

A SURVEY OF PINE PLANTATIONS FOR THE  
SCLERODERRIS CANKER AND OTHER DISORDERS IN  
NOVA SCOTIA IN 1974

by

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## ABSTRACT

An inspection of 432 pine plantations was carried out in Nova Scotia in 1974, primarily to establish the distribution of scleroderris canker in the Province. Information (age, height, acreage) on the plantations and on the disorders observed, both biotic and abiotic, was recorded.

*Gremmeniella abietina* is now known to be present in Cumberland, Pictou, Guysborough and Richmond counties. *Sirococcus strobilinus* the causal fungus of shoot blight, is widespread in the Province and is causing considerable browning in some plantations in the Stanley Management Area, Hants County. Red flagging, conceivably caused by either or both of these fungi, is common on the Garden of Eden Barrens in Pictou-Guysborough counties. The establishment of study plots is recommended to gain information on symptom development and disease intensification before control recommendations are made.

## Résumé

En 1974, on a entrepris en Nouvelle-Ecosse une inspection de 432 plantations; le but de l'inspection consistait à trouver la distribution du Chancre scléroderrien à travers cette province. On a obtenu des informations (l'âge, la hauteur et la superficie) sur les plantations et les désordres observés, à la fois biotiques et abiotiques.

On signale actuellement la présence de *Gremmeniella abietina* dans les comtés de Cumberland, de Pictou, de Guysborough et de Richmond. *Sirococcus strobilinus*, maladie cryptogamique responsable des brûlures aux pousses est largement répandu dans la province, causant des taches brunes considérables dans certaines plantations de Stanley Management Area, comté de Hants. On signale communément dans le Garden of Eden Barrens, comtés de Pictou et de Guysborough, la présence de rouille provoquée par soit l'un ou l'autre, ou les deux champignons. Avant qu'on puisse établir des mesures de lutte, on recommande l'établissement de lopins d'étude pour acquérir des informations sur le développement des symptômes et le degré d'intensité de la maladie.

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## INTRODUCTION

The fungus *Gremmeniella abietina* (Lagerb.) Morelet (*Scleroderris lagerbergii* Gremmen), the causal organism of the scleroderris canker of pines, was found in Nova Scotia in 1972. The Forest Insect and Disease Survey (F.I.D.S.) of the Canadian Forestry Service and the Nova Scotia Department of Lands and Forests (N.S.L.F.) undertook a cooperative survey of pine plantations in 1973 to establish the distribution of the organism and to determine the extent of the damage it may be causing. *G. abietina* was found at three locations, and a continuation of the survey in 1974 was recommended.

The 1974 survey again was carried out in cooperation between the two establishments, mentioned above. Information was recorded on all types of disorders found. This report summarizes the results and some of the disorders are discussed.

## METHOD, PLANTATIONS

Examination by F.I.D.S. field technicians or by N.S.L.F. personnel usually consisted of a zig-zag walk through the plantation primarily in search of symptoms of scleroderris canker, but also noting other disorders. Observations were recorded on a standardized report form (Fig. 1) which was submitted (with samples when applicable) to the Maritimes Forest Research Centre for processing. Tables 1 to 3 give some of the pertinent parameters of the pine plantations in Nova Scotia, based on the survey, while Tables 4 to 7 summarize the conditions found during the survey.

PLANTATION SURVEY (INSECTS & DISEASES)

Subdivision \_\_\_\_\_

LOCATION: \_\_\_\_\_ OWNER: \_\_\_\_\_  
 (Grid number C.F.S.: \_\_\_\_\_) ADDRESS: \_\_\_\_\_  
 COUNTY: \_\_\_\_\_ (MAP REFERENCE: \_\_\_\_\_)  
 PLANTATION NUMBER: N.S.L.F. NO.: \_\_\_\_\_ F.I.D.S. No.: \_\_\_\_\_

SPECIES: \_\_\_\_\_  
 ACREAGE: \_\_\_\_\_ and NUMBER OF TREES: \_\_\_\_\_  
 YEAR PLANTED: \_\_\_\_\_ SPACING: \_\_\_\_\_  
 SOURCE OF TREES: N.S.L.&F.  PRIVATE NURSERY  UNKNOWN  (check one)

Date: \_\_\_\_\_ Examiner: \_\_\_\_\_ good   
 Age: \_\_\_\_\_ Tree height: \_\_\_\_\_ General condition: fair   
 poor

- 1. Negative Report (no insect or disease found)
- 2. Positive Report (insect or disease found) Sample submitted to FIDS: Yes   
 No   
 Field identification: \_\_\_\_\_  
 F.I.D.S. report (include number if available): \_\_\_\_\_

Remarks: \_\_\_\_\_ more on back

Date	Inspect by	Age yrs	Height feet	General condit.			Report		For posit. reports		Remarks on back
				good	fair	poor	Neg.	Posit.	Sample submitted	Yes	
(Fill in)				(Put X in appropriate columns)							

After each inspection please submit form \* for photocopying to: Dr. L.P. Magasi  
 P.O. Box 4000  
 Fredericton, N.B.  
 E3B 5G4

\* with sample if collected

Figure 1. Plantation survey form used to record field observations.

