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Pole Blight of Western White Pine

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Pole blight is one of the most serious diseases of western white pine (*Pinus monticola* Dougl.) and is restricted to that species. The disease is given this name because it affects pole-size trees primarily, usually those within the 40- to 100-year age class, although trees both younger and older are occasionally affected.

Distribution

Pole blight was first observed in 1929 and has since been found throughout the northern part of the western white pine type in northern Idaho and adjacent western Montana and eastern Washington. It has not been detected south of Disalto Creek in the St. Joe National Forest of northern Idaho, leaving the valuable Clearwater stands so far untouched. Pole blight also extends northward into interior British Columbia and has been reported on Vancouver Island. It has not been found in the white pine areas of the Cascade Range of the Western United States.

Importance

About 95,000 acres or approximately one-eighth of the area occupied by pole-size western white pine stands are damaged by pole blight. This has been determined from aerial and ground surveys of the 750,000 acres of pole-size stands in northern Idaho and adjoining States. Damage appraisal surveys completed in 1955 reveal that in severely diseased stands about 57 percent of the total white pine basal area has been killed or is affected. Damage amounting to as much as 81 percent of the basal area has been noted in the most heavily infected areas. In lightly damaged stands, where the disease is usually of more recent origin, between 10 and 53 percent of the basal area is affected. The amount of basal area damaged has more than usual significance because pole blight characteristically affects the larger and more vigorous trees—the ones that would normally become the crop trees.

These 750,000 acres of pole stands constitute the forests that will have to supply industry with white pine logs in the near future. Even under the best conditions, these stands are not adequate to fully meet the needs for future sustained yield of white pine timber. Losses caused by pole blight are particularly serious because no other local species would be a satisfactory substitute for western white pine in the manufacture of many specialized products.

Symptoms

Short yellow needles in the upper one-fifth to one-third of the crown generally are the first symptoms of pole blight observed. As the disease progresses the needles appear as tufts on the tips of the upper branches, and a reduction in leader and terminal branch growth can be observed (fig. 1). Symptoms typically progress down the crown, and top-dying may precede death of the tree by a few years.

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Figure 1.—Part of a diseased western white pine stand. The healthy tree in the center is flanked by two trees in the intermediate stage of pole blight.

Closer examination of trees exhibiting crown symptoms will usually reveal the presence of one or more long, narrow, necrotic lesions paralleling the grain on the trunk of the tree (fig. 2). These may occur throughout the length of the bole but are generally found in the lower half. Dry faces that may be either blue-stained or resin-soaked or both are found in the wood beneath the lesions (fig. 2). Most pole blight lesions lack marginal callus formation.

Considerable variation is encountered in the symptoms but, with rare exception, once noticeable decline from pole blight starts, it continues until the tree is dead, generally within 5 to 10 years.

