wide buffer zone around recently sanitized areas should also be monitored for 3–4 years.

Studies are under way to improve the control of dwarf mistletoe by fire, pruning, and thinning. High-hazard areas should be replanted with or surrounded by resistant trees. There are no chemical treatments available for the treatment of dwarf mistletoe.

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Canada

Dwarf mistletoe

Forestry Canada Forêts Canada

Distribution and Hosts

True mistletoes (*Phoradendron* spp.; *Viscum* spp.) and dwarf mistletoes (*Arceuthobium* spp.) are parasitic plants that live on trees. The mistletoes in druidical folklore and holiday customs are true (leafy) mistletoes; in North America, they grow mostly on hardwood trees as far north as the southern USA. Dwarf mistletoes are parasites of conifer trees throughout much of North America. In Canada, eastern dwarf mistletoe (*A. pusillum* Pk.) is a pest of spruce and larch as far west as Hudson Bay, Saskatchewan. Lodgepole pine dwarf mistletoe (*A. americanum* Nutt. ex Engelm.), ranging from British Columbia to Lake Winnipeg in Manitoba, causes serious damage to both lodgepole and jack pines (it is the most serious pest of jack pine in Manitoba). The plant is occasionally found on other pines, firs, Douglas-fir, and white spruce.

Symptoms and Damage

The rootlike structures (haustoria) of the dwarf mistletoe interrupt the normal growth and function of any branch or stem that they penetrate: the branch begins to swell around the infection point and, beyond that point, can become stunted and deformed. Repeated stunting of new tree growth produces a clump of branches called a "witches' broom" (a tree may have more than one). Other organisms can also cause witches' brooms, so care should be taken to identify correctly the dwarf mistletoe's aerial shoots or their bases (basal cups), which remain attached to the branches when the shoots have fallen off. Very heavy brooms may break off, exposing trees to infection by fungi. As dwarf mistletoe infection intensifies, affected trees lose vigor, and growth can be decreased by one third or more. Ultimately, dwarf mistletoe can cause the premature death of infected trees.

It is estimated that dwarf mistletoe causes an annual growth loss of almost 4 million m^3 of wood in western Canada. Trees stunted by long-term infection have little or no commercial value, except as firewood. Young infected stands require extensive silvicultural treatment to ensure a commercially useful product. High-value trees in cities and parks can be seriously devalued, and made hazardous, by deformities such as witches' brooms. Heavily infected stands are also increased fire hazards.

Causal Agent

Dwarf mistletoe is a plant whose rootlike structures grow under the bark of living trees, not only in young twigs but also in branches and stems. Greenish yellow aerial shoots, several centimetres long, grow in clusters around infection points and produce tiny yellowish flowers in late spring or early summer. Later in the summer the female mistletoe produces dark green berries that ripen after about a year, at which time the single seed in each berry is expelled as far as 18 m at high speed. The seed sticks to its landing surface. When the seed lands on susceptible host tissue it overwinters until the following April or May, when it sprouts and begins to penetrate the host bark.

Control

Dwarf mistletoe is spread by seeds shooting from one host to another; therefore, the best control is the removal of seed sources—infected branches, and whole trees that are heavily infected. Sometimes, entire stands must be either harvested or burned. Wildfires may burn infection centers, but if the destruction of these centers is incomplete the surviving trees and stands should be checked for dwarf mistletoe before it can infect regenerating trees. Trees in a 20-m