Table 1. Species distribution of pine plantations inspected in Nova Scotia in 1974

Subdivision	County	Number of plantations by host <sup>1</sup>										Total inspected
		rp	ScP	jP	wP	lP	aP	piP	mixed			
Western	Digby	5	3	1	1	-	-	-	-	2	12	
	Yarmouth	25	3	2	4	-	-	4	-	2	40	
Valley	Shelburne	21	1	3	-	-	-	-	-	3	28	
	Annapolis	9	10	-	2	-	-	-	6	27		
	Kings	36	2	-	-	-	-	-	5	43		
	Queens	2	-	1	-	-	-	-	-	3		
South Shore	Lunenburg	2	9	-	-	-	-	-	1	12		
	Hants	52	1	2	-	-	-	-	1	56		
South Central	Halifax	11	-	-	-	-	-	-	-	11		
	Cumberland	38	9	4	-	1	-	-	1	53		
North Central	Colchester	30	3	2	-	2	-	1	1	39		
	Antigonish	9	-	-	-	-	1	-	-	10		
Eastern	Pictou	20	2	1	1	-	-	1	-	25		
	Guysborough	41	3	2	3	-	-	-	2	51		
Cape Breton South	Cape Breton	8	-	-	-	-	-	-	-	8		
	Richmond	6	-	-	-	-	-	-	-	6		
Cape Breton North	Inverness	-	1	-	-	-	-	-	-	1		
	Victoria	6	-	1	-	-	-	-	-	7		
Total		321	47	19	11	3	1	6	24	432		

<sup>1</sup> See appendix for abbreviations.

Table 2. Size distributions of pine plantations inspected in Nova Scotia in 1974

Subdivision	County	Number of plantations in each size category										Total inspected			
		<1	1-5	6-10	11-15	16-20	21-30	31-40	41-50	50-100	100+		Unknown		
Western	Digby	5	6	-	-	-	-	1	-	-	-	-	-	-	12
	Yarmouth	-	5	2	-	-	-	2	5	3	7	12	-	-	40
	Shelburne	1	15	2	1	2	2	2	-	-	-	3	-	-	28
Valley	Annapolis	4	19	-	-	-	-	-	-	-	-	-	-	-	27
	Kings	5	20	2	2	4	-	-	-	-	-	2	-	-	43
South Shore	Queens	-	2	-	-	-	-	-	-	-	-	1	-	-	3
	Lunenburg	-	2	-	-	-	-	-	-	-	-	10	-	-	12
South Central	Hants	2	17	2	10	2	8	1	-	-	-	-	-	-	56
	Halifax	1	7	-	1	-	-	-	-	-	-	-	-	1	11
North Central	Cumberland	4	20	2	5	2	2	3	-	1	1	6	-	-	53
	Colchester	12	13	-	-	-	2	-	-	-	-	6	-	-	39
Eastern	Antigonish	3	3	-	-	-	-	-	-	-	-	-	-	1	10
	Pictou	1	7	2	4	2	1	2	3	-	-	3	-	-	25
	Guysborough	1	8	11	6	5	9	2	2	6	-	1	-	-	51
Cape Breton South	Cape Breton	-	5	2	-	-	-	-	-	-	-	-	-	1	8
	Richmond	-	5	1	-	-	-	-	-	-	-	-	-	-	6
Cape Breton North	Inverness	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Victoria	1	2	2	-	-	-	-	-	-	-	2	-	-	7
<b>Total</b>		<b>40</b>	<b>156</b>	<b>71</b>	<b>29</b>	<b>17</b>	<b>28</b>	<b>13</b>	<b>10</b>	<b>10</b>	<b>8</b>	<b>50</b>		<b>432</b>	
% of plantations (with size known) in group		10.5	40.8	18.6	7.6	4.5	7.3	3.4	2.6	2.6	2.1	-		-	

Table 3. Age distribution of pine plantations inspected in Nova Scotia in 1974

Subdivision	County	Number of plantations in each age group										Total		
		1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	40+	Unknown			
Western	Digby	1	5	2	1	2	1	-	-	-	-	-	-	12
	Yarmouth	-	10	10	14	2	-	-	-	-	-	-	4	40
Valley	Shelburne	2	7	5	2	-	-	-	-	-	-	-	12	28
	Annapolis	-	7	4	2	7	1	5	-	-	-	-	-	27
	Kings	1	17	9	3	5	4	1	-	-	-	1	1	43
South Shore	Queens	1	-	-	-	1	-	-	-	-	-	-	1	3
	Lunenburg	-	-	-	-	-	-	1	-	-	-	11	-	12
South Central	Hants	4	11	11	18	10	2	-	-	-	-	-	-	56
	Halifax	1	6	-	-	-	2	-	-	-	-	2	-	11
North Central	Cumberland	11	7	6	6	6	3	1	1	1	1	5	5	53
	Colchester	5	7	7	10	4	1	-	-	-	4	-	-	39
Eastern	Antigonish	1	3	3	2	-	-	-	-	-	-	1	-	10
	Pictou	1	13	2	5	1	-	-	-	-	3	-	-	25
Cape Breton South	Guysborough	3	14	23	7	2	-	-	-	-	2	-	-	51
	Cape Breton	1	4	2	-	-	-	-	-	-	-	1	-	8
Cape Breton North	Richmond	-	6	-	-	-	-	-	-	-	-	-	-	6
	Inverness	-	-	-	-	-	-	-	-	-	-	1	-	1
	Victoria	-	6	1	-	-	-	-	-	-	-	-	-	7
<b>Total</b>		<b>32</b>	<b>123</b>	<b>85</b>	<b>70</b>	<b>40</b>	<b>14</b>	<b>11</b>	<b>8</b>	<b>1</b>	<b>48</b>	<b>432</b>		
% of plantations (with age known)		8.4	32.0	22.1	18.2	10.4	3.6	2.9	2.1	0.3	-	-		
In group														



