

Tree-ring analysis of the fungal disease Swiss needle cast in Western Oregon coastal forests

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Abstract

Swiss needle cast (SNC) is a foliage disease caused by the fungus *Phaeocryptopus gaeumannii*, which is specific to Douglas-fir (*Pseudotsuga menziesii*). The goal of this study was to reconstruct the history of the disease and determine the climatic conditions that influence the disease in western Oregon. We analyzed tree-ring data from six late-successional Douglas-fir stands in the western Oregon Coast Range to identify growth suppression patterns associated with the disease. At each site, reductions in radial stem growth displayed periodicities associated with climate and the maturation cycle of the fungus. Growth reductions associated with SNC dated back to the 1590s—the earliest record in our dendritic data. Growth suppression patterns were synchronous across the six sites, indicating that the disease severity was largely influenced by climatic conditions. SNC index of impact significantly correlated with winter and summer temperatures and summer precipitation. The impact of SNC on coastal Douglas-fir peaked in 1984-1986 at all six study sites, followed by unprecedented disease impacts of 100% in 1996 and 2004 at one site, while decreasing to previous levels at the other five sites. Disease severity is likely to continue to increase at highly diseased areas within the coastal fog zone under future climate scenarios but decrease elsewhere due to warmer, drier summers which are less favorable conditions for fungal reproduction and growth.