



## Quick Facts...

Ponderosa, lodgepole, limber and 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.

Damage includes 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, improve tree vigor, form buffer zones, prune infected branches, or remove infected trees.

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# DISEASES

## Dwarf Mistletoe Management

no. 2.925

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Dwarf mistletoes (*Arceuthobium* spp.) are a common 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 small, leafless, parasitic flowering plants (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. Sinkers become embedded 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 lower infected branches take more food and water. Death occurs slowly in most cases and depends on the severity of infection and on the vigor and size of the tree (Table 1).

Dwarf mistletoes have a relatively long life cycle between infection and seed production (six to eight years). This allows for long-term disease



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



Figure 2: Lodgepole pine dwarf mistletoe plants. Note thin green-yellow shoots.

management. However, when trees are heavily infested by mistletoe, they are commonly attacked by twig and *Ips* bark beetles that kill branches or whole trees.

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. If more than 50 percent are infected, it is 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. All management recommendations and longevity information are based on this dwarf mistletoe rating.

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

Tree Diameter	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.

## 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, a distorted branching habit or witches' broom may form (Figure 3). Witches' brooms take years to form. They slowly take more and more food from uninfected parts of the tree. This 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 1/2 to 6 inches long and 1/8 to 1/4 inch in diameter. Shoots form two to three years after infection. Douglas-fir dwarf mistletoe shoots are hard to see because they are only about 1/2 inch long.



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

## Management

Dwarf mistletoes are not quick killers, so long-term management options are feasible. However, dwarf mistletoe infected trees may attract various types of bark beetles that may breed and kill parts or the whole tree. These beetles may then attack nearby trees.

### 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 severely infected trees (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 – that 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. Burning pruned-off branches is not necessary. When pruning, keep 30 to 40 percent of the branches (from the top down), even if that means leaving some infected branches.



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

Trunk infections are not as detrimental as branch infections, so their removal is not necessary. If space allows, create 50-foot buffer zones between infected trees and healthy trees by cutting or by planting resistant trees. Contact a professional forester, the Colorado State Forest Service, or other professionals to obtain help in these decisions.

### **Management Options:**

1. *Pruning and removing trees is the best management measure available to reduce or eliminate dwarf mistletoe infestations in ornamental trees or urban forests.*
2. *Plant resistant trees under infected trees to replace trees when infected ones are removed.*
3. *Use ethephon sprays in high value areas where planting with the same species under infected trees is the only option.*

### **Plant Resistant Trees in Heavily Infected Areas**

Plant resistant trees under infected trees to replace trees when infected ones are removed. Site and moisture availability will determine what trees can be planted. **NOTE:** Scotch pine is susceptible to both ponderosa and lodgepole pine dwarf mistletoe.

- Ponderosa pine areas: Replant to Douglas-fir, white fir, blue spruce, pinon pine, limber pine, Rocky Mountain juniper, bristlecone pine, gambel oak and pea shrub.
- Lodgepole pine areas: Replant to Englemann spruce, subalpine fir, Douglas-fir, bristlecone pine and limber pine.
- 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 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 some mistletoe shoots and reduce seed production for one to three years. This, in turn, reduces infection of trees planted under infected trees.

This treatment does not kill the whole mistletoe plant, just the shoot. Retreatment is necessary until infected trees are removed or mistletoe infections have been pruned out and new trees planted.

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