



## Quick Facts...

Ponderosa, lodgepole, limber, pinon pines and Douglas-fir are the most common trees affected by dwarf mistletoes in Colorado.

Dwarf mistletoes are host-specific parasitic flowering plants that spread by forcibly ejected seeds.

The effects of dwarf mistletoe include growth reduction, loss of wood quality, poor tree form, predisposition to insect infestation and diseases, premature death, and reduction in seed crops.

To prevent infection and help manage dwarf mistletoe, plant resistant trees, increase vigor of trees, form buffer zones, prune infected branches or remove infected trees.

# DISEASES

## Dwarf mistletoe management

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### Introduction

Dwarf mistletoes (*Arceuthobium* spp.) are a major problem in Colorado forests on ponderosa and lodgepole pine. Douglas-fir, pinon and limber pine are damaged in some parts of the state. Nursery and ornamental plantings seldom are affected, but the parasite can be introduced to an area by planting trees infected with dwarf mistletoe.

Dwarf mistletoes are a small, leafless, parasitic flowering plant (Figures 1 and 2). The seeds, explosively discharged from the fruit at almost 60 mph, are sticky and adhere to any surface they strike. Seeds that adhere to young branches of susceptible trees germinate and the mistletoe rootlet penetrates the bark. Birds occasionally may spread the seeds to uninfected trees. Dwarf mistletoe seeds generally are dispersed in August and early September. Mistletoes spread slowly from tree to tree. In closely spaced trees of about the same height this spread is 1 to 2 feet per year. The spread from large to small trees can extend 60 feet but the average usually is less than 30 feet. Most dwarf mistletoes are specific to a particular type of tree (i.e. lodgepole pines) and do not infect other tree species.

Dwarf mistletoes grow into the bark and phloem of the tree. The parasite produces root-like structures called “sinkers” that form each year. Older ones become imbedded deep in the wood as twigs grow. These sinkers provide the parasite with water and nutrients obtained from the host.

Dwarf mistletoes kill by slowly robbing the tree of food and water. Diseased trees decline and die from the top down as the lower infected branches take more food and water. Mortality of infected trees does not occur rapidly in most cases and depends on the severity of infection, and the vigor and size of the tree (Table 1). Dwarf mistletoes have a relatively long life cycle between infection and seed production (6 to 8 years). This allows for long-term disease management.

A measure of infection severity is based on the following rating scale. A tree’s crown is divided into thirds and each third is rated. If less than 50 percent of the branches are infected in that third – the rating is 1, and if more than 50 percent are infected, it equals 2. If there are no visible infections that third of the crown gets a 0. Add the rating of each third to get a total rating (Table 1). All management recommendations and longevity information is based on this dwarf mistletoe rating.



Figure 1: Ponderosa pine dwarf mistletoe plants, note thick, brown shoots.

**Table 1: Approximate number of years needed to kill 50 percent of ponderosa pine trees infected with dwarf mistletoe.<sup>1</sup>**

Tree Diameters	Infection Severity <sup>2</sup>		
	Light	Moderate	Heavy
4-9 inches	30	17	7
greater than 9 inches	60	25	10

<sup>1</sup> Based on ponderosa pine in open, multi-aged stands.

<sup>2</sup> Infection severity based on the following: light= a rating of 2 or 3; moderate= a rating of 4 or 5; heavy= a rating of 6.

*Figure 2: Lodgepole pine dwarf mistletoe plants-note thin, green-yellow shoots.*



## Symptoms

The first symptom of dwarf mistletoe infection is a slight swelling of the bark at the infection site. As the parasite's sinkers become more extensive in the host, a distorted branching habit or witches' broom may form (Figure 3). Witches' brooms take food from uninfected parts of the tree, which reduces vigor and causes premature death. Yellow foliage, reduced foliage and mortality of branches or the entire top of the trees may indicate mistletoe infections are present (Figure 4). The parasite is identifiable when the yellow to green or brownish-green segmented shoots protrude from the infected part of the tree (Figures 1 and 2). These woody shoots are ½ inch to 6 inches long and 1/8 inch to 1/4 inch in diameter. Shoots form two to three years after infection.

## Management

**Pruning and tree removal.** Pruning and removing trees is the best management measure available to reduce or eliminate dwarf mistletoe infestations in ornamental trees or urban forests. First remove trees severely infected (rated 5 and 6) or those with only a few live branches. Trees with high, unreachable mistletoe infections will continue to shower seeds on nearby trees if not cut down. However, it is not necessary to completely eradicate the mistletoe since it may require removal of all trees. Prune and remove a few heavily infected trees and keep a green forest on the property.

The parasite can be removed from lightly infected trees (rated 1 to 3). Prune off all infected branches for healthier trees. Prune the entire branch at the branch collar near the trunk. Examine trees every two or three years and remove any newly infected branches.

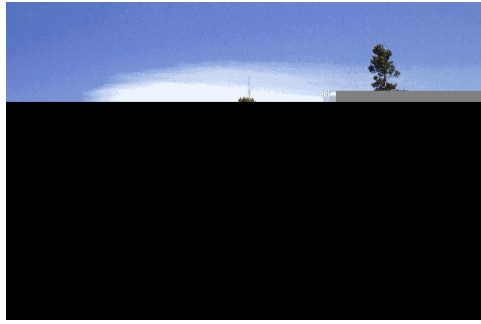
Mistletoe shoots die as soon as the tree branch is cut, consequently burning pruned-off branches is not necessary. When pruning, 30 percent to 40 percent of the branches (from the top down) should be retained even if it means leaving some infected branches.

Trunk infections are not as detrimental as branch infections so their removal is not necessary. Buffer zones (50 feet wide) can be cut or formed with resistant trees between infected trees and healthy trees if space allows. Contact a professional



*Figure 3: Witches' brooms-dense multiple branches on lodgepole pine infected with dwarf mistletoe.*

Figure 4: Ponderosa pine with witches' brooms on lower branches and dying top branches.



forester, the Colorado State Forest Service, or other professional to obtain help in these decisions.

**Planting resistant trees in heavily infected areas.** Plant resistant trees to replace infected and removed trees. Site and moisture availability will determine what trees can be planted. Ponderosa pine areas can be replanted to Douglas-fir, white fir, blue spruce, pinon pine, limber pine, Rocky Mountain juniper, bristlecone pine, gambel oak and pea shrub. **NOTE:** Scotch pine is susceptible to both ponderosa and lodgepole pine dwarf mistletoe.

In lodgepole pine areas replant to Englemann spruce, subalpine fir, Douglas-fir, bristlecone pine and limber pine. In Douglas-fir areas replant to aspen, ponderosa pine, lodgepole pine and Englemann spruce. Hardwoods, such as ash, birch and aspen, also can be planted in affected areas because dwarf mistletoes do not attack hardwood trees.

## Chemical Sprays

Use ethephon (Florel) sprays (as label allows) in high value areas where planting with the same species under infected trees is the only option (lodgepole planted under infected lodgepole). Ethephon sprays remove mistletoe shoots and reduce seed production and infection of trees planted under infected trees for one to three years. This treatment does not kill the whole mistletoe plant. Retreatment is necessary until infected trees are removed and new trees are planted.

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