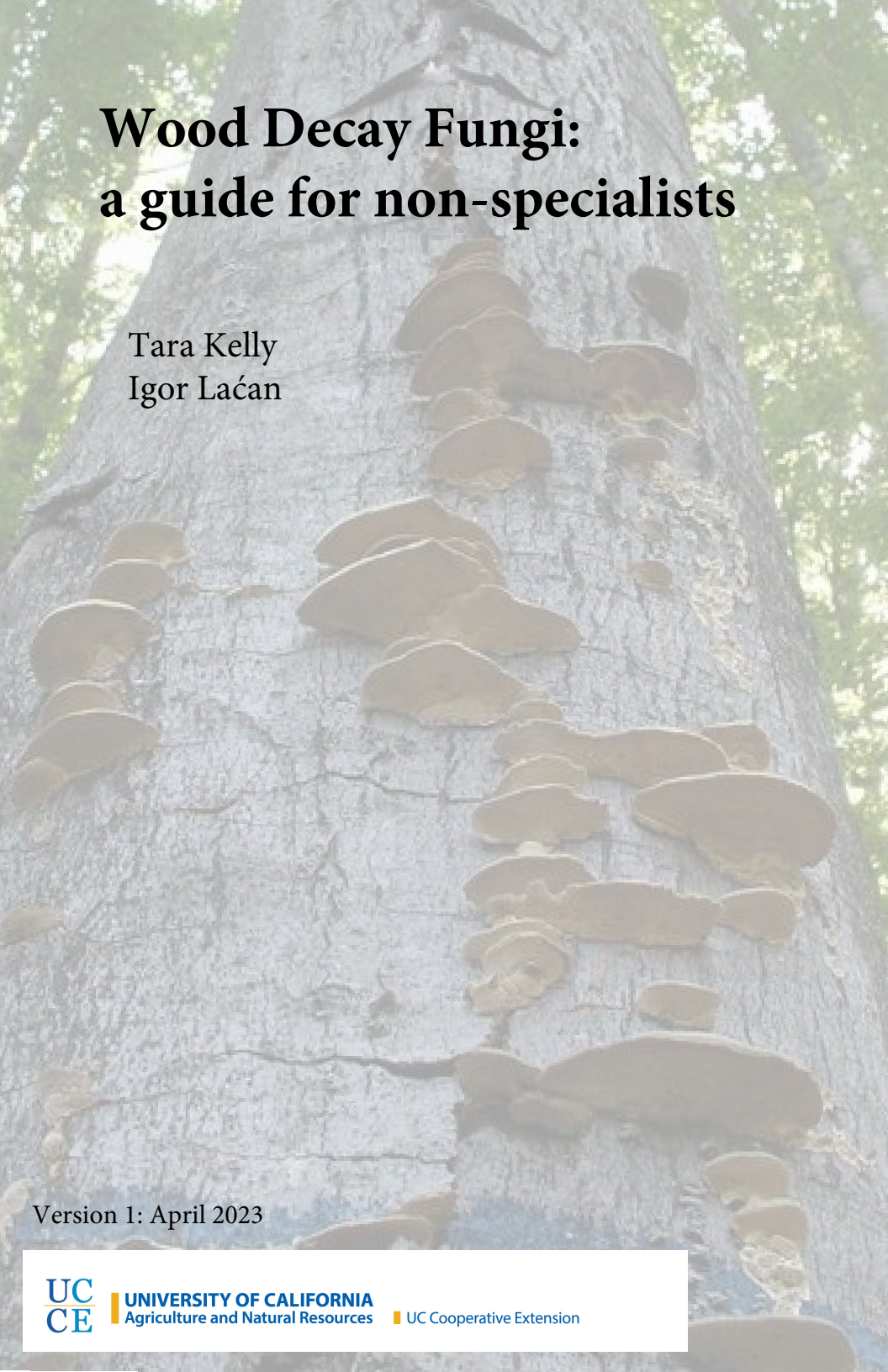

Wood Decay Fungi: a guide for non-specialists

Tara Kelly
Igor Laćan

Version 1: April 2023

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Contents

Please read: Important notes and cautions

The publication is intended to provide information on wood decay fungi in context of tree management.

→ This is not a comprehensive guide to fungi.

→ Our focus is on standing trees and tree parts. Additional fungi will be found on downed wood, on the ground and on leaves – these are not covered here.

→ No information is provided or implied on edibility of any of the fungi shown and this publication should not be used to identify a fungus for edibility.

This is not a tree risk assessment guide!

Presence of any wood decay fungus on a standing tree indicates that some wood decay has occurred inside the tree, likely reducing the strength of wood and roots. But this is only one factor affecting tree risk, and other important factors are not covered in this publication.

