



Frontline

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THE DISTRIBUTION AND CONTROL OF SCLERODERRIS DISEASE IN ONTARIO

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INTRODUCTION

Scleroderris canker, caused by the fungus *Gremmeniella abietina* (Lagerb.) Morelet, has been regarded as a major pest of pine (*Pinus* spp.) for over 30 years. In North America two distinct strains of the fungus, the North American and European races, are known to cause damage. The North American race causes cankering and mortality to young jack pine (*P. banksiana* Lamb.) and red pine (*P. resinosa* Ait.) trees, and has been associated with numerous planting failures. This strain of the disease apparently does not cause mortality to trees over 2 meters in height; however, it will attack the lower branches.

The European strain, which is considered more damaging, was first observed in North America in New York State in 1975. There, several thousand hectares of semimature red pine and Scots pine (*P. sylvestris* L.) were infected and killed by the disease (Skilling 1977). More recently, the European race has caused extensive damage to red pine plantations in western Quebec (Laflamme and Lachance 1987), where it was first isolated in 1978. It was not detected in Ontario until 1985. In eastern Canada, red pine is the primary host and jack pine is not affected. Several isolates of both races have been collected from Scots pine and Austrian pine (*P. nigra* Arnold) in Ontario.

Both strains of scleroderris have a similar life history. Spores are generally dispersed and infect trees during wet periods. The North American race is known to produce two types of spores; one of these, the ascospore, is capable of long-range

dispersal. The European race, however, yields only conidia. Also produced by the North American race, conidia are capable only of short-range dispersal. More information on the life history and the symptoms of the disease are provided by Skilling et al. (1986), Laflamme (1991), and Myren (1994).

In Ontario, the European race has been restricted in its range through an aggressive system of detection conducted by the Forest Insect and Disease Survey (FIDS) Unit of the Canadian Forest Service, and followed by control efforts undertaken by the Ontario Ministry of Natural Resources (OMNR). In recent years, however, population levels and distribution of the European race of scleroderris have apparently increased within the province. The purpose of this document is to report on the distribution of scleroderris canker in central Ontario and to describe control options.

DISEASE DISTRIBUTION

The North American race of scleroderris is found throughout eastern Canada across the range of pines north of 45° N latitude. The European strain, which usually exists in combination with the North American race, has a more restricted distribution and is concentrated in central Ontario within the OMNR's Parry Sound and Bancroft districts (Fig. 1). As of 1994, the southernmost extent of the disease in Ontario was 44° 30' N in Somerville Township, Bancroft District. Prior to 1993, the most southern location was 45° 10' N in Mayo Township, Bancroft District. Presently, a northern limit to the distribution of the European race exists; it has not been isolated from plantations north of Strong and Joly townships in the Parry Sound District (45° 45' N). The general distribution of the European race showed little change over the period