Table 4. Type of observations in pine plantations inspected in Nova Scotia in 1974

Subdivision	County	Negative report	Positive report	Total inspected
Western	Digby	12	-	12
	Yarmouth	30	10	40
Valley	Shelburne	18	10	28
	Annapolis	15	12	27
	Kings	29	14	43
South Shore	Queens	-	3	3
South Central	Lunenburg	-	12	12
	Hants	9	47	56
	Halifax	7	4	11
North Central	Cumberland	21	32	53
	Colchester	21	18	39
Eastern	Antigonish	1	9	10
	Pictou	4	21	25
Cape Breton South	Guysborough	6	45	51
	Cape Breton	1	7	8
	Richmond	-	6	6
Cape Breton North	Inverness	-*	1	1
	Victoria	2**	5	7
Total		176	256	432

\*Plantations in County inspected by R. Johnson - Summary negative report received without counts.

\*\*Plantations in County inspected by J. MacKillop and A. Hanaan - Summary negative report received without counts.

Table 5. Forest fungi found in pine plantations in Nova Scotia during inspection in 1974

Subdivision + County		Number of plantations where fungus found <sup>1</sup>									
		Scleroderris canker	Shoot blight	Red flag	Stem rust	White pine blister rust	Needle rusts	Needle casts	Globose gall rust	Shoestring root rot	Branch fungus
Western	Digby	-	-	-	-	-	-	-	-	-	-
	Yarmouth	-	1	1	-	-	-	-	-	-	-
	Shelburne	-	1	2	1	-	-	-	-	-	-
Valley	Annapolis	-	-	2	-	2	-	-	-	-	-
	Kings	-	-	1	-	-	2	-	2	1	1
South Shore	Queens	-	1	-	1	-	-	-	-	-	-
	Lunenburg	-	2	-	-	-	4	-	-	-	-
South Central	Hants	-	17	9	1	-	1	-	-	-	-
	Halifax	-	3	1	-	-	-	-	-	-	-
North Central	Cumberland	3	10	3	1	-	3	4	5	-	3
	Colchester	-	3	3	-	-	-	1	-	-	1
Eastern	Antigonish	-	-	2	-	-	2	-	-	-	-
	Pictou	3	1	13	-	-	1	-	2	-	-
	Guysborough	4	-	38	-	-	-	1	2	-	-
Cape Breton South	Cape Breton	-	1	2	-	-	-	-	-	-	-
	Richmond	-	1	3	-	-	-	-	-	-	-
Cape Breton North	Inverness	1	-	-	-	-	-	-	-	1	-
	Victoria	-	-	1	-	-	1	-	-	1	-
Total		11	41	88	4	2	14	6	11	3	5

<sup>1</sup>See appendix for scientific names.

Table 6. Forest insects in pine plantations in Nova Scotia during inspection in 1974

Subdivision	County	Number of plantations where insect found <sup>1</sup>																			
		European pine shoot moth	White pine weevil	Root collar weevil	Pine nodule maker	Red pine sawfly	Monochamus beetle	Spruce bud scale	Sooty mold assoc. with insect activity												
Western	Digby	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Yarmouth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Valley	Shelburne	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Annapolis Kings	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Queens	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Shore	Lunenburg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Central	Halifax	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cumberland	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North Central	Colchester	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Antigonish	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eastern	Pictou	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Guysborough	1	-	-	2	-	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-
Cape Breton South	Cape Breton	-	2	-	3	-	-	-	-	8	2	-	-	-	-	-	-	-	-	-	-
	Richmond	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cape Breton North	Inverness	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Victoria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		22	8	2	8	2	8	12	3	2	16	2	2	16	2	2	2	2	2	2	2

<sup>1</sup>See appendix for scientific names.

Table 7. Miscellaneous conditions found in pine plantations in Nova Scotia during inspection in 1974

Subdivision	County	Animal damage				Climatic conditions			Miscellaneous				
		Porcupine damage	Rodent damage	Cattle grazing	Deer grazing	Winter drying	Snow damage	Roadside salt	Canker undet.	Unknown causes			
Western	Digby	-	-	-	-	-	-	-	-	-	-	-	-
	Yarmouth	5	1	-	-	3	-	-	-	-	-	-	-
Valley	Shelburne	-	-	-	-	4	-	-	-	-	-	-	-
	Annapolis	2	-	-	-	-	-	-	-	-	1	-	-
South Shore	Kings	4	-	-	-	-	-	-	-	-	-	-	-
	Queens	-	-	-	-	1	-	-	-	-	-	-	-
South Central	Lunenburg	1	-	-	-	-	-	-	-	-	1	-	-
	Hants	10	-	-	-	6	-	-	-	-	-	-	-
North Central	Halifax	-	-	-	1	11	-	-	-	-	-	-	-
	Cumberland	9	4	-	-	3	1	-	-	-	1	-	1
Eastern	Colchester	5	-	-	-	7	-	1	-	-	-	-	-
	Antigonish	2	-	1	-	-	-	-	-	-	-	-	-
	Pictou	2	1	-	-	1	-	-	-	-	-	-	-
Cape Breton South	Guysborough	4	-	-	-	1	-	-	-	-	-	-	-
	Cape Breton	-	-	-	-	1	-	-	-	-	1	-	1
Cape Breton North	Richmond	-	-	-	-	-	-	-	-	-	-	-	-
	Inverness	-	-	-	-	-	-	-	-	-	-	-	-
	Victoria	-	-	-	-	-	-	-	-	-	-	-	-
Total		44	6	1	1	38	1	1	4	2			

