

THE STATUS OF BEECH BARK DISEASE IN THE MARITIME

PROVINCES OF CANADA IN 1980¹

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Abstract.--Beech bark disease first reached North America about a 100 years ago and within a few decades rendered beech an almost useless weed species in the Maritimes. A survey in 1980 to determine the current status of the disease found the scale insect active, though infestations generally light, on over 90% of trees in Nova Scotia and Prince Edward Island but on only about 50% in New Brunswick; *Nectria coccinea* var. *faginata* distributed throughout; some degree of stem cankering on trees; mortality in New Brunswick (3.7%) less than half of that found in Nova Scotia (9.1%) or Prince Edward Island (9.8%). The future of beech as an economical forest species is bleak.

INTRODUCTION

The Maritime Provinces of Canada have been in a vulnerable position with regard to introduction of foreign pests, especially those from Europe. Being the first land upon which most goods were unloaded, particularly in the years when the wounds of separation were still fresh in the memories of both the British Empire and the United States of America, areas around ports of entry such as Halifax, Nova Scotia, were prime targets for escape and establishment of introduced organisms.

One such organism was the beech scale, *Cryptococcus fagi* (Baer.), an insect introduced on imported nursery stock of European beech, *Fagus sylvatica* L., some time prior to 1890 and first found in North America near Halifax, Nova Scotia (Ehrlich 1934, Hawboldt 1944). The scale and the disease were present throughout mainland Nova Scotia by 1925, the same year it was first found established in Prince Edward Island. The first infestation on Cape Breton Island was found in 1926 and in

1927 the first well-established infestation was located in southeastern New Brunswick (Hawboldt 1944). The gradual northwestward spread of beech bark disease in New Brunswick is illustrated in Figure 1. By 1980, beech was affected throughout the Maritime Provinces, but not to the same extent in all areas.

American beech, *Fagus grandifolia* Ehrh., although used mainly for firewood has been also utilized in small amounts in flooring, furniture, veneer, flakeboard, and as corrugated filler in cardboard. The tree was readily attacked by both the beech scale and the fungus *Nectria coccinea* var. *faginata* Lohm. Wats. & Ayers, and by the early 1930's about half of the beech was dead in the older outbreak areas (Ehrlich 1934). In the Fredericton, New Brunswick area where the scale was first found in 1937, 11% of the beech trees died by 1946 (Barter 1947) and by 1952 about 20% of the trees, representing about 40% of beech volume, were dead (Barter 1953).

For a tree species of diminished economic importance, beech bark disease received more than routine attention during assessments by the Forest Insect and Disease Survey. In 1969, a survey was conducted to determine the changes in the status of the disease since the initial wave of tree mortality (Forbes *et al.* 1970). In 1980, partly in preparation for this IUFRO conference, 50 of the original 103 areas from the 1969 survey were re-evaluated to obtain information on the current status of beech bark disease in the Maritime Provinces and to determine changes during the past decade (Magasi 1981).

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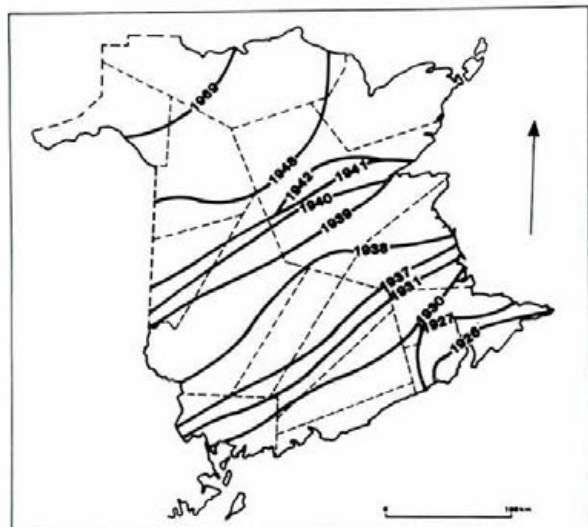


Figure 1.--The spread of beech bark disease in New Brunswick (Based on information from Hawboldt 1944, Forbes *et al.* 1970, and Canadian Forestry Service data).