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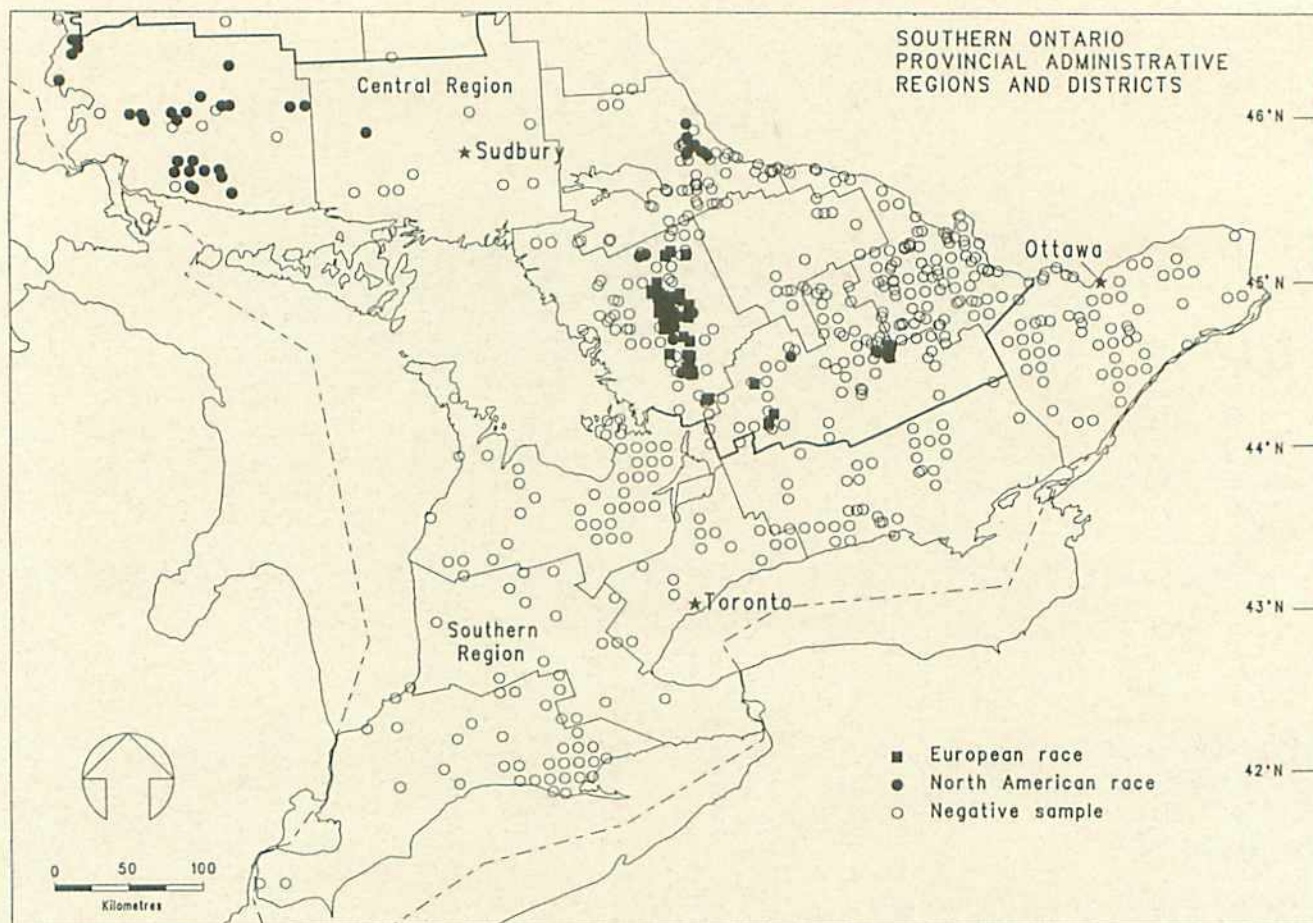


Figure 1. Historical distribution of the European and North American races of *scleroderris* in central Ontario, 1985–1994.

1985–1991, with only a limited spread prior to 1992. Between 1985 and 1991 a total of six townships contained infected plantations. However, since 1992 an annual increase in the number of plantations infected by the European race has been recorded during FIDS Unit surveys (Fig. 2).

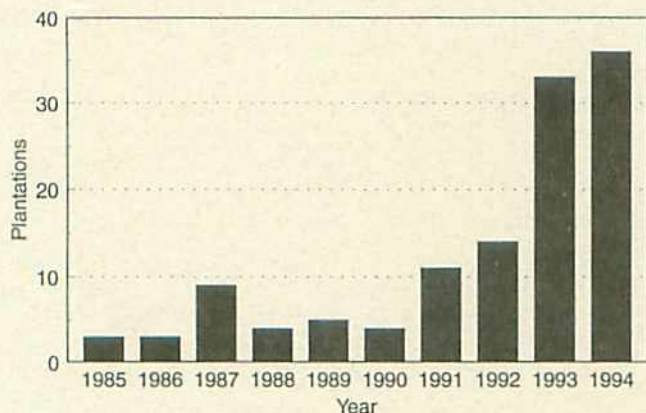


Figure 2. Percentage of red pine plantations infected by the European race of *scleroderris*, 1985–1994.

Perhaps the most interesting observation on the distribution of both races of the disease is its absence in eastern Ontario. The disease has occurred at almost epidemic proportions at various times on the Quebec side of the Ottawa River

(Laflamme and Lachance 1987), but subsequent pruning has reduced the level of infection. Although extensive surveys have been conducted on the Ontario side of the river since 1985, neither race of *scleroderris* has been recovered from pines in that area. This might suggest that the disease was introduced into western Quebec on nursery stock, and could also explain its rapid development in that portion of the province and its failure to spread beyond the areas initially infected.