## SCLERODERRIS CANKER

*History and Importance of the Disease*

The history of scleroderris canker has been treated extensively by Dorworth (1971). For nearly a century, the fungus *Gremmeniella abietina* has caused dieback and cankering of pines in Europe and dieback of spruce, the host tree on which the fungus was originally described. In North America, the disease became important only in the past 20 years.

In Canada, the greatest losses caused by this fungus were suffered in Ontario where it "nearly eliminated red pine from many plantations and promises to exact a similar toll of planted jack pine" (Dorworth, 1970a). In natural forests of Ontario, the fungus "will undoubtedly exercise its full potential as a forest tree pathogen among the young jack pine stands. Great numbers of juvenile pines are destroyed by the fungus. This situation is most notable in regeneration or areas cleared by fire or logging. Equally serious are those situations in which *G. abietina* is endemic in the pine understory, being a potential source of infection for regeneration that appears after the area is logged, and a continuing source of inoculum to infect young pines in adjacent areas" (Dorworth and Buchan, 1972). In nurseries, the fungus is just as destructive, and potentially more dangerous, because it spreads easily from seedling to seedling even during shipping, and "a limited nursery infection can become magnified by the time the seedlings reach the planting site" (Dorworth, 1970b).

In Quebec, scleroderris canker is evident in 11 of 26 counties where jack pine grows naturally, and infection levels from 29 to 85%

have been found in plots established at one location in an area of natural jack pine regeneration. Mortality of 3- to 8-year-old jack pine trees ranged from 9 to 71%. The disease is also widespread in plantations of red, jack, and Scots pines (Martineau and Lavallee, 1973).

In New Brunswick, the disease was first recorded in 1971 when 8% of 3,500 Scots pine trees in a Christmas tree plantation were killed and 79% were severely damaged by the fungus. Examination of 124 locations during the same year established the presence of the disease at 15 locations in natural stands or plantations of red, jack, eastern white, Scots, and, for the first time in North America, on Austrian pine (Magasi, 1972). Since then, the fungus has been found at many widely separated locations throughout the natural range of jack pine.

In Nova Scotia, the fungus was isolated from two of seven trees sampled in a 15-year-old red pine plantation on the Garden of Eden Barrens in 1972. In 1973, it was found near Pleasant Harbour, Halifax County, in a red pine plantation; near Port Howe, Cumberland County, in a Scots pine Christmas tree plantation; and on the Garden of Eden Barrens, Pictou and Guysborough counties, in plantations of red, Scots, and eastern white pines.

#### *Life Cycle and Symptoms of Gremmeniella abietina*

Primary infection is by small, wind-disseminated spores (ascospores), which are released from fruiting bodies (apothecia) during moist periods. Spores deposited on needles or branches of the current year's growth of pine, germinate and the fungus grows into the internal tissues of the host. Spores are released from May to October but the peak period of spore production is around mid-July.

Regardless of the time of infection, the fungus kills the branch. The first symptoms, however, do not become evident until the next spring, shortly before shoot elongation begins. As shoots on adjacent branches begin to grow, the foliage on infected branches turns grayish green and a yellow-orange discoloration progresses from the base towards the tip of the needles. The bases of the needles later turn chocolate brown. *A dead terminal bud surrounded by light green needles with brown bases is the first easily recognizable symptom.* This symptom should not be confused with that of winter drying, where the tips of the needles are brownish, the bases are green, and the terminal bud, in most cases, is not dead.

As summer progresses, needles turn yellowish brown and usually drop by autumn. A few months after the branch dies, another fruiting stage of the fungus (pycnidia) develops. Pycnidia appear as small, pin-head sized, black spots on dead twigs. Spores (conidia) are released from the pycnidia during rainy periods. These spores are capable of causing new infections when they are splashed to healthy branches of the same, or adjacent trees.

The fungus grows into the main stem of the tree. Young trees are girdled quickly and may die within a few months. On older trees, cankers form, usually close to the ground, enlarge year after year and may kill the tree. Apothecia appear on branches that have been dead for 1 or 2 years.

The fungus causes a yellowish green discoloration in the inner bark and wood of infected branches and stem. This discoloration can often be detected in young newly killed branches by slicing the stem longitudinally, but it must not be confused with residual chlorophyll, which is present well into summer.

Hosts are susceptible from the early seedling stage, but trees are rarely killed after they reach a certain height, varying from 8 feet (2.4 m) for red pine to 12 feet (3.6 m) for jack pine.

All plantations may be susceptible to infection, but damage appears to be most serious in areas of frequent frost. These areas include not only frost pockets but also large, flat fields with poor air drainage.