Some wood decay fungi (e.g., *Heterobasidion*) are difficult to find and identify in the field although they may cause extensive wood decay. Other fungi (e.g., *Armillaria*) are prone to being mis-identified. See *Resources* section for additional suggestions, but we urge consultation with professionals when identification is uncertain.

If you have any concerns about the potential for tree failure, please consult with a qualified professional (see *Resources* section)

Notes Regarding "Levels of concern"

"Level of concern" is a suggestion on the possible relationship between a fungus and wood decay with potential for tree failure. Because almost no scientific studies have quantified this relationship, "level of concern" is a professional opinion, based on available literature and consultation with scientists and arboricultural professionals.

~ "Level of concern" is not a formal "tier" or "risk level" in a risk assessment system.

~ Extent of wood decay in a standing tree may change over time; "level of concern" concept is unable to account for this change; monitoring is recommended.

~ A single fungal species may cause different decay in different tree species. In the few cases where this information is available, we have tried to include it.

~ Fungal species other than those included here may decay wood, and could contribute to failure. We attempted to include herein the most common species, but this publication should be considered incomplete.

~ This guide focuses on information pertaining to the Western United States and is intended for use in California. "Levels of concern" may differ significantly for other regions, even for the same fungi and trees.

We suggest four levels of concern

Very High Level of Concern: Prompt action recommended

- Primarily saprobic and/or sap-rotting fungi. Their presence indicates that the tree or tree part (branch) is **dead**, even if still standing. This may pose elevated risk, and prompt action is needed to evaluate the tree further, which may lead to risk-mitigating tree work.

High Level of Concern: Further evaluation and possible action recommended

- Primarily heart rots (brown rots, few white rots). Some evidence exists that their presence could be associated with substantive wood decay. The tree should be evaluated by a qualified arborist who has been alerted to the fungus.

Moderate level of Concern: Follow-up recommended

- Heart rot fungi (mostly white rots), for which less evidence exists associating them with extensive or rapid decay. Follow-up assessment is recommended.

Limited Level of Concern: Monitoring recommended

- Heart rot fungi (white rots), without a clear causal link with elevated failure risk. Presence should be recorded, and a qualified opinion sought if there are concerns about tree safety.

Some notes on terms used in this guide

1. *Location of decay: Saprot vs. Heartrot*

Saprot fungi degrade the outer layers of wood (sapwood), potentially resulting in severe loss of wood strength. Heart rot fungi degrade the inner central layers of wood (heartwood), leaving a hollow trunk or branch; strength loss varies from negligible to severe.

2. *Mechanism of decay: White vs. Brown rot*

Wood comprises cellulose, which provides strength in tension, and lignin providing compressive strength. Decay fungi preferentially degrade either lignin or cellulose, and are named after what they leave behind. "White rots" decay lignin first (white cellulose remains), leading to loss of compressive strength. "Brown rots" decay cellulose first (brown lignin remains), leading to the loss of strength-in-tension.

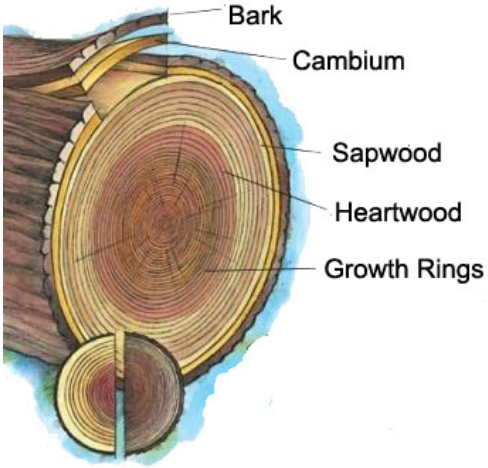
3. *Interaction of wood decay and tree growth: Body language of trees*

Prof. Claus Mattheck's "Body language of trees" concept suggests that internal defects, such as cracks, cavities or wood decay, will be reflected in modified growth patterns visible from the outside, such as ribs, callus tissue, asymmetric trunk or branch, and similar. "Body language" can thus indicate that something is going on inside the tree – possibly fungal wood decay.

Important: not all wood decay results in visible "body language" symptoms; brown rot especially can be present without any external body language symptoms.

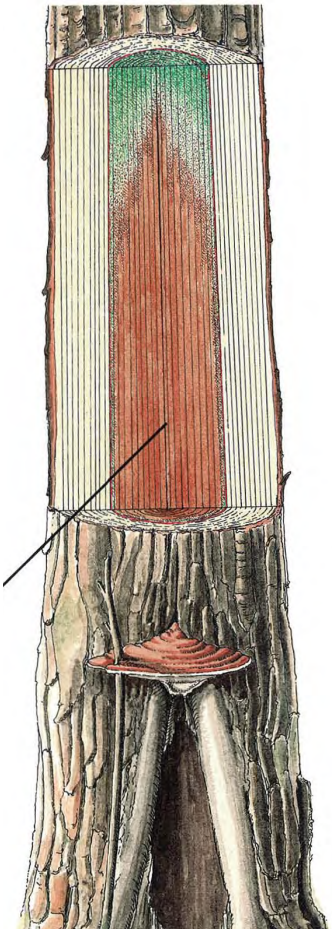
Some useful diagrams

Anatomy of a tree
Sapwood and heartwood are not always visually distinct, but their functions differ. Heartwood forms the central core of the tree; sapwood is on the outside of heartwood. Cambium is the thin layer under the bark, which produces all tree tissues including wood.
From:
USDA Forest Service
Anatomy of a Tree