CONTROL

Nurseries

The OMNR has established a policy for preventing the spread of *scleroderris* by nursery stock, and for disease control in plantations. In nurseries, the OMNR has recommended that pine (red, Scots, jack, or Austrian) seedlings be sprayed with Chlorthanoni[®] in the spring when temperatures rise above 0°C and equipment can be moved into the field. Spraying is to be repeated every 2 weeks until early July; this represents the period during which spore dispersal and infection are most likely. Following this, seedlings are sprayed every 4 weeks until early September. It is recommended that spraying be repeated if rainfall occurs within 24 hours of treatment. This followup treatment is required because the spores produced by the fungus are dispersed by rainfall. As disease symptoms are not evident until at least the following growing

season, such treatment is required to prevent outplanting of infected seedlings. It is also recommended that the planting of susceptible species be avoided in nurseries that are surrounded by pine windbreaks.

Plantations

The North American race of *scleroderris* generally affects only those branches on the lower 2 meters of the tree. Because of this, disease severity and incidence in plantations will be reduced after crown closure. However, the European race is capable of infecting branches above the 2-m level and therefore is less affected by normal crown closure. In Ontario, the recommended control measures for infected plantations involve sanitizing infected trees or areas. After the disease is detected and the race is verified, control should include on-site removal and destruction of diseased material, particularly if the European race is present.

Proper pruning of plantation trees has also been shown to be an effective control measure, reducing both the upward movement of the disease and the amount of inoculum present. To be effective, however, pruning must be performed on both healthy and diseased trees. While pruning of the lower one-third of the crown for all plantation trees is advisable to prevent or reduce the spread of disease, it is not always practical. Laflamme (1991) has proposed very specific recommendations for young plantations (< 20 years old):

1. Regardless of tree height, if less than 2% of the pines have only one or two infected branches, only these branches should be removed and destroyed. This procedure should be repeated the following year if the disease is still evident.
2. In plantations with trees less than 1.5 m high, only infected branches should be cut or destroyed. The plantation should be inspected the following year and the procedure repeated if necessary.
3. For plantations with trees over 1.5 m in height and where more than 2% of the trees are affected, the lower whorls should be removed up to one whorl above the highest infected branch. If more than two-thirds of the whorls are infected the tree should be removed and destroyed.
4. If most trees in the plantation are infected with > 25% of those dead or severely infected, consideration should be given to complete destruction of the plantation or pockets where the disease is most evident.
5. If the plantation is comprised of jack pine only and is over 2 m in height, no further control measures are necessary as the disease will be reduced with crown closure.
6. If only the European race of the disease is present, planting of jack pine is recommended, where suitable.

The timing of pruning operations can be critical. Field work performed in Quebec (Laflamme and Blais 1993) has shown that pruning is only effective in young red pine plantations

where the disease incidence is low (< 5 % of the trees are infected). When the incidence and severity of the disease increase and upper branch whorls become infected, the effectiveness of pruning in controlling the disease is reduced. Table 1 shows the results of field trials carried out in Quebec.

Table 1. Results of pruning trials in Quebec red pine plantations infected with *scleroderris*.

Year	Classes (percent)					
	Low		Moderate		High	
	Control	Pruned	Control	Pruned	Control	Pruned
1983	1.7	2.2	15.1	12.6	81.3	74.3
1992	10.5	0.1	11.8	5.6	78.7	50.3

Plantations ranging in age from 9–12 years were assessed for the incidence of *scleroderris*. Following this, the bottom one-third of the crown was pruned to remove all branch whorls in all treated plots. In control plots no pruning was performed. Plots were assessed 10 years later, after canopy closure had occurred. Pruning was successful when plantations with low incidence (1–5%) of the disease were treated. Here, incidence was reduced to near 0%. It is likely to remain at these levels due to self pruning of the trees after canopy closure. In control plantations, disease incidence was appreciable even after canopy closure. In the case of plantations infected at moderate levels (6–25%), pruning reduced the incidence of infection after closure, but to a lesser degree. In control plots incidence was also reduced after closure, but significant infection levels still existed. In young plantations where high disease incidence and mortality occurred, pruning provided no significant protection. However, subsequent observations suggested that more aggressive pruning (*see* Control Recommendation 3) would further reduce infection levels in moderately to severely infected plantations.

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