*Scleroderris Canker in Nova Scotia, 1974*

a, Carrington and West Leicester, Cumberland Co. -- About 5% of the Scots pine trees in a Christmas tree plantation near Carrington (Plot 2 of Cloney) were found with symptoms of the disease. In the plantation covering about 26 acres (10 ha), the trees are between 10 and 20 years old and between 5 and 20 feet (1.5-6.0m) high. The symptoms are most noticeable on trees that have grown beyond the Christmas tree stage. *G. abietina* was identified on two of the six samples submitted. In addition to scleroderris canker, globose gall rust (*Peridermium harknessii*), a twig fungus (*Cenangium ferruginosum*) and insect damage probably white pine weevil, was found in the samples, and mice, rabbits, and porcupine were reported to have caused some damage.

At West Leicester, two plantations of Scots pine were found infected by *G. abietina*. The first plantation (Plot 3 of Cloney) covers 15 acres, the trees vary in age from 8 to 15 years, and in height from 5 to 15 feet (1.5-4.5m). Disease symptoms were found on less than 5% of the trees, most of these beyond the Christmas tree stage. In addition to scleroderris canker some trees suffered rodent damage and some were affected by the pitch nodule maker. The other plantation (Plot 4 to Cloney) covers 60 acres (24 ha), the conditions are similar to those found in Plot 3 except some trees were affected by globose gall rust and no pitch nodule maker damage was observed.



Control measures should be initiated in these plantations; all three are the property of the Gold Star Christmas Tree Export Company. If the infected portion of the plantation is abandoned for Christmas tree purposes, then the trees could be removed with minimal economic loss to the Company. If, however, the trees are to be cut for marketing, then careful selection and removal of infected trees could prevent the disease from spreading. These measures are the same as those recommended for a plantation west of Port Howe, owned by the same Company, found infected in 1973. The Company complied with these recommendations and removed the infected Scots pine trees.

b, Abercrombie, Pictou Co. -- A red pine plantation (N.S.L.F. No. 7, map ref. D31; F.I.D.S. No. 114), owned by Scott Maritimes Limited, was planted in 1968. In the winter of 1973-74, 12,000 of the original 48,000 trees were killed from girdling by mice. About 90% of the remaining trees were infested by the European pine shoot moth, and larvae were found in 3-4 shoots per tree. The sample from which *G. abietina* was isolated was "just a dead branch" submitted. Dead trees were removed and the area replanted with spruce in 1974. No estimate of the incidence of the disease was possible. Future inspections will clarify the situation.

c, Garden of Eden Barrens, Pictou-Guysborough Co. -- Particulars of the plantations in which *G. abietina* was found in 1973 and in 1974, are given in Table 8. Obviously the disease is established in the area, but the statement made last year, that "the symptom development of the disease not being typical, it is almost impossible to recommend sensible control measures," is still valid. Of 59 plantations where "red flags"

Table 8. *Gremmeniella abietina* in plantations at the Garden of Eden Barrens, 1974

Plantation					Remarks
N.S.L.F. No.	F.I.D.S. No.	Age Year	Height feet	Size acres	
6	19	24	15	3	Dead shoots common on trees. Fungus not isolated in 1974 but was identified in 1973. ScP.
17 & 18	27	10	3	26	3 of 300 trees were found with one dead shoot each. rP.
24	32	16	10	29	5 of 8 trees sampled in 1973 were found to be infected. rP & wP. 3% of trees infected in 1974.
25 & 26	33	9	-	11	1 of 2 trees sampled in 1973 was found to be infected. ScP.
38	22	9	5	7	3 of 300 trees were found with one dead shoot each. rP.
76, 78, 79	55	17	-	33	1 of 3 trees sampled in 1973 was found to be infected. rP.
81	60	17	7	16	5 of 13 trees sampled in 1973 were found to be infected. In 1974, 6 more infected trees were identified. A study plot on scleroderris canker is established in this plantation. rP.
151	132	13	7	23	Dead shoots found on about 5% of trees. rP.

were observed, the fungus was found in only a few. However, the symptoms were identical in the two types of plantations, leaving the impression that Table 8 may be only a partial list of infected plantations in the area.

An experimental plot was established in the spring of 1974 in N.S.L.F. plantation No. 81 to study the symptom development of the disease. Photographic records of changes on marked branches are being assembled but the study will not be completed until culture work can be carried out in the spring of 1975.

Because of the unusual pattern of the disease in the area, information on its spread and intensification must be collected before meaningful control measures can be recommended. Permanent plots should be established in some of the infected plantations and in some where the red flags are present but the fungus not yet found. Trees should be numbered, branches with symptoms marked, and the plots periodically inspected for changes.

d, Oban, Richmond Co. -- The red pine plantation (N.S.L.F. No. 9, map ref. C.B.-14) was established in 1965, when 6,000 trees were planted over 8 acres (3.2 ha). The trees are now 2 feet (0.6m) high and are reported to be in good condition. *G. abietina* was isolated from both samples submitted from the plantation, but no information is available on the incidence of the disease. It is recommended that, infected trees be identified, removed, and burned. The plantation should be surveyed to establish the incidence of the disease, and samples submitted for identification, before further control measures are considered.

