

‘Bleeding’ canker on tree trunk



- ‘Bleeding’ or oozing on the bark
- Not associated with cracks in bark or insect holes
- Usually on the lower 6 ft. of tree trunks

Photo: Garbelotto lab, UC Berkeley

Upon closer examination, *P. ramorum*-infected trees with widespread crown death show symptoms of bleeding bark on the trunk. Bleeding on the bark is an oozing or seeping of a reddish-brown to tar black sap that appears as small droplets on the bark. This is the tree’s response to infection or injury and is not unique to *P. ramorum*. Bleeding caused by *P. ramorum* is typically not associated with cracks in the bark or insect holes, although insect holes may be present in *P. ramorum* infected trees. Bleeding cankers *usually* occur first in the lower portion of tree trunks but have been found as high as 60 ft. above the ground. The combination of whole crown death accompanied by bleeding of the bark are good indicators of *P. ramorum* infection.

Phytophthora ramorum



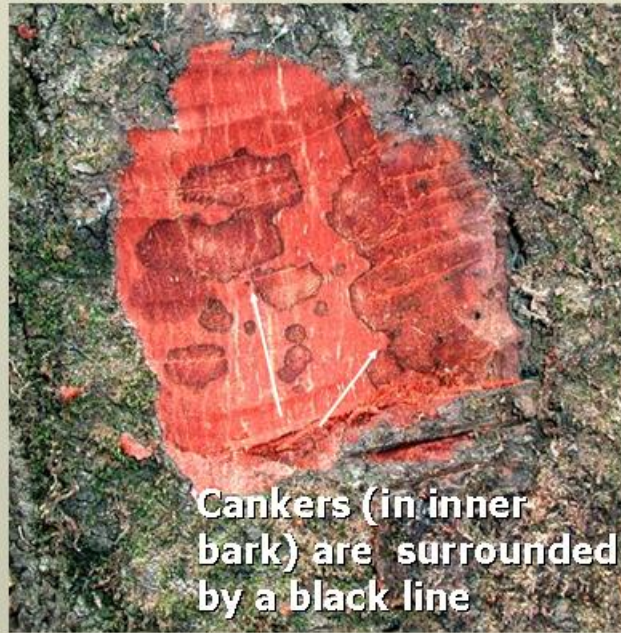
"bleeding"



Photos: Mike McWilliams, ODF & Bruce Moltzen, Missouri Dept. of Conservation

On the top and bottom left are trees with active bleeding cankers. On the right is a tree in which the infection is older and the bleeding is less active. The bleeding has been washed away by rainfall leaving diffuse stains on the bark.

Phytophthora ramorum



Cankers (in inner bark) are surrounded by a black line

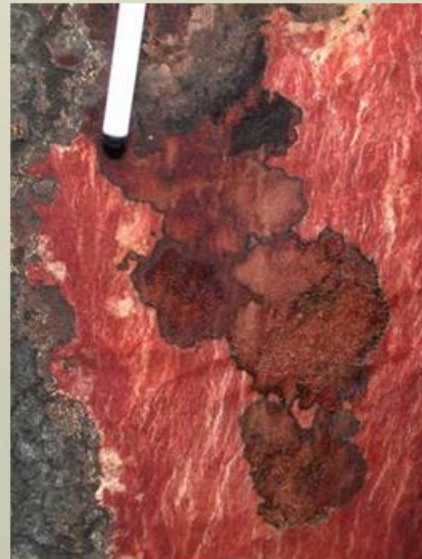
Photo: Dave Rizzo, UC Davis

This photo is from a coast live oak. If you shave off the outer layer of bark where the bleeding is present, you will see the cankers in the inner bark. The cankers are infected tissue which appear as dark blotches surrounded by black lines. In this species, healthy bark is bright red. Infected bark is brownish and surrounded by a dark line.

Phytophthora ramorum



outer bark



inner bark

Photo: Bruce Moltzen, Missouri Department of Conservation

This slide shows symptoms caused by *P. ramorum* on tanoak. On the left is a photo of the outer bark, showing the bleeding canker caused by *P. ramorum*. On the right is the same tree with the outer bark removed to reveal the inner bark under the bleeding. In this species, the healthy bark is bright red. In the next few slides, we'll be looking at similar symptoms on the outer and inner bark caused by fungi or insects.

Similar symptoms – not *P. ramorum*



outer bark



inner bark

Bleeding canker caused by *Armillaria*

Photo: Steve Oak, USDA-Forest Service

This bleeding canker on the left is caused by a fungus, *Armillaria*, a root pathogen. On the right, note the white mycelial fans under the bark as shown by the white arrow. If you see only these symptoms, it is not *P. ramorum*. Also, cankers caused by *P. ramorum*, which generally do not extend down below the soil line, but those caused by *Armillaria* begin beneath the soil line at the base of the tree and grow upward. Sometimes trees can be infected by both *Armillaria* and *P. ramorum*, however.

Similar symptoms – not *P. ramorum*



outer bark



inner bark

Bleeding canker caused by inner-bark boring insect

Photo: Steve Oak, USDA-Forest Service

This bleeding canker on the left is caused by an insect that has bored through the inner bark shown on the right. It is not *Phytophthora ramorum*.

Similar symptoms – submit sample



outer bark



inner bark

Bleeding canker caused by *Inonotus hispidus*

Photo: Steve Oak, USDA-Forest Service

This bleeding canker on the left is caused by a fungus, *Inonotus hispidus*. However, the inner bark symptoms are similar enough to those caused by *P. ramorum* that the tree should be tested.

Other common diseases & injuries



- Bacterial wetwood
- Boring insects
- Mechanical injury
- Fungi

There are many other tree diseases, injuries and disorders that can cause similar symptoms, and this can be confusing when trying to diagnose Sudden Oak Death. A few of the more common causes are bacterial wetwood, insects, mechanical injury, fungi, and even other *Phytophthora* species, such as *Phytophthora cinnamomi*. If you are in doubt about what is causing a bleeding canker, seek the advice of an expert in your area, such as your county extension agent.