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Incidence of the Pine Wood Nematode in Green Coniferous Sawn Wood in Oregon and California

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Abstract

Samples of green sawn Douglas-fir, redwood, ponderosa pine, and white fir were collected in August and September 1992 from seven mills in Oregon and California, and assayed for the pine wood nematode, *Bursaphelenchus xylophilus*. The mills produced about 108 million board feet during the survey period. The pine wood nematode was not found in any of the 424 samples of Douglas-fir, the 192 of redwood, or the 3 of white fir. The nematode was recovered from 8 of 105 samples of green ponderosa pine lumber from a mill in Oregon. These eight samples contained an average of 54 pine wood nematodes per gram of dry weight. This is the first report of the pine wood nematode in Oregon.

Keywords: *Bursaphelenchus xylophilus*, *Pseudotsuga menziesii*, *Sequoia sempervirens*, *Pinus ponderosa*, *Abies concolor*, lumber, risk assessment, export.

Introduction

The pine wood nematode, *Bursaphelenchus xylophilus* (Steiner and Buhner) Nickle, is a destructive pest of the pine forests of Japan (Mamiya 1983), and may cause some mortality of stressed exotic conifers in the United States (Dwinell and Nickle 1989). It has been found in wood chips exported from North America (Rautapaa 1986) and intercepted in green lumber shipments (EOLAS 1991; Tomminnen and Lahtinen 1990; Tomminnen and Nuorteva 1992) and packing-case wood (Tomminnen 1991) from Canada. To protect European forests from exotic pests such as the pine wood nematode, the European Community Commission is considering regulations for all coniferous sawn wood.

The pine wood nematode is transmitted from one tree to another when its insect vector, *Monochamus* spp., lays its eggs in freshly cut, felled, dying, or recently dead conifers, particularly pines (Wingfield 1983). In these cases, the nematode is a secondary associate and not the cause of mortality. The result, however, is that the nematode may occasionally be present in green lumber, particularly pine (Dwinell 1990; Dwinell and Nickle 1989).

There is a paucity of critical information on the *Bursaphelenchus-Monochamus*-conifer complex in the Pacific Northwest. *Monochamus scutellatus oregonensis* LeConte, *M. muculosus* Haldeman, and *M. obtusus* Casey attack dying, recently dead, and down Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) and pines (*Pinus* spp.) (Furniss and Carolin 1977). *Monochamus notatus morgani* Hopping reported feeds on the outer bark and phloem of living twigs and branches of several conifer species, but oviposits only in western white pine (Morgan 1948). The importance of various *Monochamus* species as vectors of the pine wood nematode, however, is not fully known. In Canada, the pine wood nematode did not occur in any of the 1,293 *Monochamus* specimens sampled (Bowers and others 1992).

Little is known about the distribution of the pine wood nematode in the Pacific Northwest. It has been found in isolated urban situations in Pacific Grove and Yreka, in California (Holderman 1980). The study described here was undertaken to determine the incidence of the pine wood nematode and related species in green coniferous sawn wood of Douglas-fir, redwood, and ponderosa pine at mills in Oregon and California.

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Materials and Methods

Green sawn wood was sampled during August and September at seven mills in Oregon and California. In Oregon, Douglas-fir logs were sampled at three mills (Willamette Industries, Inc., Dallas; Stimson Lumber Company, Forest Grove; and Roseburg Lumber Company, Roseburg). Douglas-fir lumber was also sampled at the Pacific Lumber Company mill in Scotia, CA. Redwood lumber was sampled at Pacific Lumber Company mills in Scotia and Fortuna, CA, and ponderosa pine and white fir (*Abies concolor* (Gord. and Glend.) Lindl. ex Hidebr.) at the Ochoco Lumber Company in Prineville, OR.