THE STATUS IN 1980

The host

Beech, once a considerable element in the species composition of hardwoods in the Region, has been decimated by beech bark disease. By 1969 it comprised only 3.5% of the total gross merchantable timber (Forbes *et al.* 1970). Beech now contributes only 1.8%, and 1.7% to the total merchantable inventory of New Brunswick (Anon. 1981) and Nova Scotia (Anon. 1979), representing 1.57 million m³ and 4.7 million m³ of wood, respectively.³

The size distribution of trees in the 1980 survey was as follows (based on 2505 trees):

diameter	3 - 8 cm	27.5%
	9 - 16 cm	21.1%
	17 - 24 cm	33.8%
	25 + cm	17.6%

The scale insect

Cryptococcus fagi was present at all 21 locations in Nova Scotia and 3 in Prince Edward Island and at 21 of 26 locations in New Brunswick. All five scale-free plots were in the northwestern part of the Province where cankering was also the lowest (Fig. 2). From 2 to 100% of the trees were infested on plots.

³The Prince Edward Island forest inventory is in preparation and figures are not yet available.

The amount of wool produced by the insect, expressed as a percentage of surface area covering the lower trunk, varied from low (1-5%) to medium (6-35%) on individual trees. The infestation was generally light and was found moderate only at three locations in New Brunswick and at one location in Nova Scotia. Elsewhere, only occasional trees were moderately infested.

Most trees were infested to some degree in Nova Scotia and Prince Edward Island but only about one-half of the trees in New Brunswick harbored the scale. Trees of all sizes were attacked by the scale in about equal proportions in any given Province (Table 1).

Table 1.--Percentage of scale infested trees by diameter classes in the Maritimes in 1980^a

Province	Diameter class (cm)				Average infestation
	3-8	9-16	17-24	25+	
New Brunswick	44	52	57	47	51
Nova Scotia	96	99	97	96	97
Prince Edward Island	80	97	96	96	90

^aBased on 963 trees in New Brunswick, 866 in Nova Scotia, and 138 in Prince Edward Island.

The fungus

Nectria coccinea var. *faginata* is the species associated with beech bark disease in the overwhelming majority of mycological collections. Its distribution closely matches that of the disease. *Nectria galligena* Bres. has been collected occasionally from cankered beech.

The canker

Cankering was assessed on the lower 3 m of the trunk of 50 trees at each location and expressed as the percentage of the trunk surface cankered. A severity index was calculated for each plot by multiplying the number of trees in each canker class as follows (Forbes *et al.* 1970):

- 0 for healthy trees,
- 1 with 1-20% of lower trunk cankered,
- 2 with 21-50% of lower trunk cankered,
- 3 with 51% of lower trunk cankered,
- 4 dead with cankers.

Beech bark disease was present at all locations in the Maritimes but the incidence

