

39. Ganoderma Root Rot or White Mottled Rot

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Ganoderma root rot, also called white mottled rot, is caused by the fungus *Ganoderma applanatum*. This fungus is found in all 50 states and occurs throughout North America and Europe. It is a pathogen and a common wood-decaying fungus of roots and lower stems (butts) of many deciduous and some coniferous trees species. Ganoderma-caused root rot has been reported in live trees, such as apple (*Malus* spp.), aspen (*Populus* spp.), basswood (*Tilia* spp.), beech (*Fagus* spp.), birch (*Betula* spp.), cherry (*Prunus* spp.), citrus (*Citrus* spp.), cottonwood (*Populus* spp.), elm (*Ulmus* spp.), hemlock (*Tsuga* spp.), hornbeam (*Carpinus caroliniana*), horsechestnut (*Aesculus hippocastanum*), black



Figure 39-1—Drawing on the lower surface of *Ganoderma applanatum* conk (James J. Worrall, U.S. Forest Service).

locust (*Robinia pseudoacacia*) and honeylocust (*Gleditsia triacanthos*), maple (*Acer* spp.), mulberry (*Morus* spp.), oak (*Quercus* spp.), spruce (*Picea* spp.), sycamore (*Platanus occidentalis*), tulip tree (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), and willow (*Salix* spp.).

G. applanatum is commonly known as the artist's conk. The name comes from the use of its fruiting bodies as a drawing medium by artists (fig. 39-1). When the fresh lower surface is rubbed or scratched, it immediately changes from white to dark brown, producing shading or visible lines. When the conk is dried, drawings become permanent.

Hosts and Distribution

In the Great Plains, *G. applanatum* occurs predominantly in aspen, cottonwoods, and other *Populus* species. This fungal pathogen is irregularly distributed across the Great Plains, but its distribution is not well documented in many areas.

Symptoms and Signs

Crown symptoms in trees affected by *G. applanatum* are not always apparent. When present, symptoms resemble those of other root disorders, including reduced terminal growth, chlorotic foliage, premature foliage drop, and branch dieback. Although *G. applanatum* is often found in dead trees in an affected stand, it can decay roots and butts of otherwise healthy trees in the stand.

Extensive wood decay in roots and butts of infected trees is often overlooked until trees fall. Trees with this root disease often break at the soil line or slightly below with few or no attached roots (fig. 39-2). Often no other symptoms are apparent. Small trees or trees growing on poor sites with dry, shallow soils may be killed before decay leads to

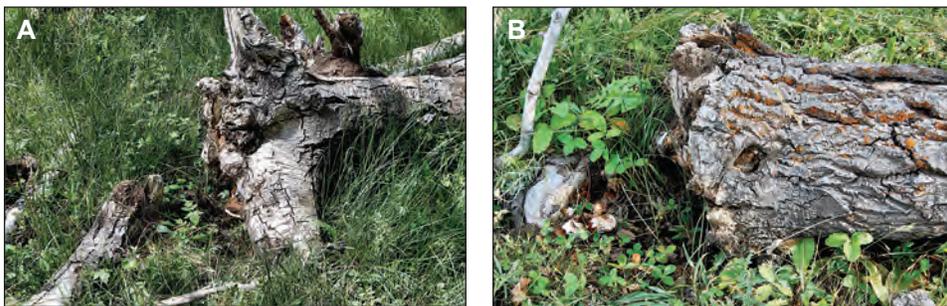


Figure 39-2—Roots infected with *Ganoderma applanatum*. Roots often break (A) near the stem or (B) at root collars. Conks might be present (A) above or (B) below the break (James T. Blodgett, U.S. Forest Service).

windthrow. The fungus causes a white rot, and decayed wood is mottled white and light tan, eventually becomes spongy, and may develop black lines (fig. 39-3).

Fruiting bodies (conks) are the best indicator of host infection, but conks typically are not formed until several years after initial infection. Although conks are not produced on some trees with extensive decay, conks often develop before trees fall or die. Conks also can develop after trees fall or die.