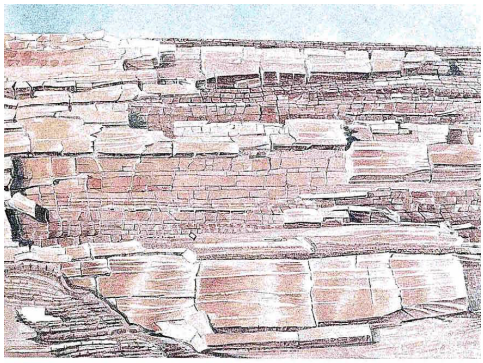
Conceptual view of decay in a tree

Illustrated are multiple concepts related to wood decay fungi:
~ wood decay progressing in the heartwood (heart rot) but not moving into the sapwood; advanced decay in orange, incipient decay in red
~ a "conk" or "bracket" fruiting body of the fungus
~ a wound, surrounded with callus tissue that indicates that the tree is attempting to close the wound. This type of callus is also an example of "body language" that will remain visible after/if the wound closes and can serve as reminder of an internal defect (decay in this case).
From: *Compartmentalization of Decay in Trees*, by Shigo and Marx 1977. USDA Forest Service.



Conceptual drawings of decay types

Advanced white rot (left) vs. advanced brown rot (right).
~ note that frequently the difference will not be this obvious; nevertheless, brown rots often progress to the "cubical rot" stage shown here, whereas white rots do not.



From: *Tree Decay - An Expanded Concept*, by Shigo, 1979. USDA Forest Service.

Visual Key: Gilled Mushrooms

Leathery and Hairy

Split-gilled fungus
Schizophyllum commune, page: 26

Fleshy and Soft

Oyster mushroom
Pleurotus ostreatus, page: 29

Oak root rot
Armillaria spp., page: 32

Visual Key: Conks with Pores

Soft and Fleshy

Sulfur shelf
Laetiporus spp., page: 33

Tough and Leathery

Turkey tails
Trametes spp., page: 27

Velvety

Velvet top
Phaeolus schweinitzii, page: 35

Shelf to Hoof-shaped

Red ring rot
Porodaedalea pini, page: 37

Inocutis dryophila, page: 40

Visual Key: Conks with Pores

Hard and Woody

Varnished conk
Ganoderma lucidum, page: 34

Artist's conk
Ganoderma applanatum, page: 36

Red belt fungus
Fomitopsis pinicola, page: 30

Quinine fungus
Laricifomes officinalis, page: 31

Visual Key: Others

Round Conks

Veiled polypore
Crytoporus volvatus, page: 24

Cramp balls
Annulohypoxylon thouarsianum, page: 25

Sheet-like Mat

Inonotus andersonii, page: 28

Icicle-like Teeth

Lion's mane
Hericium erinaceus, page: 38

Sappy When Young

Weeping conk
Pseudoinonotus dryadeus, page: 39

Tree Host Key

Conifer Specific
usually not on broad-leaf trees

Veiled polypore
Cryptoporus volvatus, page: 24

Red belt fungus
Fomitopsis pinicola, page: 30

Quinine fungus
Laricifomes officinalis, page: 31

Velvet top
Phaeolus schweinitzii, page: 35

Red ring rot
Porodaedalea pini, page: 37

Tree Host Key

Broad-leaf Trees
usually not on conifers

Cramp balls
Annulohypoxylon spp., page: 28

Inonotus andersonii, page: 31

Inocutis dryophila page: 43

Conifer and Broad-leaf Trees

Split-gilled fungus
Schizophyllum commune, page: 29

Turkey tails
Trametes spp., page: 30

Tree Host Key

Conifer and Broad-leaf Trees

Oyster mushroom
Pleurotus ostreatus, page: 32

Oak root rot
Armillaria spp., page: 35

Sulfur shelf
Laetiporus spp., page: 36

Varnished conk
Ganoderma lucidum, page: 37

Artist's conk
Ganoderma applanatum, page: 39

Lion's mane
Hericium erinaceus, page: 41

Weeping conk
Pseudoinonotus dryadeus, page: 42

Northern CA Habitat

Common Fungi of Concern:

- **"Veiled polypore"** *Cryptoporus volvatus,* Page: 24
- **"Cramp balls"** *Annulohypoxylon thouarsianum,* Page: 25
- **"Split-gilled fungus"** *Schizophyllum commune,* Page: 26
- **"Turkey tails"** *Trametes* spp., Page: 27
- ***Inonotus andersonii,*** Page: 28
- **"Oyster mushroom"** *Pleurotus ostreatus,* Page: 29
- **"Red belt fungus"***Fomitopsis pinicola,* Page: 30
- **"Quinine fungus"** *Laricifomes officinalis,* Page: 31
- **"Oak root rot"** *Armillaria* spp. Page: 32
- **"Sulfur shelf"** *Laetiporus* spp., Page: 33
- *Ganoderma* spp.,
    - **"Varnished conk"** Page: 34
    - **"Artist's conk"** Page: 36
- **"Velvet top"** *Phaeolus schweinitzii,* Page: 35
- **"Red ring rot"** *Porodaedalea pini,* Page: 37
- **"Lion's mane"** *Hericium erinaceus,* Page: 38
- **"Weeping conk"** *Pseudoinonotus dryadeus,* Page: 39

Other Factors to Consider - not an extensive list

❖ While uncommon in forests, trees adjacent to roadside may be impacted by filled soil from road construction. Check for root flares.

Additional Resources:
See 'Urban and Suburban Landscapes' habitat page for information on construction damage.
See 'Mixed Conifer Forests' habitat page for information on *Heterobasidion* spp.

Mixed Conifer Forests Habitat

Common Fungi of Concern:

- **"Veiled polypore"** *Cryptoporus volvatus,* Page: 24
- **"Split-gilled fungus"** *Schizophyllum commune,* Page: 26
- **"Red belt fungus"** *Fomitopsis pinicola,* Page: 30
- **"Quinine fungus"** *Laricifomes officinalis*, Page: 31
- **"Oak root rot"** *Armillaria* spp. Page: 32
- **"Sulfur shelf"** *Laetiporus* spp., Page: 33
- *Ganoderma* spp.,
    - **"Varnished conk"** Page: 34
    - **"Artist's conk"** Page: 36
- **"Velvet top"** *Phaeolus schweinitzii*, Page: 35
- **"Red ring rot"** *Porodaedalea pini*, Page: 37

Other Factors to Consider - not an extensive list

❖ Conifer-base Polypore

Only in conifer forests. Root decay fungi that make trees susceptible to wind-throw. Does not display showy fruiting bodies. Recognized by spotting a cluster of dead conifers, with an infection center that decay spreads from.

Additional Resources:
UCANR Integrated Pest Management Program: *Heterobasidion* spp.
https://ipm.ucanr.edu/PMG/GARDEN/PLANTS/DISEASES/heterobasidion_annosum.html

Oak Woodland Habitat

Common Fungi of Concern:

- **"Veiled polypore"** *Cryptoporus volvatus,* Page: 24
- **"Cramp balls"** *Annulohypoxylon thouarsianum,* Page: 25
- **"Turkey tails"** *Trametes* spp., Page: 27
- ***Inonotus andersonii,*** Page: 28
- **"Oyster mushroom"** *Pleurotus ostreatus,* Page: 29
- **"Oak root rot"** *Armillaria* spp., Page: 32
- *Ganoderma* spp.,
    - **"Varnished conk"** page: 34
    - **"Artist's conk"** page: 36
- **"Lion's mane"** *Hericium erinaceus,* Page: 38
- ***Inocutis dryophila,*** Page: 40

Other Factors to Consider - not an extensive list

❖ Sudden Oak Death (SOD)
Phytophthora ramorum is common throughout coastal Northern California. Causes bleeding cankers and canopy dieback in oaks. Trees often die standing, presence of *Hypoxylon* spp. is a common indicator tree died of SOD.

Additional Resources:
CA Oak Mortality Task Force: suddenoakdeath.org

Urban and Suburban Habitat

Common Fungi of Concern:

- **"Cramp balls"** *Annulohypoxylon thouarsianum,* Page: 25
- **"Split-gilled fungus"** *Schizophllum commune,* Page: 26
- **"Turkey tails"** *Trametes* spp. Page: 27
- **"Oyster mushroom"** *Pleurotus* spp. Page: 29
- **"Oak root rot"** *Armillaria* spp. Page: 32
- **"Sulfur shelf"** *Laetiporus* spp. Page: 33
- *Ganoderma* spp.,
    - **"Varnished conk"** page: 34
    - **"Artist's conk"** page: 36
- *"*__Velvet top__" *Phaeolus schweinitzii,* Page: 35

Other Factors to Consider - not an extensive list

- ❖ Construction Damage
  Construction sites near trees may cause damage to root systems. If a root system is compromised, loss in canopy can occur and/or infection can enter root wounds.