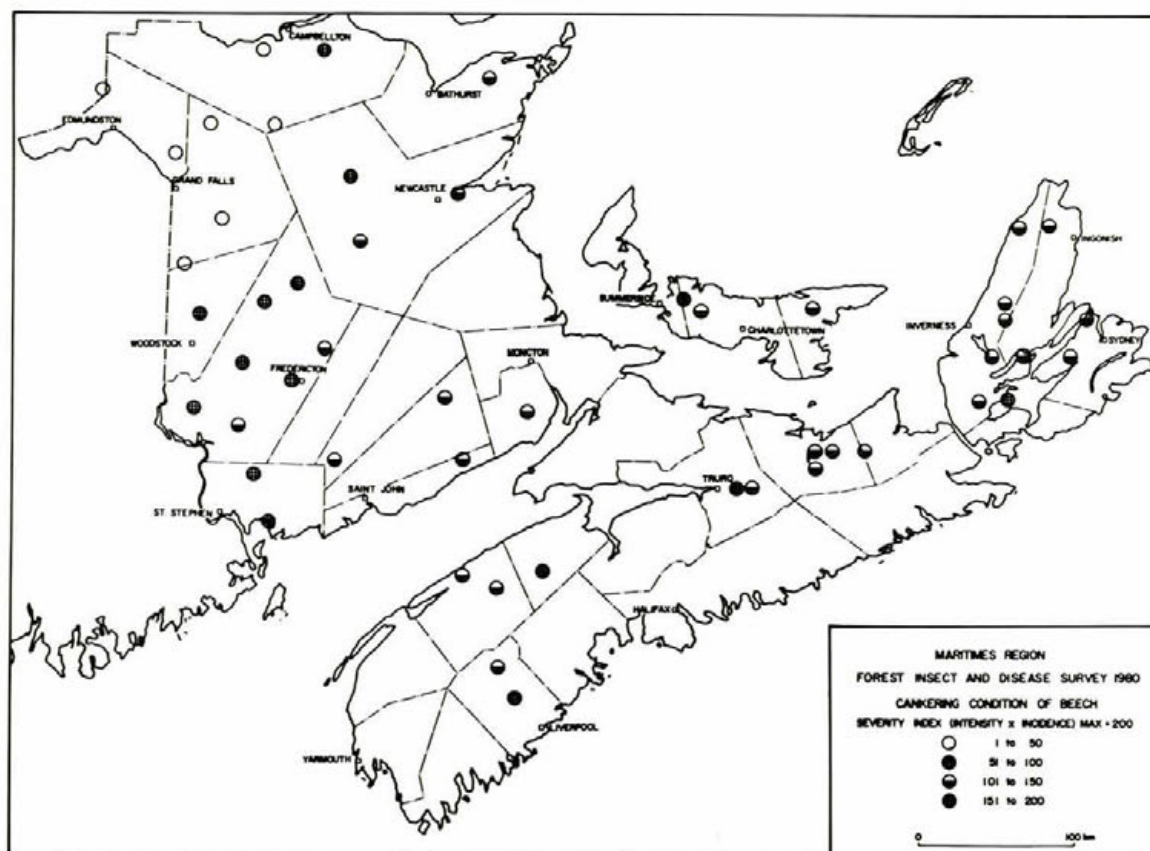


Figure 2.—The degree of stem cankering on beech in the Maritime Provinces of Canada in 1980 (from Magasi 1981).

of severe cankering was lowest in north-western New Brunswick which has the shortest history of beech bark disease (Fig. 2).

The severity of cankering generally increased with increasing tree size. However, the fact that the percentage of canker-free trees in the smallest size diameter class was not significantly higher than that of larger trees suggests that the prospect of using these trees in the future for anything but firewood is bleak, (Table 2). All but six of the 262 canker-free trees, comprising 10.5% of the sample, were found in New Brunswick, 160 of these (61.0%) on the five northwestern plots (Fig. 2).

The dieback

Crown dieback was assessed in relation to the degree of trunk cankering (Table 3) and to diameter classes (Table 4). The amount of dieback appears to be more dependent on the degree of cankering than on tree size.

Table 2.—Cankering of lower trunk of beech in the Maritimes in 1980^a

Diam. class (cm)	Living trees				Dead trees	
	Percent of lower 3 m of trunk cankered				with	without
	Nil	1-20	21-50	51+	cankers	cankers
	-----percent-----					
3-8	12.3	35.2	29.9	14.8	7.2	0.6
9-16	10.2	23.7	28.4	30.5	7.2	—
17-24	9.9	20.9	18.4	44.5	6.2	0.1
25+	8.2	25.5	19.1	43.0	2.8	1.4
All trees	10.5	27.0	24.9	30.9	6.3	0.4

^aBased on assessment of 1325 trees.

