



# TREE NOTES

CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION

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## Diplodia Blight of pines, caused by *Sphaeropsis sapinea* (*Diplodia pinea*)

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In most years, the fungal disease Diplodia blight is an incidental problem on low elevation and coastal pines in California. Ponderosa pine is a common host, although many native and exotic pine species are susceptible. Outbreaks of the disease on ponderosa pine are associated with wet spring weather and typically occur below 2000 ft elevation. The majority of trees recover from outbreaks, but some may be debilitated by heavy and/or repeated infections.

### Recognition

Shoot dieback is the principal symptom of disease. From a distance, severely diseased trees may appear to be dying because of the large amount of dead, brown foliage. Closer-up, it becomes apparent that it is primarily the new shoots that are dead. Infected shoots are green in the spring and do not turn brown until hot weather begins to dry the needles. Because of this, shoot dieback is not usually noticed until summer.

Several symptoms are characteristic of shoot dieback caused by Diplodia blight. When seen together, these symptoms help distinguish Diplodia blight from other causes of branch tip dieback:

- 1) because the shoot is killed before it completely elongates, the current year's dead needles are usually shorter than normal,
- 2) resin-soaked bark and wood occur in the dead shoot; when cut into, these tissues vary in color from amber to nearly black; older, non-resinous portions of the branch support live, green needles,
- 3) the dead tip typically includes the current year's shoot, and may or may not include a portion of the adjacent previous year's growth, and
- 4) there is no evidence that insects killed the shoot.

In addition to brown needles, you may see gray needles still attached to shoots that were killed in a previous year. Resinosis in the shoots acts as a glue, holding some needles in place long after they have died.

The amount of shoot dieback varies considerably from one tree to the next, and on an individual tree, it is not uncommon for shoot dieback to be heavier in certain portions of the crown. While young trees may become infected, the disease is more common and generally more severe on mature and over-mature trees. Repeated damage by Diplodia blight may very well contribute to the gnarly appearance of some older, low elevation ponderosa pines.

On some trees, entire branches and/or the top may be killed. This may or may not occur in conjunction with shoot dieback and appears to take place in a couple of ways:

- 1) repeated shoot infections contribute to a branch's decline and eventual death or
- 2) on older branch tissue, girdling infections can occur through wounds. Wounding by insects, for example, has been associated with such infections.

### Infection and Impact

The fungus can infect new needles and shoots, older woody tissue through wounds, and second year cones. Pycnidia, a minute type of fungal fruiting structure, may be produced on any of these substrates, usually in the spring of the year following infection. Infected cones can be found on trees without other types of infection and spores from cones may provide a ready source of inoculum for shoot infections under appropriate environmental conditions.

On ponderosa pine, shoots are typically infected once a year, in the spring as the new shoots are elongating. Once this susceptible period has passed, additional shoot infections are unlikely. Wet spring weather during shoot elongation is a prerequisite to infection and often causes an increase in damage. In most years, infections are rare or absent because environmental conditions simply do not favor infection.

Generally, Diplodia blight is much less serious than the appearance of the tree suggests. It is not a systemic or inherently chronic disease. The vast majority of diseased trees recover. One has to assume, however, that severe levels of infection on an already stressed tree will further weaken the tree, contributing to its decline and predisposing it to attack by other pests. While late spring rains are generally considered to benefit tree vigor by extending the growing season and reducing drought stress, increased levels of Diplodia blight could counteract this effect on susceptible trees.

### Recent Conditions

Wet springs in 1993, 1995, 1996, and 1997 resulted in disease build-up and repeated yearly infections on susceptible ponderosa pines surrounding the Sacramento Valley and at other low elevation sites. Although early spring was dry in 1997, a spate of late storms and high inoculum levels favored the disease

again in many areas of Northern California. The late spring storms in 1997, however, missed much of southern and central California. As a result, a severe outbreak of Diplodia blight at Henry W. Coe State Park, Santa Clara County, in 1996 failed to reoccur in 1997. Trees that were heavily infected there in 1996, looked more or less normal in 1997.

Late rains occurred again in the spring of 1998, favoring the disease for yet another year.

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## **Control**

Two fungicide spray applications in the spring, when shoots are susceptible, can prevent infection. There are, however, reasons why control may be impractical:

- » environmental conditions that favor infection are infrequent and unpredictable; fungicide treatments would have to be applied yearly to prevent infections that have a relatively low probability of occurring
- » accurate timing of fungicide applications is critical to success
- » large trees are more likely to suffer from the disease, yet it is difficult to get adequate fungicide coverage throughout the crown of a large tree
- » only a small percentage of trees appear to be highly susceptible to the disease; repeated yearly infections on an individual tree may be an indication that the tree is poorly suited to the site or is stressed from other causes.

Pruning-out infected shoots and branches will not control the disease. Although it may be possible to remove these sources of inoculum, infected cones on the tree can still provide inoculum for new infections. When branches or tops are killed, pruning may be needed to reduce hazard or for aesthetic reasons. To avoid infections through wounds, do not prune trees during wet months, especially in the spring. Early fall, while it is still dry, is the recommended time to prune trees that are susceptible to Diplodia blight.

If damage is limited to shoot dieback, renewed growth in subsequent years will likely compensate for and hide the damage. Trees that suffer significant amounts of crown dieback and exhibit little or no recovery in subsequent years should be evaluated as candidates for removal.

The preponderance of disease among older trees and trees on poorer, lower elevation sites suggests that stress may play a role in disease susceptibility. Efforts to improve the vigor of individual specimen trees may or may not have any bearing on disease susceptibility, but should improve the overall health of a tree. Trees growing on harsher low elevation sites need more room to grow. Thinning trees and removing competing vegetation will increase the resources available to individual trees and provide better aeration to tree crowns.

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## **References**

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- Sharpf, R.F., tech. coord. 1993. Diseases of Pacific Coast Conifers. Agric. Handb. 521. Washington, DC: USDA Forest Service. 199 p.
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Figure 1. Diplodia blight on ponderosa pine.



Figure 2. Infected shoot. Bark has been removed to show discoloration of the wood in the dead shoot.