Additional Resources:
UCANR Integrated Pest Management Program:
"Protecting trees during construction",
https://ipm.ucanr.edu/PMG/GARDEN/ENVIRON/protectlandscapes.html

Common Fungi of Concern

- **"Veiled polypore"** *Cryptoporus volvatus:* Page: 24
- **"Cramp balls"** *Annoluhypoxylon thouarsianum,* Page: 25
- **"Turkey tails"** *Trametes* spp., Page: 27
- **"Oak root rot"** *Armillaria* spp., Page: 32
- **"Sulfur shelf"** *Laetiporus* spp., Page: 33
- *Ganoderma* spp. Pages:
  - **"Varnished conk"** Page: 34
  - **"Artist's conk"** Page: 36
- **"Velvet top"** *Phaelous schweinitzii,* Page: 35
- **"Red ring rot"** *Porodaedalea pini,* Page: 37
- **"Lion's mane"** *Hericium erinaceus,* Page: 38

Other Factors to Consider: not an extensive list

❖ Drought Stressed Conditions
Trees injured from chronic water deficits may be confused with trees impacted by other diseases and disorders.

Additional resources:
UCANR Integrated Pest Management Program:
"Water deficit and excess"
https://ipm.ucanr.edu/PMG/GARDEN/ENVIRON/poorwater.html

Prompt Action Recommended if Any of These Fungi Are on a Standing Tree

"Veiled polypore"
Page: 27

Yellow, brown, or white golf ball-like conks

"Cramp balls"
Page: 28

Black globe-like balls

"Split-gilled fungus"
Page: 29

Small hairy white-brown brackets

"Turkey tails"
Page: 30

"Turkey tail." Shelf-like, tough and leathery, multi-colored to pale gray

Inonotus andersonii, Page: 31

Sulfur yellow to pale sheet-like mat

Visual Tree Body Language Cues

"Tree Body Language:" refers to the natural modifications of tree growth and form in response to internal defects or external forces.

Defects such as cavities, cracks or splits, thickened areas on trunk (ribs), and leaning, can be associated with wood decay fungi and / or internal defects in the wood. These are very common in older trees, and are not themselves lethal to the tree.

If any of these are seen:

recommend evaluation of the tree by an arborist

Cavities: Very High Concern

Prompt action recommend

Oak with large cavity

Notes

May indicate internal decay column. Large cavities may indicate tree instability.

Large cavity in base of tree

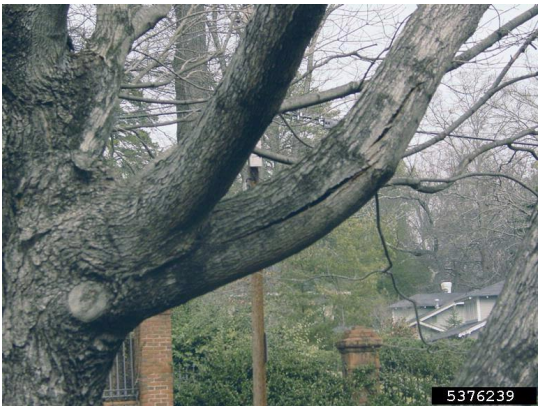
Cracks or Splits: Very High Concern

Prompt action recommended

Split in trunk

Notes

Indicates unstable union of tree parts.



Crack in large branch

Leaning: Very High Concern

Prompt action recommended

Tree with severe lean

Notes

Severe lean may indicate inadequate root support. Check for other signs of decay such as cracks or splits.

Ribs: Very High Concern

Prompt action recommended

Thickened areas on trunk (ribs)

Notes

The tree has expended energy to create additional wood because of internal structural decay.

"Common name"

Scientific name

Level of Concern:
Very high / High / Moderate / Limited
Recommendation of action

Identifying Features
common attributes

Notes
importance, indicators to look for, etc.

Common on:
known hosts - not an extensive list

Commonly found in:
known CA habitats - not an extensive list

Indicator maps:
likelihood of seeing fungus in CA

Red: highest likelihood

Orange: moderate likelihood

Yellow: lowest likelihood

Please refer to *Introduction* pages 2-3 for information on level of concern ratings and recommendation of actions.

"Veiled polypore" "Pouch fungus"

Cryptoporus volvatus

Concern Level: **Very High**

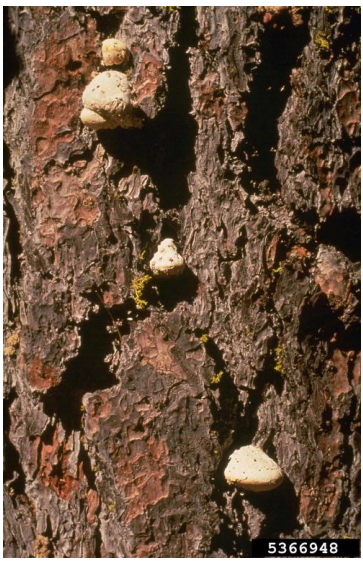
Prompt Action recommended - tree part is dead

C. volvatus

Identifying Features

Small, round golf-ball shaped conks with pores and no stem. Initially a yellow-brown color that fades to white or brown with age.