Table 3.--Crown dieback of beech in relation to severity of lower trunk canker in the Maritimes in 1980

Severity of trunk canker (%)	Percentage of crown dieback				
	Nil	1-20	21-50	51-75	76-99
	- - - - - percent - - - - -				
Nil	8.5	4.5	0.2	0.1	0
1-20	7.5	12.7	1.7	0.4	0.1
21-50	2.8	12.4	6.2	2.1	0.5
51+	0.1	11.0	16.7	8.9	3.6
All trees	18.9	40.6	24.8	11.5	4.2

Table 4.--Crown dieback of beech in relation to diameter classes in the Maritimes in 1980

Diam. class (cm)	Percentage of crown dieback				
	Nil	1-20	21-50	51-75	76-99
	- - - - - percent - - - - -				
3-8	35.2	42.6	12.4	6.3	3.5
9-16	16.8	46.1	23.2	10.7	3.2
17-24	10.3	35.3	33.0	15.6	5.8
25+	12.4	41.2	30.5	12.9	3.0
All trees	18.9	40.6	24.8	11.5	4.2

Some degree of dieback was present on 81.1% of the trees and 15.7% of the trees had more than half of their crown dead. The increase of dieback during the past decade was the most significant change in the condition of beech. In 1969 only about 20% of the trees had dieback (Forbes *et al.* 1970).

The mortality

Tree mortality (Table 2) was not excessive and certainly not of the same magnitude reported by Barter (1947, 1953) during the initial wave in the spread of the disease. There was less mortality in New Brunswick, 3.7%, than in Nova Scotia and Prince Edward Island, 9.1% and 9.8%, respectively.

Mortality rate decreased with increasing tree size and was considerably lower in the over 25-cm diameter class, regardless of the location of trees in the Region. The reason for this is unknown but it is plausible that only trees with some degree of resistance to the disease are able to survive long enough to attain that size.

CONCLUSION

Beech bark disease has rendered beech an unimportant hardwood species in the forests of the Maritimes. The disease is present throughout the Region and has transformed a tree with a clear, straight trunk of high-quality wood into a poorly-formed, low-grade wood species. The exception, to date, is in a small corner of northwestern New Brunswick. Until a way is found to produce disease-free beech, its significance to the forest economy in the Region is a liability by occupying valuable space needed to grow some 6.3 million m³ of a better-quality hardwood species.

RÉSUMÉ

La maladie de l'écorce du hêtre fit son apparition en Amérique du Nord il y a une centaine d'années, mais il ne lui fallut que quelques décennies pour réduire le hêtre au niveau d'une essence sans valeur dans les Maritimes. En 1980, un relevé effectué pour mettre à jour la situation de cette maladie, révéla la présence active de la cochenille, bien qu'en infestations généralement légères sur plus de 90% des arbres en Nouvelle-Écosse et à l'Ile-du-Prince-Edouard, mais sur seulement 50% au Nouveau-Brunswick: le *Nectria coccinea* var. *faginata* était présent partout; on notait une certaine quantité de chancres aux arbres; au Nouveau-Brunswick, le taux de mortalité (3.7%) était moins de la moitié de celui observé en Nouvelle-Écosse (9.1%) ou à l'Ile-du-Prince-Edouard (9.8%). L'avenir du hêtre comme essence forestière commerciale n'est pas prometteur.

ZUSAMMENFASSUNG

Die Buchen-Rindennekrose trat in Nordamerika vor rund 100 Jahren erstmals auf. Innerhalb weniger Jahrzehnte ließ sie die Buche in den Provinzen an der Ostküste zu einer fast wertlosen Baumart werden. Eine Bestandsaufnahme der Krankheit im Jahre 1980 ergab, daß *Cryptococcus fagisuga* vorhanden, der Befallsgrad der Bäume in der Regel aber gering ist. In Neuschottland und auf der Prinz-Edward-Insel sind mehr als 90% der Buchen befallen, in Neubraunschweig nur rund 50%. *Nectria coccinea* var. *faginata* war im ganzen untersuchten Bereich anzutreffen, ebenso ein gewisses Maß an Stammkreben. Die Sterberate der Buche lag in Neubraunschweig mit 3,7% deutlich unter der in Neuschottland (9,1%) und der Prinz-Edward-Insel (9,8%). Die Zukunft der Buche als einer forstlich und wirtschaftlich bedeutenden Baumart muß als düster angesehen werden.

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