

Fomes fraxinophilus on Green Ash in North Dakota Windbreaks

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ABSTRACT

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Incidence of *Fomes fraxinophilus* stem decay on green ash in North Dakota Prairie States Forestry Project windbreaks was determined using a 0.9% random sample of windbreaks. A total of 25,558 trees in 30 windbreaks in five counties was examined. Live green ash with sporocarps were found in four of five counties and in 47% of windbreaks examined. Mean incidence of 36- to 43-year-old trees with sporocarps was $0.29 \pm 0.07\%$ (0.95 confidence limit). A mean of 5.8 sporocarps per tree was present on 78 infected trees. Nearly all sporocarps were associated with branch stubs on the bole within 3.6 m of the ground. From this survey, we estimate that 8,700 trees, of an estimated population of 3 million living green ash trees in North Dakota, have sporocarps.

Green ash (*Fraxinus pennsylvanica* Marsh.) is widely planted in North Dakota windbreaks. This species has

been used increasingly in windbreak plantings in recent years, as demand for shelterbelts has increased, because of its good performance and because of the disease susceptibility of elm species. Serious disease damage is seldom found on young, vigorous green ash in North Dakota windbreaks. However, when green ash trees become mature, vigor declines and they become more susceptible to stem decay fungi. *Fomes fraxinophilus* (Peck) Cooke is the most common stem decay fungus reported on green ash in the Great Plains (6-8).

Mature green ash trees in native stands in North Dakota are usually infected with

F. fraxinophilus. Brenckle (1) reported *F. fraxinophilus* on green ash in Cass and Ransom counties in 1914 and 1916, respectively, and indicated that it was very common (J. F. Brenckle letter to O. A. Stevens, 19 September 1920, North Dakota State University Library). This fungus has also been found in North Dakota on bur oak, *Quercus macrocarpa* Michx., in Cass County (1), and on boxelder, *Acer negundo* L., in Billings County (6). No information is available about the incidence of *F. fraxinophilus* in North Dakota windbreaks.

In 1978 we completed a survey of the distribution and incidence of *F. fraxinophilus* in green ash in Prairie States Forestry Project (PSFP) windbreaks planted in North Dakota between 1935 and 1942.

MATERIALS AND METHODS

Tree planting records revealed that windbreaks were planted on 4,256 km in 31 North Dakota counties during the PSFP. We compared the original records with high-altitude photographs taken from 1967 to 1974 in seven North Dakota counties in the major planting zone and determined that PSFP windbreak

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Table 1. *Fomes fraxinophilus*-infected green ash with sporocarps in 30 windbreaks in North Dakota counties in 1978 (6 windbreaks per county)

County	Location	Windbreaks with sporocarps (%)	Trees examined (no.)	Trees with sporocarps (%)
Ramsey	North central	83	5,059	0.75
Cass	East	67	5,274	0.36
Stutsman	Central	50	5,393	0.28
Ransom	Southeast	33	4,523	0.13
Grand Forks	Northeast	0	5,309	0.00
Total		47	25,558	0.29 ^a

^a Average of trees with sporocarps in each county, weighted by the green ash population in that county relative to the size of the total sampled population.

Table 2. Planting date in relation to *Fomes fraxinophilus*-infected green ash with sporocarps in 30 North Dakota windbreaks in 1978

Planting date	Windbreaks examined (no.)	Windbreaks with sporocarps (%)	Trees examined (no.)	Trees with sporocarps (%)
1942	5	20	2,765	0.04
1941	4	50	3,414	0.38
1940	7	43	5,785	0.10
1939	8	50	7,341	0.26
1938	4	50	3,662	0.14
1936	1	100	1,776	0.62
1935	1	100	815	2.82
1935-1942	30	47	25,558	0.29

removals ranged from 12 to 39%. By applying the removal percentages from these seven counties to the nearby 24 counties in which PSFP windbreaks were also planted, we estimated that windbreaks totaling 3,340 km (78%) were still present in North Dakota in 1978.

Five counties, selected because of their distribution throughout the major windbreak planting zone, were sampled using a stratified random sampling procedure (3). Thirty PSFP windbreaks, six in each of the five counties, were randomly selected for examination from a North Dakota windbreak atlas.

Within each windbreak, we examined all living green ash trees and recorded the following information: number and position in row of all trees with *F. fraxinophilus* sporocarps; diameter breast height, total height, and crown class position (dominant, codominant, intermediate, suppressed, or open) of each tree with sporocarps; and number and position of sporocarps on each tree. Sporocarps and samples of decayed wood were collected from one or two living green ash trees in each affected windbreak.

Isolations to recover the fungus were made on malt agar on the collection day. Cultures were compared with stock cultures of *F. fraxinophilus*, and sporocarp characteristics were examined to verify identity of the fungus (2,5). Comparisons were made specifically to distinguish *F. fraxinophilus* from *F. fraxineus* (Bull. ex Fries) Cooke based on

appearance of sporocarps and cultures because these fungi are very similar (4,5).

RESULTS

Sporocarps of *F. fraxinophilus* were found on live green ash in nearly half of the windbreaks examined (Table 1). A total of 78 infected trees with sporocarps was found among the 25,558 trees observed. Weighted mean incidence of infected trees with sporocarps (0.95 confidence limit) was $0.29 \pm 0.07\%$, which gives a statewide disease incidence estimated to be 0.22 to 0.36%.

An average of 5.8 *F. fraxinophilus* sporocarps per tree was observed on the 78 trees. Nearly all of the 453 sporocarps observed were associated with branch stubs on the bole; only 2% were on frost cracks and wounds on the bole. All sporocarps were within 3.65 m of the ground.

Trees with sporocarps were found in four of the five crown class positions. Of the 78 trees with sporocarps, 55% were classed intermediate, 29% suppressed, 13% codominant, and 4% dominant.

Incidence of infected trees with sporocarps by windbreak planting date appears in Table 2.

DISCUSSION

F. fraxinophilus is widely distributed on green ash in North Dakota PSFP windbreaks. Based on this survey, we estimate that about 8,700 of 3 million living green ash in these windbreaks have *F. fraxinophilus* sporocarps. Although *F.*

fraxinophilus has long been a common stem decay fungus on live green ash in North Dakota (1), we consider the incidence as estimated by sporocarp count to be very low. True disease incidence is probably higher because some trees are infected but do not have sporocarps. Studies are needed to compare infection levels with presence of sporocarps.

The incidence of *F. fraxinophilus*-infected trees with sporocarps in North Dakota windbreaks is much lower than that found in Nebraska windbreaks. Riffle et al (8) estimated a statewide incidence there of $5.5 \pm 0.4\%$. They also reported a very low incidence (0.2%) of infected trees with sporocarps in five western Nebraska counties. We do not know why the North Dakota windbreaks have a lower incidence of infection than those in Nebraska.

The windbreaks planted in 1935-1936 had a much higher incidence of infection by *F. fraxinophilus* than windbreaks planted in later years. Although this study was not designed to quantify these differences, some discussion is appropriate. Most 1935-1936 windbreaks are 20 rows wide with 8 rows of green ash, compared with a sample average of 11 rows with 3 rows of green ash. The wide 1935-1936 windbreaks accumulate more snow than narrower windbreaks, and the green ash are more subject to severe snow damage that creates infection courts.

Our observations of *F. fraxinophilus* sporocarps on more than 50% of the green ash in some farmstead plantings and native stands (J. Walla, unpublished data) indicate the potential for damage by this stem decay fungus in North Dakota. However, based on this survey, structural damage by *F. fraxinophilus* to green ash is unlikely to present a major problem in North Dakota PSFP windbreaks in the near future.

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