

BEECH BARK DISEASE IN WEST VIRGINIA: STATUS AND IMPACT

ON THE MONONGAHELA NATIONAL FOREST¹

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Abstract.--*Cryptococcus fagisuga* has infested over 70,000 acres (28,000 ha) of forest in West Virginia. Beech bark disease is causing heavy mortality in two areas of the Monongahela National Forest and additional scattered mortality. In the areas most affected, per-acre losses total 1,369 board feet of sawtimber and 2.67 cords, with a potential loss of 5,697 board feet and 9.29 cords. *Nectria galligena* appears to be the only species of *Nectria* involved in the disease complex.

INTRODUCTION

Beech scale (*Cryptococcus fagisuga* Lind.) was first discovered in August 1981 infesting American beech (*Fagus grandifolia* Ehrh.) in West Virginia at the Gaudineer Scenic Area on the Greenbrier Ranger District of the Monongahela National Forest (Mielke et al. 1982). A survey conducted in October 1981 established the presence of *C. fagisuga* scattered over approximately 70,000 acres (28,000 ha) of primarily national forest land and some adjacent private lands. *Nectria galligena* Bres. was found in association with *C. fagisuga* in the Gaudineer Scenic Area and at two additional survey points on Shavers Mountain within 3 miles of the Scenic Area (Mielke et al. 1982), in the southcentral portion of the area infested by *C. fagisuga* (see fig. 1). Scale populations were heavy (based on density of wax secretions) in scattered areas throughout the generally infested area. Based on our observations of scale populations and tree mortality, we estimate the infestation to be older than 20 years at the Gaudineer Scenic Area. The previous known range of *C. fagisuga* was only as far south as northeast Pennsylvania, a

distance of over 300 air miles (480 km), over an area characterized physiographically by the Allegheny Mountains and the Ridge and Valley system.

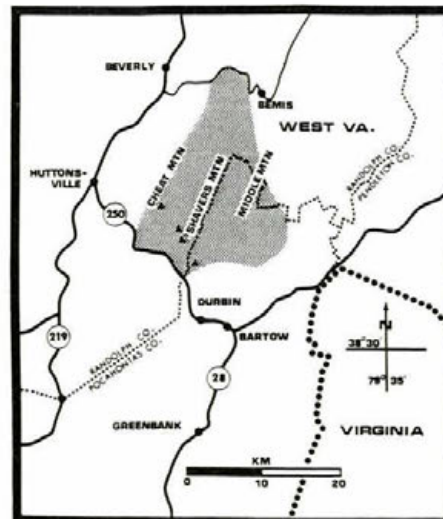


Figure 1.--Infestation by beech scale (shaded area) in West Virginia. Solid triangles indicate the presence of *Nectria galligena*. County lines are indicated by small dots and State lines by large dots.

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Nectria coccinea var. *faginata* Lohm. et al., the fungus commonly implicated in the disease complex in the northeast United States, was not found. *N. galligena*, a common canker-causing fungus of hardwoods in West Virginia (Ashcroft 1934), is the only species of *Nectria* associated with beech bark disease in samples from more than 10

affected trees within the infested area. The species was determined from ascospore size (Cotter and Blanchard 1981) and cultural characteristics (Booth 1959, 1966).

Subsequent observations have established the presence of beech bark disease on Cheat Mountain, 5 miles (8 km) due west of Shavers Mountain, with considerable mortality in both areas.

Beech is a major component of the northern hardwood forest on the unglaciated Allegheny Plateau region of the Monongahela National Forest. More than 11 percent of the total sawtimber volume on the entire forest is beech (USDA 1978). In the areas where beech occurs, the percentage is even higher. A survey to assess the damage caused by beech bark disease was conducted in July 1982.

MATERIALS AND METHODS

The Gaudineer Scenic Area (140 acres or 56.65 ha) was selected for an impact survey because there was beech bark disease and resultant mortality there. Twenty-eight, 20-basal-area-factor prism plots were systematically located on a 132-ft. (40.2 m) grid. Data taken for all trees were tree species, diameter at breast height (4.5 ft. or 1.37 m), crown class, and crown condition. Additional data taken on beech included an average score of *C. fagisuga* populations (Houston 1981), the presence of *N. galligena*

(perithecia and sporodochia), tarry spots, the mycoparasite *Gonatorrhodiella highlei* A. L. Smith and, as appropriate, an estimate of how many years a tree had been dead.

RESULTS AND DISCUSSION

The stand is virgin red spruce (*Picea rubens* Sarg.) together with associated hardwoods. Stand composition and diameter data are summarized in Table 1.

Thirty-six percent of the total basal area is beech. Of this, 29 percent or 15 square feet of basal area per acre has died. In terms of sawtimber (12 inches and greater dbh to a 9-inch merchantable top), 5,697 board feet per acre is beech of which 1,369 or 24 percent has died. On those plots where beech is present, there are 6,613 board feet per acre of which 1,562 has died. The error rate is 15.6 percent at the 68 percent level of confidence, range 5,581 to 7,645 board feet per acre. In addition to

Table 1.--Stand composition and diameters

Species	Average basal area ^a		Average dbh	
	(Ft ² /Acre)	(M ² /Ha)	(Inches)	(Cm)
Red spruce	68.57	15.74	18.87	47.93
American beech	55.71	11.79	13.74	34.90
Yellow birch (<i>Betula alleghaniensis</i> Britton)	28.57	6.56	17.98	45.67
Red maple (<i>Acer rubrum</i> L.)	12.14	2.79	14.32	36.37
Black cherry (<i>Prunus serotina</i> Ehrh.)	3.0	.69	24.16	61.37
Other	2.0	.46	8.7	22.10
Total	169.99	39.03	16.68	46.36

^aOnly stems greater than 5.5 inches (13.97 cm) dbh were tallied.

sawtimber volume, there are 9.29 cords per acre (6-11 inches dbh to a 4-inch minimum top) of which 2.67 or 29 percent has died. Volume data are summarized in Table 2.