SHOOT BLIGHT *SIROCOCCUS STROBILINUS*

Numerous branches of red pine, submitted as scleroderris suspects, were found to contain fruiting bodies of *Sirococcus strobilinus*, the causal fungus of shoot blight:

*S. strobilinus* (syn. *Ascochyte piniperda*), although reported in the literature in the 1930's has received attention in North America only in the last decade. The fungus causing damage mostly on red pine in the Lake States, has been reported as far west as British Columbia. Its hosts, in addition to pine, include spruce, larch, hemlock, Douglas fir, and true firs. The fungus infects and kills newly developed shoots, fruits on the twigs or needles from where the spores are dispersed and cause new infections. Infected seedlings may die early. On larger trees discoloration spreads and the tree is stunted.

The fungus was found to be widespread in Nova Scotia. Branch discoloration varied greatly, from a single infected branch of a single tree to most branches of most trees in a plantation. Patches of natural regeneration of red pine were also found infected. Locations of these and of the few plantations in which the fungus was identified after the conclusion of the 1973 survey, are also listed in Table 9 along with remarks on the conditions observed. Survey results in the Chignecto Management Area, Cumberland County, and the Stanley Management Area, Hants County are detailed in Tables 10 and 11.

Table 9. The distribution of *Sirococcus strobilinus* in red pine plantations in Nova Scotia 1974

County	Location	Plantation				U.T.M. Grid	Remarks
		Number	Age	Height	Size		
		N.S.L.F.	F.I.D.S.	(year)	(feet)		
Yarmouth	Kemptonville	-	-	6	-	20-27-488	Big Meadow Ridge plantation. Only one tree found with symptoms; this was sampled in 1973 with negative results.
Shelburne	Moose Lake	-	-	-	-	20-30-488	Indian Fields Barren. Red flagging on reproduction in natural stand.
Queens	North Access Rd., Rossignol Area	-	-	-	-	20-32-490	10% of trees with red flags.
Lunenburg	Auburdale	-	-	-	2	20-37-491	Red flagging severe on many trees, 100% of trees affected. Natural regeneration.
	Henneberry Lake, East Chester Map ref: M19 21A/9E	1	7	36	2	20-40-493	100% of trees with red flags.
	East River	-	-	30	-	20-40-493	Red flagging common on almost 100% of trees, some trees up to 10% of shoots affected. This observation was made in 1973, but the fungus was identified in 1974.

Continued

Table 9 (continued).

County	Location	Plantation					Remarks
		Number	Age	Height	Size	U.T.M. Grid	
		N.S.L.F.	F.I.D.S.	(year)	(feet)		
Hants	Stanley Management Area	-	-	varied	varied	20-42-499	17 plantations affected. See Table 11 for details
Halifax	Big Hubley Lake	-	-	-	several	20-43-494	Red flags common.
	Glenmore	1	16	30	45	20-48-499	Red flagging on 100% of trees, most severe along edges.
	Map ref: 127 11E/3E						
Cumberland	Chignecto Management Area	-	-	varied	varied	20-39-504	10 plantations affected. See Table 10 for details
Colchester	Debert (Lower Onslow) Map ref: F25 11E/6W	1	1	14-17	-	20-46-502	Less than 5% of trees affected.
		2	2	18	15	20-46-502	10-15% of trees affected
		8	8	12	15	20-46-502	Only one tree with one red flag found.
		-	-	-	-	20-46-502	Natural forest.
Pictou	McDonald Siding (Meadowville)	-	-	-	-	20-50-506	Serious browning in natural forest.
	Garden of Eden Barrens Map Ref: G-35	81	60	13	7	20-55-502	Dead shoots common in trees. Scleroderris canker also present. Study plot established.

Continued

Table 9 (concluded)

County	Location	Plantation					U.T.M. Grid	Remarks
		Number	Age	Height	Size			
		N.S.L.F.	F.I.D.S.	(year)	(feet)	(acre)		
Cape Breton	Mira Road Map Ref: CB 55	2	14	11	8	7.5	20-72-510	No information on incidence and intensity.
Richmond	St. Esprit Map Ref.: CB 17	4	-	7	5	2.5	20-69-505	Found on one of two samples received.

Table 10. Distribution of *Strocoecus strobilinus* in red pine plantations in the Chignecto Management Area: 1974

Plantation						
N.S.L.F.	F.I.D.S.	Age year	Height feet	Size acres	Map Ref.	Remarks
46	32	27	30	10.0	E18 21H/9W	Few scattered dead shoots.
47	32	31	35	1.1	"	Few scattered dead shoots.
49	33	33	25	2.0	"	Few scattered dead shoots.
64	41	20	15	9.0	"	Dead shoots on two trees.
52	34	29	30	1.0	"	Few scattered dead shoots.
66	43	30	40	9.0	"	Few scattered dead shoots.
67	44	17	14	18.0	"	Few scattered dead shoots.
68	45	34	30	0.8	"	Few scattered dead shoots.
73	50	36	45	0.6	"	Few scattered dead shoots.
89	45	25	30	3.0	"	Few scattered dead shoots.

Dead shoots were found in two additional plantations but the cause of discoloration was not determined.