C. volvatus on a Douglas Fir



C. volvatus on a conifer

Notes

Fruiting bodies appear on dead tree parts and likely indicate tree mortality.

Common on conifers:

Ponderosa pine, Douglas fir

Commonly found in:

Fire damaged forests, Mixed conifer forests, North Coast, Sierras, Southern CA

"Cramp balls"

Annulohypoxylon thouarsianum

Concern Level: Very High

Prompt Action recommended - tree part is dead

Annulohypoxylon spp.

Identifying Features

Small black globe-shaped to disk-like fruiting bodies, with small bumps.

Notes

Fruiting bodies appear on dead tree parts.

Annulohypoxylon spp. on a Coast Live Oak

Annulohypoxylon spp.

Common on oaks:

Coast live oak, CA black oak, valley oak, tanoak

Commonly found in:

Areas with sudden oak death, oak woodland, urban, North Coast, Southern CA

"Split-gilled fungus"

Schizophyllum commune

Concern level: **Very High**

Prompt Action recommended - tree part is dead

S. commune

Identifying features

Small, leathery, and thin. White-gray to brown with a hairy top. Gills split towards the margins.

S. commune

Notes

Indicates extensive decay. If there are many fruiting bodies, check for branch or tree failure.

Common on:

eucalyptus, laurels, oaks, pines, sequoias

Commonly found in:

urban, North Coast, Sierras

"Turkey tails"

Trametes spp.

Level of Concern: Very High
Prompt Action recommended - tree part is dead

T. versicolor

T. hirsuta

T. versicolor

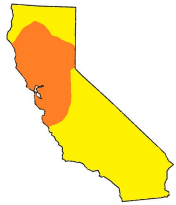
Identifying Features
Shelf-like, tough and leathery. Multicolored to pale gray, looks like a turkey tail.

Notes
Indicates dead and decaying tree parts.

Common on:
eucalyptus, oaks, pines, laurels

Commonly found in:
urban, oak woodland, North Coast

Inonotus andersonii



Concern Level: Very High
Prompt Action recommended - tree part is dead

I. andersonii on coast live oak

Identifying Features
Flat, sheet-like mat. Found between bark and inner wood. Spore deposits sulfur yellow, fruiting bodies dull brown.

Notes
Only appears on dead tree parts and likely indicate tree mortality.

I. andersonii on oak with outer bark removed

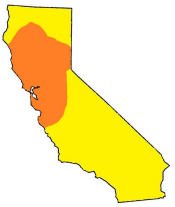
I. andersonii

Common on:
Coast live oak, CA black oak, valley oak, cottonwood

Commonly found in:
Northern CA, oak woodland

"Oyster mushroom"

Pleurotus ostreatus



Level of Concern: High

Further evaluation and possible action recommended

P. ostreatus

Identifying Features

White to grayish, soft and fleshy, gilled fan-shaped clusters.

Notes

Indicates significant structural issues.

Pleurotus spp.

Pleurotus spp.

Common on:

eucalyptus, oaks, conifers

Commonly found in:

North Coast, oak woodland, urban

"Red belt fungus"

Fomitopsis pinicola

Level of Concern: High
Further evaluation and possible action recommended

F. pinicola top of conk

F. pinicola underside of conk

F. pinicola

Identifying Features
Large, woody brackets with dark tops that often have bright red bands at the margin, and white porous undersides. Tops will darken and red band may fade with age.

Notes
Commonly seen on damaged trees with open wounds. Check for other body language indicators of internal decay.

Common on conifers:
Ponderosa pine, Monterey pine, Douglas fir

Commonly found in:
North Coast, mixed conifer forests

"Quinine fungus"

Laricifomes officinalis

Level of Concern: High

Further evaluation and possible action recommended

F. officinalis

F. officinalis

Identifying Features

Hard, woody brackets, white to gray, with cracked surfaces.

Found on: top 1/3 of tree most commonly in old growth forests.

F. officinalis shown within indicator box

Notes

Indicates extensive internal decay, tree will eventually fail.

Common on conifers: Ponderosa pine, Douglas fir

Commonly found in: mixed conifer forests, North Coast, Sierras

"Oak Root Rot", "Honey Mushroom"

Armillaria spp.

Level of Concern: High
Further evaluation and possible action recommended

A. gallica

Special Note
Often misidentified, refer to page: ___ for information about sending samples for lab work.

Identifying Features
Clusters of gilled, fleshy, soft mushrooms. Yellow-orange to brown.
Found on: root zone and base of tree.

A. mellea

Notes
Decay can be difficult to detect. **Check for crown symptoms:** yellow foliage, branch dieback, etc.

