that favor this fungus has caused a major epidemic that is still growing."

The disease has now been identified at varying levels of severity in western Oregon on more than 300,000 acres in each of the past four years, peaking at 376,000 acres in 2008. Prior to this four-year period, it had affected as much as 300,000 acres only once in the 14-year history of aerial detection surveys, researchers say.

Depending on the multiple factors that influence it, it's possible it could ultimately have an impact on up to two million acres of forests near the Oregon coast, and change the face of forestry in a huge region.

The new study concluded that warmer conditions, especially from March through August, are associated with significantly reduced growth in diseased trees, which may reflect earlier fruiting of the fungus. Wet, drizzly conditions in May through July are also important. The warm, wet conditions within 20 miles or so of the Pacific Ocean make those areas a hotspot of disease in coastal Oregon and Washington.

"We now know that weather is a driver in the epidemiology and spread of this disease," said Bryan Black, an assistant professor of forestry based at OSU's Hatfield Marine Science Center. "We can't say yet whether climate change is part of what's causing these problems, but warmer conditions, milder winters and earlier springs would be consistent with that."

Another key suspect, scientists say, is the planting for decades of a monoculture of Douglas-fir in replacement of coastal forests, which previously had trees of varying ages and different species. Since Douglas-fir was a small component of these forests, it appears the disease was relatively insignificant. Even-aged stands of vulnerable Douglas-fir allow the [fungus](#) to build up to much higher levels, releasing spores that can literally spread with the wind. Reductions in growth of 20-30 percent are fairly common, and sometimes higher.

It used to be thought that the disease primarily affected only younger trees, mostly less than 40 years old and predominately the 10-30 year age group, the researchers say. This study, based on examinations of rings in naturally-regenerated trees more than 80 years old, for the first time showed that they are very susceptible as well. The findings erase any hope that older trees will "outgrow" the susceptibility to this disease, the scientists concluded.

"Tree growth has been reduced so much at severely-impacted sites that we could not actually find a growth ring that went all the way around

some trees," Black said. "At these sites the overall growth rate over the past 25 years was reduced by more than 85 percent in comparison to non-diseased trees."

The impact of Swiss needle cast is highly uneven, difficult to predict, and often dependent on microclimate, terrain and availability of soil nitrogen. Fungicides can control it, but cost too much to be practical and raise environmental concerns. However, OSU is developing tools to better anticipate the problems it may cause and allow forest managers to consider alternative management strategies. Planting of less Douglas-fir is one option, using more western hemlock, red alder or other species.

In some places, nature has already begun this approach.

"We've seen sites where western hemlock is overtopping Douglas-fir that has almost stopped growing, and may ultimately replace it," Shaw said. "Some stands are already converting to alternative species on their own."

Work is under way to develop fungal-tolerant Douglas-fir families that may be of some value, especially in areas with low or moderate levels of the disease. Those studies will not be complete for several years.

If the epidemic continues to spread and begins to change growth and productivity of Douglas-fir, the researchers said, its impacts may go beyond [forest](#) health and timber production. It could affect the efficacy of managing lands for other purposes, such as wildlife protection.

"These tree ring data corroborate that the impacts of Swiss needle cast continue to worsen in the western Oregon Coast Range," the researchers wrote in their conclusion. "They also corroborate that Swiss needle cast is associated with climate, especially long-term warming trends during the late winter and early spring."

Provided by Oregon State University

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