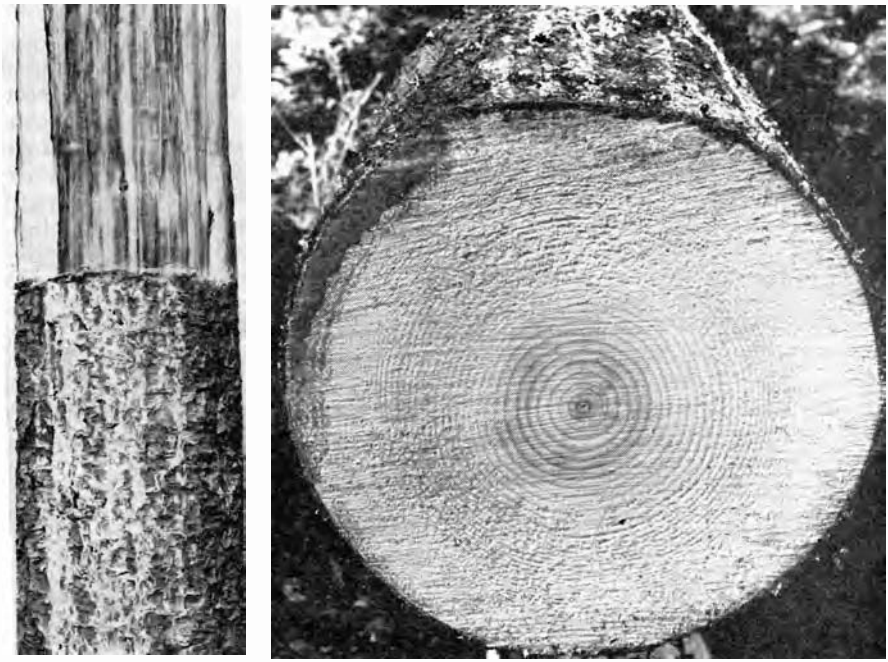

Figure 2.—*Left,* A trunk section from a pole-blighted tree. The bark has been peeled from the upper half of the section to reveal a wide resin-impregnated lesion. The copious resin flow on the bark surface of the lower half of the section is of common occurrence and originates from the lesion face. *Right,* A dry face extending around most of the tree trunk. Dry faces always occur beneath lesions. Note that the only living functional sapwood is in the upper left quarter of the cross section.

Detailed dissection studies of trees affected by pole blight show that a period of reduced radial and terminal growth almost invariably precedes the visible crown symptoms and stem lesions. Studies of the root systems of both healthy and diseased stands suggest that all these above-ground symptoms are, in turn, preceded by an abnormally high deterioration of the rootlets and the root system. This condition may be responsible for the development of the crown and stem symptoms or may be simply the result of a general physiological decline of the tree from some unknown cause.

Pole blight chiefly affects dominant and codominant trees. There is no regular pattern of disease spread from one tree to another within a stand. The appearance of pole blight in new areas has been slow, but within damaged stands the disease has intensified almost without exception.

Studies of Cause

The cause of pole blight is as yet unknown, despite intensive research. It is not clear whether the relationship that exists between high rootlet mortality and pole blight is one of cause or effect. Accumulated evidence suggests that root system deterioration precedes the manifestation of crown symptoms. Rootlet deterioration is more pronounced in stands, healthy or diseased, where the soils are of shallow effective depth (12 to 18 inches) and have a low available water storage capacity (2 to 4

inches) in the top 3 feet of soil mantle. In stands affected by pole blight, the disease tends to be more severe where the soil conditions are most unfavorable. Pole blight has not been found on deep, permeable soils having high available water-holding capacities (6 or more inches in the top 3 feet). The importance of adverse soil conditions in limiting root-growing space and available moisture, both so necessary for tree growth, is under investigation.

Climate, as reflected in temperature and precipitation during the growing season, may play an important role and serve to trigger the onset of pole blight. Precipitation deficiencies and above-normal temperatures have been more common in pole-blighted areas than elsewhere in the western white pine type. A combination of below-normal rainfall and above-normal temperature during the growing season causes a soil moisture stress that may be limiting to white pine growth and, if prolonged, may lead to more serious consequences.

The role of fungi and viruses as possible causes of pole blight is being investigated. Isolations from diseased roots have yielded many organisms, the most common ones being *Armillaria mellea* and a species of *Leptographium*. Inoculation trials with these and several other common isolates have thus far failed to produce crown symptoms typical of pole blight.

Grafting experiments to study the possible virus aspects of the disease have not given conclusive results. The possibility, however, that some fungus or virus, alone or in combination with other organisms or environmental factors, plays a major role in the pole blight complex has not been completely ruled out.

Control

Even though the cause of pole blight has not yet been determined, the possibility of control is receiving attention. Experimental thinnings and salvage cuttings indicate that no cutting method currently practiced is effective in retarding or halting the progress of pole blight within a diseased stand. Furthermore, only rarely has an individual tree been observed to recover after it displayed typical pole blight symptoms. Blighted trees, therefore, should be salvaged, whenever this is economically feasible, in order to recover as much value as possible.

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