Common on:
oaks, conifers, CA bay laurel, madrone, Monterey pine, ponderosa pine, Douglas fir

Commonly found in:
mixed conifer forests, urban, North Coast, Sierras, Southern CA

"Sulfur Shelf"

Laetiporus conifericola, L. gilbertsonii

Level of Concern: High
Further evaluation and possible action recommended

L. conifericola

Identifying Features
Large, fleshy, overlapping conks. Orange-yellow that fades and becomes pale with age.

Notes
Conks may appear after many years of internal decay.

L. gilbertsonii

L. gilbertsonii

Common on:
blue gum eucalyptus, Fremont cottonwood, conifers, oaks

Commonly found in:
Northern CA, urban, Southern CA

"Varnished conk"

Ganoderma lucidum, G. polychromum

Level of Concern: High
Further evaluation and possible action recommended

G. lucidum

Identifying Features
Shiny dark red varnish crust on the top of circular conks. White porous underside, can be white around the margin.

Found on: base of tree

G. lucidum

Notes
May indicate extensive decay in the base of the tree, causing an elevated risk of tree failure.

Common on:
oaks, pines, Fremont cottonwood

Commonly found in:
North Coast, Sierras, urban, oak woodland, Southern CA

"Velvet top", "Dyer's fungus"

Phaeolus schweinitzii

Levels of Concern:

High if conks are on tree trunk or **if exposed to wind**
Further evaluation and possible action recommended

Moderate if conks are on root zone
Follow-up recommended

P. schweinitzii

P. schweinitzii faded to dark brown

P. schweinitzii on Douglas Fir

Identifying Features
Fan-shaped or overlapping, velvety conks. Yellow-brown with a yellow margin when young, fades to dark brown.
Found on: tree base / root area

Notes
Indicates a large amount of decay. High risk of wind-throw failure from base.

Common on conifers**:**
Monterey pine

Commonly found in:
mixed conifer forests, urban, North Coast, Sierras

"Artist's conk"

Ganoderma applanatum, G. brownii, G. adspersum

Level of Concern: Moderate
Follow-up recommended

G. applanatum

Identifying Features
Medium to large sized, hard and woody shelf-like conks. Brown top with white underside that stains when bruised.

Found on: base of tree

Notes
Associated with buttress root and butt failure.

G. applanatum

G. applanatum

Common on:
CA bay laurel, CA black oak, valley oak, Coast live oak, CA foothill pine, Ponderosa pine, Douglas fir

Commonly found in:
Sierras, North Coast, oak woodland, urban, Southern CA

"Red ring rot" "Pine bracket"

Porodaedalea pini

Levels of Concern:

Limited if **less than 5 conks**
Monitoring recommended

High if **5 or more** conks; especially if **exposed to wind**
Further evaluation and possible action recommended

P. pini, Santa Cruz CA

Identifying Features
Shelf to hoof-like. Tops are rough and dark brown. Underside is lighter in color with irregular maze-like pores.

P. pini, Tuolumne County, CA

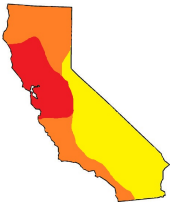
Notes
Highly common on conifers.

Common on conifers:
Douglas fir

Commonly found in:
mixed conifer forests,
North Coast, Sierras

"Lion's mane"

Hericium erinaceus



Levels of Concern:

Limited

Monitoring recommended

High if associated with a cavity

Further evaluation and possible action recommended

H. erinaceus

Identifying Features

Long white teeth attached to a central core. Turns brown with age.

Notes

Associated with tree wounds, check for cavities and other body language signs of decay.

H. erinaceus in cavity

H. erinaceus aged and turning brown

Common on:

Coast live oak, canyon live, CA black oak, valley oak, eucalyptus, conifers

Commonly found in:

North Coast, Southern CA

"Weeping conk"

Pseudoinonotus dryadeus

Level of Concern:

Limited

Monitoring recommended

High if on a **conifer exposed to wind**

Further evaluation and possible action recommended

I. dryadeus

Identifying Features
Irregular shaped, large lumpy masses. Has amber droplets when fresh, pock-marked surface when dried.
Found on: base of tree

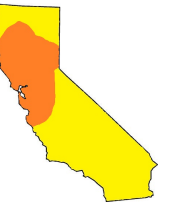
I. dryadeus

Notes
Indicates extensive root decay. Causes elevated risk of failure from wind-throw.