Table 11. Distribution of *Sirococcus strobilinus* in red pine plantations in the Stanley Management Area 1974

Plantation						
N.S.I.F.	F.I.D.S.	Age year	Height feet	Size acres	Map Ref.	Remarks
1	1	17	15	6.9	121 11E/4W	10% of trees affected.
2	2	21	12	5.6	"	50% of trees affected.
4	3	20	25	8.8	H21 11E/4W	Few scattered trees affected.
5	3	14	6	4.4	"	Dead shoots moderate to severe on 80-90% of trees. Several trees dead, 1-5% deformed.
6	3	13	8	13.8	"	Dead shoots light to moderate on 60% of trees at south end of plantation, light on 10% of trees at north end.
8	5	14	22	8.0	"	Dead shoots on 10% of trees.
9	6	16	22	12.5	H21	Dead shoots on 10-15% of trees.
10	7	15	20	2.4	-	Dead shoots on 20% of trees.
11	8	12	10	15.6	H21 11E/4W	Dead shoots light to moderate on 30% of trees. Adjacent mature trees affected to a lesser extent.
12	9	11	7	11.0	"	Dead shoots moderate on 80% of trees.
13	10	24	8	1.8	"	Dead shoots light on 30% of trees.
14	11	16	20	3.0	"	Few scattered dead shoots.
15	12	19	20	2.5	H21	Only one dead shoot found.
16	13	10	4	22.0	121 11E/4W	Less than 5% of trees affected.
19	14	7	3	21.0	"	Few scattered trees affected.
21	15	21	30	5.6	H21	Dead shoots on 20-30% of trees.
22	17	20	25	12.0	H21 11E/4W	Few scattered dead shoots.

## RED FLAG

The similarity of early symptoms of scleroderris canker and of shoot blight caused by *S. strobilinus*, makes it difficult to assign red flag samples to either of these two groups. Red flagging, i.e. discolored branches on trees, could result from many biotic or abiotic conditions. At times it is easy to determine the cause of death of single branches, often, however, especially in cases of a disease complex like the one found in Nova Scotia, red flagging cannot be casually attributed to unknown causes. Tables 12 and 13 list observations on "red flags" at the Stanley Management Area and at the Garden of Eden Barrens. These plantations should be reinspected in 1975 and some of them used to establish plots for further study (see section on scleroderris canker).

## OTHER DISEASE AND INSECT CONDITIONS

Most of the items (insect, disease, miscellaneous) listed in Tables 5 to 7 were of localized occurrence and interest and it is beyond the scope of this report to discuss each in detail. The plantation inspection forms were photocopied and returned to the inspectors. Identifications on the samples submitted, were provided either when the form was returned or sent subsequently. If further information is required on any of the causal agents, the Maritimes Forest Research Centre will cooperate on an individual basis.

## SUMMARY

For the second consecutive year an inspection of pine plantations, primarily to establish the distribution of scleroderris canker was carried

Table 12. Red pine plantations at the Stanley Management Area where dead shoots (red flag) were found in 1974

Plantation						
N.S.L.F.	F.I.D.S.	Age year	Height feet	Size acres	Map Ref.	Remarks
3	2	15	18	8.8	121	Dead shoots on 40% of trees.
7	4	18	25	3.5	H21 11E/4W	Few scattered dead shoots.
17	13	17	3	1.8	-	Dead shoots on 1% of trees.
18	13	8	3	21.0	121 11E/4W	Dead shoots on less than 5% of trees.
24	19	5	2	11.0	"	Dead shoots on only 2 trees.
-	-	16	6	15.6	H21	No extra information.

Table 13. Red pine plantations at the Garden of Eden Barrens where dead shoots (red flag) were found in 1974

Plantation							Remarks
N.S.L.F.	F.I.D.S.	Age year	Height feet	Size acres	Map ref.		
7	20	13	4	14.0	G-35	3/200 trees with 1 dead shoot each.	1.5%
16	26	13	3	43.0	G-35	3/300 trees with 1 dead shoot each	1.0%
24	32	16	10	29.0	G-35	15/500 trees with 1-2 dead shoot each	
32	36	13	4	2.0	G-35	each Scleroderris canker present in plantation	3.0%
31 & 84	36	13	10	25.0	G-35	1/100 trees with 1 dead shoot each	1.0%
52	44	12	3	17.0	G-35	5/450 trees with 1 dead shoot each	1.1%
53	44	12	4	11.0	G-35	4/35 trees with 1 dead shoot each	11.4%
59	46	13	4	14.0	G-35	6/350 trees with 1-2 dead shoot each	1.7%
64	50	14	6	85.0	G-35	2/400 trees with 1 dead shoot each	0.5%
75	54	18	15	10.0	G-35	7/1000 trees with 1 dead shoot each in one patch 200 trees with dead shoots	0.7%
82	56	15	14	16	G-35	2/300 trees with 1 dead shoot each	0.7%
84	71	10	3	41	G-34	4/650 trees with 1 dead shoot each	0.6%
86	73	10	2	2	G-34	12/800 trees with 1 dead shoot each	1.5%
87	107	10	3	10	G-34	13/200 trees with 1-2 dead shoot each	6.5%
88	108	10	3	22	G-34	4/200 trees with 1 dead shoot each	2.0%
89	60	17	15	56	G-35	1/200 trees with 1 dead shoot each	0.5%
90	61	4	5	9	G-35	few trees with 1 dead shoot each	
92	77	6	1	11	G-34	6/200 trees with 1 dead shoot each	3.0%
95	78	7	2	12	G-34	One dead shoot found	
102	83	7	4	30	G-34	One dead shoot found	
103	84	7	3	14	G-34	21/400 trees with 1-2 dead shoots each	5.3%
104	85	7	3	.6	G-34	One dead shoot each on 6 trees	
109	89	8	2	36	G-34	8/200 trees with 1 dead shoot each	4.0%
110	90	8	3	14	G-34	One dead shoot found	
						8/400 trees with 1 dead shoot each	2.0%

Continued

Table 13 (continued).