Table 2.--Volume of beech per acre

Plots	Board feet of sawtimber ^a		Cordwood ^b	
	Total	Dead	Total	Dead
All plots	5,697 ^c	1,369	9.29 ^d	2.67
Plots with beech	6,613	1,562	10.84	3.11

^aIn metric equivalents, sawtimber size classes are 27.94 cm dbh and greater to a 22.86 cm minimum top diameter.

^bCordwood size classes are 15.24 up to 27.94 cm dbh to a 10.16 cm minimum top diameter.

^cMetric equivalents of sawtimber from left to right, respectively, 33.22, 7.98, 38.56 and 9.11 m³ per ha.

^dMetric equivalents of cordwood from left to right, respectively, 52.0, 14.95, 60.68 and 17.41 m³ per ha.

In all, 78 beech trees were examined. Fifty-six live beech had an average dbh of 13.64 inches, and 22 dead beech, 13.26 inches. Fifty-two of 56, or 92 percent, of live beech had C. fagisuga ranging from a trace to very heavy. The average infestation score was moderate. Of the 56 live beech infested, 52 (46.4 percent) had tarry spots, 12 (21.4 percent) had N. galligena perithecia, and 8 (14.3 percent) had G. highlei. Only one infested tree had G. highlei and no N. galligena perithecia.

Of the 22 dead beech examined, 14 had signs of infection by Nectria spp., either perithecia, G. highlei or both. Six of the eight remaining trees were estimated to have been dead for at least 4 years and had lost most of their bark. Only two trees estimated to have been dead less than 2 years bore no evidence of infection.

The present value of beech sawtimber and cordwood in West Virginia is \$40 per mbf, and \$12 per cord. Using these figures, the value of timber lost at the Gaudineer Scenic Area is \$87 per acre (\$215 per ha). The total beech component is worth \$252 per acre (\$623 per ha). If beech bark disease continues to

kill trees as our observations suggest it will, this also represents the total potential loss.

There are three major considerations when one looks at the status of beech bark disease in West Virginia: 1) Cryptococcus fagisuga is a relatively new insect in the state and has not yet spread throughout the entire range of beech, 2) beech bark disease mortality has just started over the past few years and will continue to increase, and 3) the apparent relationship between C. fagisuga and N. galligena may be unique to West Virginia. The fact that N. galligena, a common pathogen of many hardwood hosts, can rapidly invade and kill beech trees infected with C. fagisuga is one that researchers and foresters in other beech bark disease areas should be aware of.

RÉSUMÉ

Le Cryptococcus fagisuga fut trouvé sur le hêtre à grandes feuilles dans la Virginie de l'Ouest en août 1981. Un relevé exécuté en octobre 1981 a révélé la présence éparse de l'insecte sur approximativement 28 000 ha. Le Nectria galligena fut trouvé associé au C. fagisuga dans la portion centre-sud de l'aire infestée. Le N. galligena semble être la seule espèce de Nectria impliquée dans cette situation. La distribution connue à ce jour du C. fagisuga ne s'approchait qu'à environ 500 km de cet endroit et en était séparée par un territoire surtout montagneux.

Un relevé subséquent a révélé la présence du N. galligena avec le C. fagisuga à 8 km à l'ouest du premier endroit, avec beaucoup de mortalité survenant aux deux endroits. Les pertes dans le peuplement le plus affecté de la maladie de l'écorce du hêtre dépassait 22 m³ à l'hectare. Le volume total du hêtre dépasse les 85 m³ à l'hectare, ce qui représente la perte totale potentielle.

ZUSAMMENFASSUNG

Im August 1981 wurde Cryptococcus fagisuga erstmals auf Buchen (Fagus grandifolia) in West Virginia festgestellt. Eine Überprüfung im Oktober 1981 bestätigte, daß das Insekt zerstreut auf rund 28000ha vorkommt. Nectria galligena wurde in Verbindung mit C. fagisuga im südlichen Teil des zentralen Befallsgebietes angetroffen. N. galligena

scheint die einzige Nectria-Art zu sein, die hier am Krankheitskomplex beteiligt ist. Die Grenze des bisher bekannten Verbreitungsgebietes von C. fagisuga ist rund 500 km entfernt und durch vorwiegend bergiges Gelände vom Gebiet des derzeitigen Vorkommens in West Virginia getrennt.

Eine weitere Überprüfung ergab das Auftreten von N. galligena zusammen mit C. fagisuga 8 km westlich des ersten Gebietes sowie beträchtliche Ausfälle in beiden Gebieten. Die Holzverluste in den von der Buchen-Rindennekrose am meisten betroffenen Beständen übersteigen 22 fm/ha. Das Gesamtvolumen an Buche beträgt über 85 fm/ha, was mit dem möglichen Gesamtverlust pro Hektar gleichzusetzen ist.

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