G. applanatum typically produces firm, flat, perennial, shelflike conks at the base of trees, often near old wounds, and usually close to the soil (fig. 39-4). Conks can vary in appearance, starting as a small white projection from bark. The upper surface is initially white, changing to gray, beige, or brown with age. The lower surface and conk margin remain white when growing, and the lower surface is covered with fine pores. When the conk is cut, distinct mottled brown annual tube layers (hymenial tissues) can be observed (fig. 39-5). Context tissues (non-hymenial tissues that compose fungal fruiting bodies) are brown. When conks or parts of conks die, the smooth upper and lower surfaces become dark gray to black and develop cracks. Conks can grow to a diameter of more than 16 inches, and both living and dead conks can persist for years.

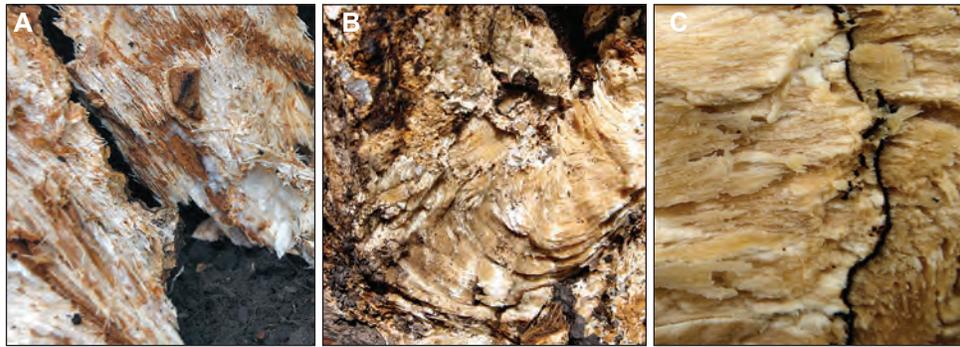


Figure 39-3—White mottled rot caused by *Ganoderma applanatum* (A-C), with (B, C) clear mottling, and (C) a zone line (right) (A: James T. Blodgett, U.S. Forest Service; B, C: James J. Worrall, U.S. Forest Service).



Figure 39-4—Conks of *Ganoderma applanatum*. They can vary in appearance, but have a white margin and underside when growing (James T. Blodgett, U.S. Forest Service).



Figure 39-5—*Ganoderma applanatum* produces perennial conks with mottled brown annual tube layers (hymenial tissues) and brown context tissues (James T. Blodgett, USDA Forest Service).

Disease Cycle

Infections occur from airborne spores or from contact with infected roots of neighboring trees. Conks can produce billions of airborne spores that are released from pores on the lower surface. Although not well understood, infections likely occur at wounds on roots or at the base of trees. Root-to-root spread can result in groups of infected trees called disease centers. In addition, the fungus can persist as a saprobe for several years after the host dies.

Damage

Ganoderma root rot affects trees used for many forest products and services including timber, recreation, and aesthetic value. It is more common in older trees and may be more prevalent on moist sites that are well suited for *Populus* species. *Ganoderma* root rot causes direct tree mortality, indirect tree mortality by breakage at the base or uprooting, growth reduction, wood loss from decay, and predisposition of trees to other disease and insect agents. Special consideration should be given when this disease occurs in developed sites because live, healthy-looking hosts with this disease frequently fall, which can endanger lives and property. Because the pathogen kills and decays roots, it likely reduces root suckering (vegetative formation of new stems from roots) and regeneration success.

Management

Once *Ganoderma* root rot is established in trees, practical methods for reducing this disease are unavailable. Because a relationship exists between wounds and decay, avoid wounds to reduce future infections. This disease is a major problem of aspen and other *Populus* species, and only a few other deciduous tree species in the Great Plains, so recognizing the problem and discriminating against susceptible host species is a practical management option. Species conversion could include complete removal of susceptible host tree species from an affected stand, or selective removal of aspen and other host species during thinning to favor nonhost species.

At developed sites with hosts, hazard tree inspectors should be trained to recognize the conks of *G. applanatum*. Conks are the only clear indicator of infection and extensive decay in live, standing trees. Fortunately, conks often develop before trees fall or die, providing an opportunity for removal of hazard trees. Species conversion away from hosts susceptible to *Ganoderma* root rot should be strongly encouraged on developed sites, especially if this disease is present.

Selected References

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