The sampling protocol was flexible and adjusted to meet each mill's processing procedures. The goal for domestic green lumber was three random samples per conifer species per day. For export wood, the number of samples was doubled. The samples were largely trim pieces from 2 by 4s and 2 by 6s. Samples for each day were placed in ziploc plastic bags and labeled. The labels included: name of mill, date of sample, species, and domestic or export designation. The destination of exported lumber was usually recorded. Also, note was made of samples with grub holes or sapstain. The California samples were handled by the Redwood Inspection Service. The Oregon samples were collected by the Western Wood Products Association. Each week the collected samples were forwarded to the Forestry Sciences Laboratory, Athens, GA, for nematode assay.

The samples were sliced into 2- to 3-gram sections for nematode assay. Nematodes were extracted from the wood using the Baermann funnel procedure. Sections were incubated for 18-24 hours at 25 °C and placed in 10 mL of deionized water. The initial temperature of the extraction water was 35 °C. Weights of wood samples with nematodes were measured after drying at 105 °C for 24 hours. Results were expressed as number of samples with pine wood nematodes and number of pine wood nematodes per gram of dry wood.

Results and Discussion

The pine wood nematode was not found in any of the 307 Douglas-fir samples screened from Oregon or the 117 from California (table 1). Among these were a very small number with grub holes and sapstain. During the survey, the mills produced about 78.6 million board feet of Douglas-fir.

The nematode was not recovered from any of the 192 redwood samples. Some 21.7 million board feet of redwood sawn wood were produced during the survey. I can find no record of redwoods being hosts of species of *Monochamus* or *Bursaphelenchus*. The three white fir samples also were free of nematodes.

Pine wood nematodes were recovered from 8 of 105 samples of green ponderosa pine lumber processed by the Ochoco Lumber Company in Prineville, OR. The eight samples contained an average of 54 pine wood nematodes per gram of dry weight. The samples, which were collected in mid-August, were probably from salvaged insect-killed trees. The mill produced some 8.7 million board feet of ponderosa pine during the survey. The previous July, I recovered the pine wood nematode from fire-killed ponderosa pine near Bend, OR (unpublished data). *Bursaphelenchus xylophilus*, as defined by Nickle and others (1981), was the only species of *Bursaphelenchus* found. Heretofore, the pine wood nematode had not been reported in Oregon.

The occurrence of the pine wood nematode in 8 percent of ponderosa pine lumber is largely of academic interest. Exported ponderosa pine is kiln-dried. This process sterilizes the wood, killing both the pine wood nematode and its vectors (Dwinell 1990; Tomminen and Nuorteva 1992).

Canada has also surveyed mills for the pine wood nematode and its *Monochamus* vector. A survey of eastern hemlock (*Tsuga canadensis* (L.) Carr.) and western redcedar (*Thuja plicata* Donn ex D. Don) green lumber at several mills found no pine wood nematodes (Magasi and others 1990; Wood and Van Sickle 1991).

To my knowledge, the pine wood nematode has never been reported in green coniferous lumber exported to European Community countries from the United States. Furthermore, a recent survey of green lumber sent to the European Community from North America (407 shipments) found that 99.75 percent of the shipments were free of pine wood nematodes. The nematode was found in planks of insect-killed *Pinus banksiana* in a shipment, which had not come under the mill certification program, from Canada to Le Havre, France (EOLAS 1991). Accumulating evidence continues to indicate that the risk of green nonpine lumber as a source of the pine wood nematode is near zero.

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Table 1—Survey of mills in Oregon and California for the pine wood nematode in green sawn wood

Mill	Species ^a	Number of samples	Pine wood nematodes	
			Incidence in samples	Mean per gram dry weight
Oregon				
Willamette	Douglas-fir	132	0	0
Stimson	Douglas-fir	132	0	0
Ochoco	Ponderosa pine	105	8	4
Ochoco	White fir	3	0	0
Roseburg	Douglas-fir	43	0	0
California				
Pacific/Scotia	Douglas-fir	117	0	0
Pacific/Scotia	Redwood	117	0	0
Pacific/Fortuna	Redwood	75	0	0
Total		724	8	4

^a Douglas-fir = *Pseudotsuga menziesii*; redwood = *Sequoia sempervirens*; white fir = *Abies concolor*; ponderosa pine = *Pinus ponderosa*.

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