

Volume Losses from *Fomes annosus* in Loblolly Pine in Virginia

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ABSTRACT—Volume losses due to *Fomes annosus* in three plantations and two natural stands gave indications of probable losses under near-ideal or ideal conditions of infection and spread. The maximum loss recorded for five-year period following initial thinning was 0.50 standard cords per acre per year. Volume losses due to mortality reached a peak at seven years and declined rapidly after the ninth year following initial thinning.

OCCASIONALLY in stands of pure pine in the Southeast, loss of standing timber due to spread of the root-rot fungus, *Fomes annosus* (Fr.) Rarst., becomes strikingly apparent three to five years after initial thinning. Mortality is most severe when trees are growing on deep, well-drained sandy soils (6, 7) and when stands are thinned during late fall and early winter, when the chance of stump infection is greatest.

To evaluate the impact of *F. annosus* in Virginia, a number of stands naturally regenerated on old fields and plantations on old fields (first generation stands) have been under observation for as long as 11 years. The pattern of spread and volume loss due to mortality has been recorded in five stands, four of which have sustained the most severe losses of all those under observation.

Procedure

Periodic volume loss was measured in one stand and a single damage estimate was made in four other stands at four to nine years after initial thinning. Estimates of volume loss were made by the plotless cruise (prism) method except in the Mountcastle Tract where each tree killed by *F. annosus* was measured and volume computed from Table 5 of USDA Technical Note 33 (5).

The five sampled stands varied in age from 18 to 32 years at the time of the first (and only) thinning. Cutting was completed during late fall or early winter, resulting in extensive natural stump infection. Site index for these stands ranged from 72-80 at age 50.

Dead trees tallied in the plotless cruise were recorded as killed by *F. annosus* if a sporophore of the

casual fungus or its typical white stringy rot was present. Sporophores of *F. annosus* were present on 90 percent of the trees tallied as infected.

All stands included in this study are growing on deep, sandy soils considered "high hazard" for the spread of *F. annosus* except the B. L. Adams Plantation, which was rated as on the border line between "moderate" and "high" hazard (6).

Results

The mortality pattern is readily evident from the periodic measurements of the Mountcastle Tract (Table 1). The first and major wave of mortality occurred within four to five years after initial thinning; the number of trees killed thereafter declined, dropping sharply after nine years. Volume losses reached a peak seven years after thinning. A similar pattern was observed in ten other stands on high hazard soils (including the Griggs and Parker plantations whose earlier history is included in this volume loss study). Berry (2) noted a similar trend in the mortality pattern in Missouri.

On the Chenault Tract, volume loss for mortality averaged 0.5 standard cords per acre per year over the first five years after initial thinning (Table 2), representing 6.7 percent of the total volume present. Over the nine-year period following thinning, before volume losses from mortality tapered off, total losses in the Mountcastle Tract reached 7.8 percent of the volume present.

Although mortality due to infection by *F. annosus* declines rapidly nine years after initial thinning (Table

Table 1.—Volume Losses (Standard Cords) from *F. annosus* Assessed by Periodic Measurements on the 2.4-Acre Mountcastle Tract

Years since thinning	Trees/acre killed between observations	Average d.b.h. of killed trees	Volume loss between observations	Volume loss
no.	no.	in.	cords/acre	cords/ac./yr.
0				
4.5	43	4.5	0.65	0.14
7.0	23	7.2	1.60	0.32
9.0	15	8.0	0.95	0.36
11.0	4	8.0	0.29	0.32
Total	85	—	3.49	—

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Table 2.—Losses (Standard Cords) from *Fomes annosus* in Selected Loblolly Pine Stands in Virginia

Tract and location	Stand derivation	Age at thinning (yrs.)	Period since thinning (yrs.)	Volume/acre present at time of observation	Standard cords/acre killed since thinning ¹	Standard cords/acre/yrs. killed
Griggs (Essex County)	Planted	21	4	22.0	0.7 (3.4)	0.17
W. F. Parker (K & Q County)	Planted	18	6	35.2	2.4 (6.6)	0.40
B. L. Adams (Charles City County)	Planted	20	9	36.1	1.8 (5.0)	0.20
Chenault (King William County)	Natural	32	5	38.0	2.5 (6.7)	0.50
Mountcastle (New Kent County)	Natural	22	9	42.2	3.3 (7.8)	0.36

¹ Figures in parenthesis give percentage of total volume per acre killed by *F. annosus* since thinning.

1), the fungus continues to survive in the stand as evidenced by the occasional windthrow of living trees and increasing attacks by the bark beetle, *Ips avulsus*, on trees weakened by attack from *F. annosus*.

The higher volume loss recorded in the Chenault natural stand was due in part to the advanced age of the plantation when first thinned. This resulted in mortality to stems of large diameter.

In this study, the natural stands were as susceptible to damage by *F. annosus* as the plantations.

Discussion

In the Coastal Plain of Virginia on average loblolly pine sites (site index 75) a loss of 0.5 cords/acre/year for a period of nine years following initial thinning amounts to one-third to one-half the growth expected over that period. Dollarwise, the loss (based on a \$6/standard cord stumpage value) over the nine-year period amounts to \$27 per acre if no salvage were possible or practical.

Although the losses recorded in this study do not dictate radical changes in management plans for the stands under observation, the figures do point out the importance of preventing stump infection at the time of the initial thinning. Cutting during July and August as suggested by Driver (4) has markedly reduced stump infection and subsequent mortality on high hazard sites in southeastern Virginia.¹ Investigations in Virginia (1) and elsewhere have shown that both borax and urea are effective in reducing stump infection when cutting must be scheduled during the fall and winter.

Unpublished data² on losses from *Fomes annosus* in four slash pine plantations on the Sandhills State Forest in South Carolina provide an interesting comparison to the present study. Age at the time of thinning ranged from 16 to 18 years in all of the plantations. In three plantations, losses ranged from 3.6 to 14.0 percent of the total basal area six years after initial thinning. Eleven years after thinning in the fourth plantation, 16.5 percent of the total basal area had been killed. Losses from *F. annosus* in the latter plantation necessitated several salvage cuts during the 11-year period and the basal area removed is not included in the 16.5 percent figure.

¹ Morris, C. L. Unpublished data.

² Hodges, Charles. U.S. Forest Serv., Forestry Sci. Lab., Res. Triangle Park, North Carolina.

When losses from the five stands in Virginia are expressed in terms of basal area, the maximum loss was 11 percent of the total basal area present nine years after thinning (Mountcastle Tract).

In general, when thinning is selective and conducted from below, the percentage loss from *Fomes annosus* expressed in basal area would be comparable (within a few percentage points) to the percentage of volume loss expressed in cords. Such was the case in four of the Virginia stands included in this study. Since the stands in South Carolina were thinned in a similar manner, percent of volume loss in those stands would be expected to closely approximate the losses expressed as a percent of total basal area. These data indicate losses in slash pine in South Carolina due to *F. annosus* are more severe than those noted to date in loblolly pine in Virginia.

In regard to the relative susceptibility of planted vs. natural stands, our observations contradict the widely held belief that planted stands are more susceptible than natural stands to damage from *F. annosus* (3, 7, 8). While the most comprehensive survey in the south (7) showed a significant difference in damage between planted and natural stands, no planted loblolly was included in the survey. It is the author's opinion that previous land use (agricultural vs. forest) may influence damage severity in loblolly pine more than the method of stand establishment.

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