COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

Plant Pathology Fact Sheet PPFS-OR-W-01

# Tree Wounds— Invitations to Wood Decay Fungi

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## Introduction

Wood decay leads to loss of tree vigor and vitality, resulting in decline, dieback, and structural failure. Wounds play an important part in this process since they are the primary point of entry for wood decay pathogens (Figure 1). While other factors may also result in decline and dieback, the presence of wounds and/or outward signs of pathogens provides confirmation that wood decay is an underlying problem. Wounds and wood decay reduce the ability of trees to support themselves.

## Wounds

Bark, which serves to protect tree tissues, is the first line of defense against wood decay organisms. Whenever bark is broken, a wound results. Wounds that penetrate bark expose underlying tissues to invading pathogens (e.g., fungi and bacteria) that cause rot or decay.

Wounds may be as small as nail holes or much larger. They may be caused by any number of mechanical factors, human activities, insect pests, or animals.

**Figure 1.** *Laetiporus sulphureus*, which enters trees through wounds and dead branch stubs, causes internal decay in various tree species.

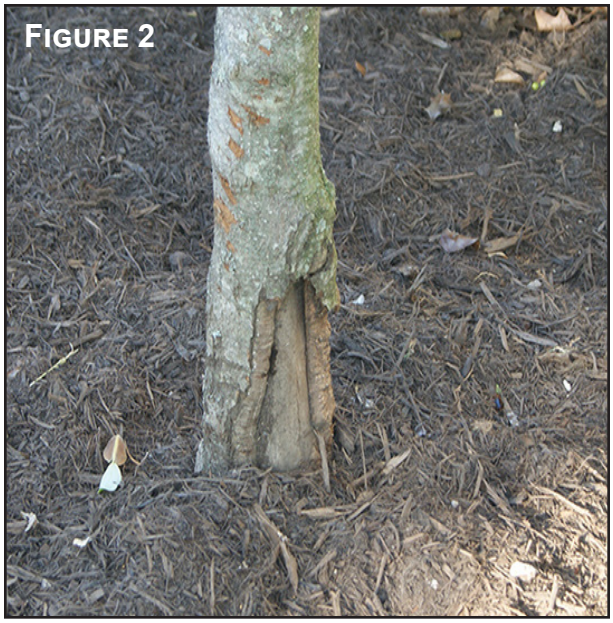




**FIGURE 2**. MULCH WAS APPLIED AFTER TRUNK WAS DAMAGED BY LAWN EQUIPMENT; TOO LATE TO PROTECT THE TREE.

**FIGURE 3**. CONSTRUCTION EQUIPMENT CAN INJURE TREE TRUNKS, BRANCHES, AND ROOTS, AS WELL AS COMPACT SOIL.

**FIGURE 4**. BRANCH STUBS LEFT AFTER PRUNING WILL NOT CLOSE, AND THEY PROVIDE POINTS OF ENTRY FOR WOOD DECAY ORGANISMS.

**FIGURE 5.** WIRE FROM STAKES AND FENCES CREATES WOUNDS; IT ALSO LEADS TO GIRDLING, WHICH IMPEDES UPTAKE OF WATER AND NUTRIENTS.

Some factors that cause wounds include:

- Lawn equipment (e.g., mower and string trimmer damage to trunk and surface roots) (FIGURE 2)
- Pruning (especially stubs left from topping or other improper pruning cuts) (FIGURE 3)
- Construction equipment and activities (trenching, grade changes, etc.) (FIGURE 4)
- Vehicles, bikes, scooters, or other objects running into tree trunks
- Wire, twine, or other objects girdling or embedded in trunk or branch (FIGURE 5)
- Herbicides (especially sub-lethal rates of glyphosate)
- Animal damage (deer, mice, woodpeckers, squirrels, etc.)
- Insect injury (especially wood boring insects)
- Severe weather (e.g., lightning, wet snow, ice, high wind, sunscald)

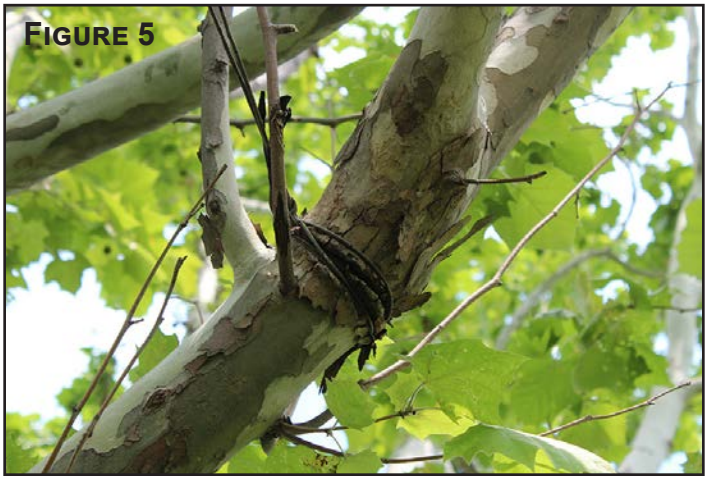



**Figure 6**. Woundwood/callus closes wounds and protects the damaged tissues from pathogens and insects. The wound in (A) is partially closed; (B) has closed completely.


