

# Dwarf Mistletoe on Red Spruce in the White Mountains of New Hampshire

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## ABSTRACT

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Although eastern dwarf mistletoe (*Arceuthobium pusillum*) has been widely distributed in New Hampshire for many years, it has been generally regarded as a botanical curiosity rather than a forestry concern. Our observations in many parts of the White Mountains, however, show that the parasite is causing not only growth reduction and mortality of red spruce (*Picea rubens*) but also marked trunk swellings, a serious lumber degrade factor, on the valuable butt log.

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Eastern dwarf mistletoe (*Arceuthobium pusillum* Peck) (Fig. 1) is a widespread parasite of spruce in the Lake states, northeastern United States, and eastern Canada (9). In most of New England, *A. pusillum* is regarded as a botanical curiosity of little concern in forest

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management (4). In many parts of its vast range, however, the mistletoe is recognized as a serious disease agent; it is considered the most serious pathogen of black spruce (*Picea mariana* (Mill.) B.S.P.) in the Lake states (10) and causes high mortality in white spruce (*Picea glauca* (Moench) Voss) stands along the Maine coast (2) and in Manitoba (5).

Eastern dwarf mistletoe is reputed to cause little damage in the Northeast

partly because of its association with poor-quality black spruce in bog sites; it has not been widely known that the parasite also occurs commonly in upland sites on red spruce (*Picea rubens* Sargent) in the White Mountains and elsewhere in New England. Although *A. pusillum* was first discovered in New Hampshire on black spruce near Hanover in 1884 and on red spruce at Mendon in 1889 (3), there have been few recent collections or reports of the parasite in this state (9). Our recent observations, however, show that the mistletoe is common on red spruce in many parts of the White Mountain National Forest. We saw severe infection in Grafton County (Hubbard Brook Experimental Forest) and in Carroll County (Bartlett Experimental Forest and Bear Notch area).

Damage seems most prevalent in older trees (100 yr or more), but several areas of



**Figs. 1-6.** (1) *Arceuthobium pusillum* on *Picea rubens*. (2) Witches' brooms on red spruce. (3) Low stem swelling associated with old broom branches of *A. pusillum*. (4) High stem swelling associated with old broom branches of *A. pusillum*. (5) Old broom branch associated with a small swelling. (6) Swollen base of an old broom that developed into a new leader.

severe damage were noted in younger trees. Although no detailed surveys were made, we saw little infection in stands less than about 25 yr old.

In many areas, isolated, infected, old-growth red spruce trees occur in predominantly beech-birch-maple forests, suggesting that spruce was more common in these forests in the past. Spruce has been a favored timber tree in these stands and has been selected over hardwoods.

Heavily infected trees [mistletoe ratings of 5 or 6 on the 6-class scale (8)] were seen in most pole-sized and older stands; scattered trees apparently killed by severe mistletoe were also found. Heavily broomed trees were apparently declining in vigor (Fig. 2), although no

studies have estimated effects on growth rates in this host.

A unique result of *A. pusillum* infection in red spruce not previously reported in this or other hosts is the development of marked trunk swellings (Fig. 3), which in extreme cases may be twice the diameter of the trunk immediately below the swelling (Fig. 4). These trunk swellings were common in all infected red spruce stands observed. Generally within 7 m of the ground, they occur on trees more than about 30 cm in dbh; thus they affect the most valuable part of the trunk.

Similar trunk swellings are induced by the western dwarf mistletoes *A. douglasii* Engelm. on *Pseudotsuga menziesii*

(Mirb.) Franco (11), *A. abietinum* Engelm. ex Munz on *Abies* sp. (7), and *A. tsugense* (Rosendahl) G. N. Jones on *Tsuga heterophylla* (Bong.) Carr. (1). Trunk swellings associated with *A. pusillum* may not have been reported previously because infected red spruce live longer than infected black spruce. Infections more than 100 yr old were found in red spruce, while infected black spruce usually die before they are 60 yr old (6; F. A. Baker, *personal communication*).

The trunk swellings are associated with remnants of infected branches that lived longer than noninfected branches (Fig. 5). In some cases, the broom branch establishes a new leader with a swollen

area at the base (Fig. 6). The mechanism of trunk swelling is not yet understood, nor has it been determined whether the parasite is still living in the distorted host tissues.

Many trees with trunk swellings were dead. The proportion of trees with trunk swellings appeared higher among dead trees than among live ones, but relative mortality rates were not estimated. Four trees (two dead, two live) with trunk swellings were dissected. The live trees had advanced internal decay, and sporophores of *Phellinus (Fomes) pini* (Thore ex Fr.) Pilat occurred on the swollen trunk areas. The wood in the swollen trunk areas of the dead trees was also decayed but was not typical of the decay associated with *P. pini*. Dissections of the swollen trunk areas and swollen areas on broom branches did not reveal

obvious mistletoe endophytic sinkers. The relationship, if any, between trunk swellings and decay needs to be determined.

Our observations suggest that *A. pusillum* damages red spruce in the White Mountains by causing growth reduction, tree mortality, and degrade, usually of the butt log. The impact of dwarf mistletoe and its implications for red spruce management in the White Mountains and elsewhere in New England need to be evaluated.

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