Plantation						
N.S.L.F.	F.I.D.S.	Age year	Height feet	Size acres	Map ref.	Remarks
111	91	8	4	4	G-34	20/200 trees with 1 dead shoot each 10.0%
112	109	8	2	42	G-34	3/500 trees with 1 dead shoot each 0.6%
113	110	8	2	13	G-34	13/800 trees with 1 dead shoot each 1.6%
114	110	8	4	8	G-34	5/400 trees with 1 dead shoot each 1.3%
115	111	8	3	25	G-34	white pine plantation One dead shoot per tree on less than 1% of trees
118	113	8	2	26	G-34	7/800 trees with 1 dead shoot each 0.9%
119	114	8	2	5	G-34	Few scattered dead shoots
125	96	12	4	37	G-34	One dead shoot per tree on less than 1% of trees
126	97	11	10	4	G-34	8/200 trees with 1 dead shoot each 4.0%
135	118	10	4	28	G-35	8/300 trees with 1 dead shoot each 2.7%
136	119	5	1	32	G-34	3/450 trees with 1 dead shoot each 0.7%
148	130	18	10	17	G-34	Two dead shoots found
154	136	13	8	3	G-34	One dead shoot found
155)						
156)	137	5	2	66	G-34	8/800 trees with 1 dead shoot each 1.0%
159)						
160)						
157	135	13	7	54	G-34	1 to 6 dead shoots on 40-50% of trees The increase from 1973 is very noticeable
158	139	5	2	54	G-34	1/600 trees with 1 dead shoot 0.2%
164	142	10	2	1	G-34	3/200 trees with 1 dead shoot each 1.5%
166	144	4	6	9	G-34	4/400 trees with 1 dead shoot each 1.0%
-	138	10	3	25	G-34	4/200 trees with 1 dead shoot each 2.0%

out jointly by staffs of the Nova Scotia Department of Lands and Forests and the Canadian Forestry Service. The disease was found in additional plantations on the Garden of Eden Barrens, in another plantation in the Port Howe - Carrington area, and for the first time, near West Leicester, Cumberland County and near Oban, Richmond County.

The shoot blight disease, caused by *Sirococcus strobilinus*, was identified for the first time and was found to be widespread in the Province.

Dead shoots, which could have been the result of infection either by *G. abietina*, the causal fungus of the scleroderris canker, or by *S. strobilinus*, were common in plantations and in natural regeneration, in areas where either of these organisms were found nearby.

Control measures against the spread of scleroderris canker can be given only in general terms because of the unusual pattern of symptom expression by the causal organism. More studies, both on symptom development and on intensification, are necessary before meaningful recommendations can be made.

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## APPENDIX

## Common and Scientific Names of Diseases and Insects

## A. Diseases

Branch fungus - *Cenangium ferruginosum* Fr.

Globose gall rust - *Endocronartium harknessii* (J.P. Moore) Hiratsuka

Formerly used for *Gremmeniella abietina* - *Scleroderris lagerbergii*  
Gremmen

Formerly used for *Sirococcus strobilinus* - *Ascochyte piniperda* Lindau

Needle casts - *Lophodermium piniastris* (Schrad. ex Hook) Chev.

- *Davisomycella ampla* (Davis) Darker

Needle rusts - *Coleosporium asterum* (Diet.) Syd.

- *Coleosporium viburni* Arthur

Scleroderris canker - *Gremmeniella abietina* (Lagerb.) Morelet

Shoestring root rot - *Armillaria mellea* (Vahl ex Fr.) Kummer

Shoot blight - *Sirococcus strobilinus* Preuss

Stem rust - *Cronartium comptoniae* Arth.

White pine blister rust - *Cronartium ribicola* J.C. Fisher

## B. Insects

European Pine Shoot Moth - *Rhyacionia buoliana* (Schiff.)

Pitch nodule maker - *Petrova albicapitana* (Busck)

Monochamus beetle - *Monochamus scutellatus* (Say)

Red Pine Sawfly - *Neodiprion nanulus nanulus* Schedl.

Root collar weevil - *Hyllobius radicis* (Buch.)

Spruce bud scale - *Physokermes piceae* (Schr.)

White pine weevil - *Pissodes strobi* (Peck)



## Abbreviations used in report:

	<u>Common name</u>	<u>Scientific name</u>
aP	Austrian pine	<i>Pinus nigra</i> Arnold
jP	jack pine	<i>Pinus banksiana</i> Lamb.
lP	lodgepole pine	<i>Pinus contorta</i> Dougl.
piP	pitch pine	<i>Pinus rigida</i> Mill.
rP	red pine	<i>Pinus resinosa</i> Ait.
ScP	Scots pine	<i>Pinus sylvestris</i> L.
wP	white pine	<i>Pinus strobus</i> L.