## Tree Responses to Wood Decay

Wounded trees do not technically "heal" since they are not capable of repair or replacement of damaged tissues. Instead, trees close over their damaged tissues with woundwood/callus tissue (Figure 6). Trees also wall-off (compartmentalize) injuries by producing chemical and physical barriers to pathogens. Organisms that are able to overcome these protective barriers can then colonize and invade wounded tissues. Among the most aggressive of these organisms are the wood decay fungi.

Not all wounds lead to wood decay, as trees are frequently able to successfully compartmentalize wounded tissues. In many cases, formation of internal barriers within trees can prevent spread of infectious microbes. Rapid formation of woundwood/callus can also prevent the introduction of new pathogens.

The ability of trees to compartmentalize decay differs between woody plants. Factors that affect this ability to compartmentalize decay include:

- Plant species (genetic ability of the plant to compartmentalize)
- Type of pathogen or disease
- Tree age
- Size and shape of wound
- Location of wound
- Vigor (how much the tree has grown)
- Vitality (overall tree health)
- Season (time of year).

Healthy trees normally respond injury more quickly than those that are stressed. Small wounds on young, healthy plants may close within a single growing season. Large wounds require several growing seasons to close, and some may never close. The rate of formation of woundwood/callus is often an indicator of relative tree vigor, but it is not necessarily indicative of tree resistance to the internal spread of decay. Extensive internal decay may exist behind a completely closed wound.

## Wood Decay Diseases

Wood decay begins when microscopic fungal strands (mycelia) or spores are carried by wind, insects, pruning equipment, or other means to a wound. Depending on the host plant, fungal species, and point of entry, decay is classified as a root rot, butt rot (decay at tree base), or trunk and branch rot. As the decay pathogen overcomes host plant defenses and colonizes, tissues essential for tree function and structural support are destroyed.

During rainy seasons and moderate temperatures, many wood decay fungi produce visible reproductive structures, such as shelf-like fungal bodies or mushrooms. Rate of wood decay and appearance of structures can vary greatly, depending upon the type of tree, as well as its vigor and age. There are hundreds of species of wood decay fungi. Some disease organisms infect many species of plants, while others infect just a few. Examples of wood decay fungi include:

- *Armillaria* (shoestring root rot fungus, honey mushrooms) (Figure 7)
- *Fomes* (Figure 8)
- *Ganoderma* (artist's conk) (Figure 9)
- *Polyporus*
- *Trametes*
- *Xylaria* (dead man's fingers) (Figure 10).

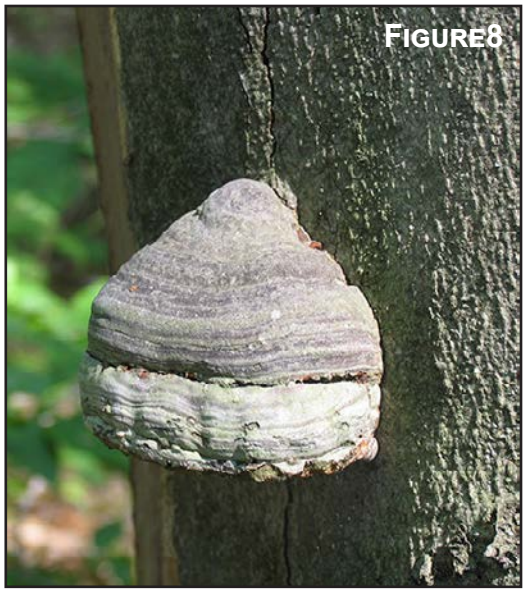






**Figure 7**. Armillaria root rot mushrooms are evident during rainy seasons.
**Figure 8**. *Fomes formentarius* produces fruiting structures (conks) that release fungal spores.
**Figure 9**. Ganoderma conks are an indication of root and butt rot.
**Figure 10**. *Xylaria* fruiting structures (commonly referred to as "dead man's fingers") are indicative of root decay.





**Figure 11**. Loose bark occurs when woody tissue underneath dies.
**Figure 12**. Opencavitiesusuallyrevealrottedheartwood and resulting loss of tree strength
**Figure 13**. Oozing sap (also called bleeding canker) can be the result of a wood rotting pathogen.
**Figure 14**. Compression rings (horizontal sections of tissue) are an indication of collapsing plant cells.

## Indications of Decay

The most conclusive indicators of decay include:

- Presence of mushroom structures in soil at or near tree base (Figures 7 & 10)
- Bracket or shelf-like fungal structures on trunks or branches (Figure 8)

Absence of these obvious indicators does not mean the tree is free of decay. Fruiting bodies of some decay fungi do not appear until decay is well advanced; others may go unnoticed because they are small, short-lived, hidden, or produced infrequently.

Other potential indicators of decay include:

- Old wounds or cracks that fail to close
- Loose bark (Figure 11)
- An open cavity (Figure 12)
- Wood that is soft, white, spongy, and stringy; or brown and brittle
- Bleeding (oozing sap) from the trunk or branch (Figure 13)
- Abnormal swellings or bulges
- Presence of compression rings evident on the trunk (Figure 14)
- Dead branches within the crown
- Weakened wood that is highly susceptibility to wind or other storm damage
- Presence of ants, termites, fungus beetles, millipedes, pill bugs, and/or white grubs.

## Wound Prevention

Closing a wound requires considerable energy from the tree, and it takes time. Long delays in closing wounds provide wood decay organisms the opportunity to infect and colonize. Once wood decay has begun, there are no controls or cures. Thus, wound prevention is critical.

- Protect trees and shrubs from injuries due to lawn equipment by managing grass and weed growth near trunks. Maintain a layer of organic mulch around tree bases, but not against trunks (Figure 15). Plastic tree guards (Figure 16), gravel, and rubber mulch are never recommended. For more information on mulching, refer to Additional Resources.
- Choose a planting site that provides adequate space for full growth to maturity. Avoid planting large trees under or adjacent to utility lines or too close to houses. This will eliminate the need for pruning to control plant size.
- Do not plant trees in areas where damage is likely (e.g., vehicle traffic)
- Prune damaged and diseased branches promptly. Do not cut into the branch collar or the branch bark ridge (Figure 17). Never leave pruning stubs (they will not close) and never top trees. For more information on proper pruning techniques and on topping, refer to Additional Resources.

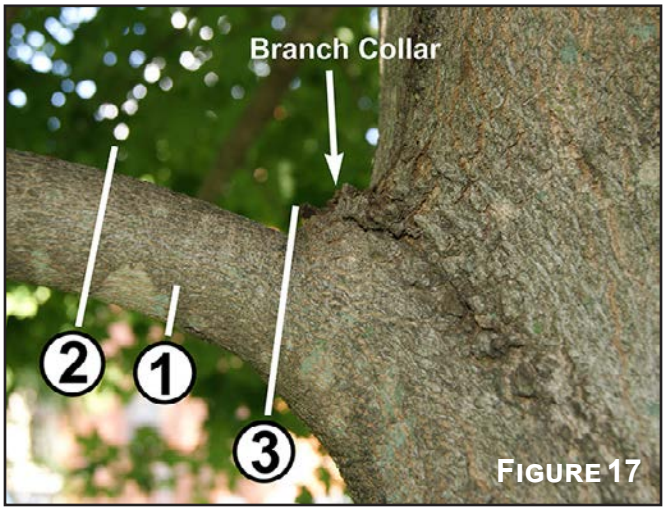
## Treating Wounds

Proper care of a tree wound encourages development of woundwood/callus formation. Promptly contact a certified arborist for an evaluation and treatment options, especially when damaged trees are large or located near houses or playgrounds.

- Make corrective pruning cuts, as instructed by an arborist.
- Wound sealants and paints do not prevent decay and are not recommended for treating wounds.
- Maintain tree vigor by mulching to moderate root zone temperatures, irrigating during dry seasons, and fertilizing according to soil test results.



**Figure 15**. Proper mulch applications should be at least as wide as the branch canopy and be pulled away from the trunk.
**Figure 16**. Plastic tree guards are not recommended.
**Figure 17**. Using the properpruningmethod prevents splitting and results in rapid callus development. Donotcutintobranch collar. The steps to thethree-cutpruning technique are:
(1) undercut
(2) cut branch
(3) final cut.



## Additional Resources

- Insect Borers in Trees and Shrubs, ENT-43 (University of Kentucky)
https://entomology.ca.uky.edu/files/desktop/ent43.pdf

- Mulch Myths, HO-106 (University of Kentucky)
http://www2.ca.uky.edu/agc/pubs/ho/ho106/ho106.pdf

- Pruning Landscape Trees, HO-45 (University of Kentucky)
https://fayette.ca.uky.edu/files/pruning_landscape_trees.pdf

- Shoestring Root Rot – A Cause of Tree and Shrub Decline, PPFS-OR-W-05 (University of Kentucky)
http://plantpathology.ca.uky.edu/files/ppfs-or-w-05.pdf

- Stress and Decline in Woody Plants, ID-50 (University of Kentucky)
http://www2.ca.uky.edu/agc/pubs/id/id50/id50.pdf

- Topping is Hazardous to Your Tree's Health, ID-55 (University of Kentucky)
http://www.ca.uky.edu/agc/pubs/id/id55/id55.pdf

- Urban and Community Forestry Program (Kentucky Division of Forestry)
https://eec.ky.gov/Natural-Resources/Forestry/urban-forestry-and-community-programs/Pages/default.aspx

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