Common on:
Coast live oak, conifers

Commonly found in:
North Coast

Inocutis dryophila



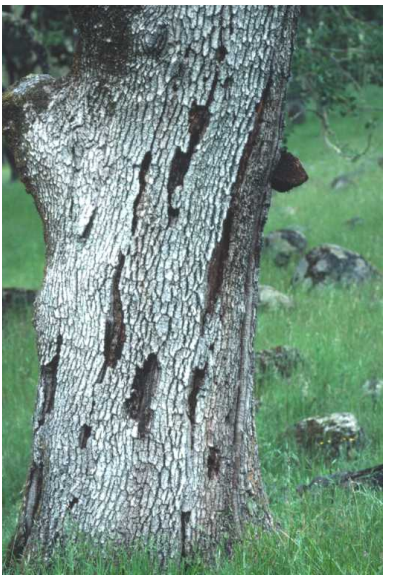
Level of Concern: Limited
Monitoring recommended

I. dryophilus

I. dryophilus

Identifying Features
Single hoof-shape or overlapping shelf-like. Light tan color, fades brown with age.

Notes
Causes elongated cankers in cambium. Associated with CA oak mortality.



Elongated cankers caused by *I. dryophilus*

Common on:
oaks

Commonly found in:
oak woodland

Others - Variable Association with Tree Failure

This is an incomplete list

Beetle-killed Trees

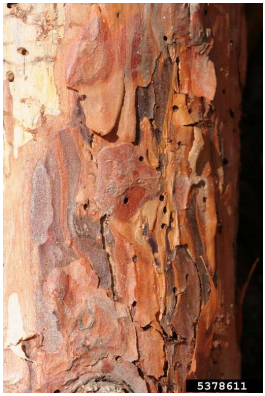
Usually numerous small holes in bark with boring dust around the hole. Trees, especially conifers, can remain green in initial stages of death. **High level of concern** if there is significant beetle activity, or if more than 50% of crown is fading with uniform change in color.

Recommendation: Prompt further evaluation needed

Crown dieback in Ponderosa pine

Bark Beetles

Oak bark beetle



Bark beetle damage

Look for numerous very small holes in bark

Shot-hole Borers

Shot-hole borer

Shot-hole borer damage

Others - Variable Association with Tree Failure

This is an incomplete list

Douglas fir beetle frass

Frass: boring insect excrement found in bark crevices and/on base of the tree. Indicates presence of insects that bore into the tree. May be reason for concern if associated with a dead tree, or a fire damaged tree, or if a large number of holes are present.

For conifer trees in forests, elevated concern if dust or frass covers at least 1/3 of base circumference**.**

Ants: some species nest in decayed wood. Presence of ants coming out of cracks or holes in tree may indicate decayed wood and cavities inside the tree.

Carpenter ant

Clearwing Moths: Usually not cause of concern unless present on dead tree parts

Oak clearwing moth

Look for large, pencil-sized holes in bark

Clearwing moth damage

Others - Variable Association with Tree Failure

This is an incomplete list

Foliage Diseases: Very common, alone not cause for concern

"Tar spot" (*Rhytisma acerinum)* damage

"Tar spot" (*Rhytisma acerinum)* damage

Branch Dieback: Most commonly found on very small twigs and not cause for concern. If a large branch is dead it is a high concern and recommend prompt follow-up.

Botryosphaeria canker causing branch dieback

Dead twig

Others - Variable Association with Tree Failure

This is an incomplete list

Dwarf Mistletoe: Only on conifers, may be cause for concern if tree part is dead and / or there is extensive beetle damage

Dwarf mistletoe shoot cluster

Dwarf mistletoe broom

Oak Galls: Very common, many different shapes and colors on leaves and / or small twigs, alone not cause for concern.

Oak apple gall

Oak leaf gall

Lichen: Grows on top of bark, does not harm the tree. Does not cause wood decay.

Lichen

Lichen (*Athelia epiphylla*)

Some useful references and notes on getting help
If the provided links are broken, please search for the title itself, and report the error to ilacan@ucanr.edu

1. Useful Resouces

a. *Illustrated guides to wood decay fungi*

Pest Notes: Wood Decay Fungi in Landscape Trees. Downer, 2019.

Decay fungi associated with oaks and other hardwoods in the western United States. Glaeser Smith. 2010.

Decay fungi of riparian trees in the Southwestern U.S. Glaeser and Smith 2013. and

b. *Body language of trees and tree hazards*

Indicators of Decay in Urban Trees. Luley, 2012.

Recognizing Tree Hazards: A Photographic Guide for Homeowners. Costello, Hagen, and Jones, 1999.

c. *General guides*

A Field Guide to Insects and Diseases of California Oaks. Swiecki and Bernhardt, 2006.

U.S. Forest Service and CalFIRE. California Forest Insect and Disease Training Manual.

2. Getting professional help

a. Wood decay fungi identification

Aside from hiring a professional arborist (below), other sources of help include the local college campuses, UC Cooperative Extension (including the local Master Gardener program), CalFIRE Forest Pathology and Entomology Program scientists, and USDA Forest Service Pacific Southwest Forest Health Protection Program experts. In addition, local County Agricultural Commissioner's offices may be able to help with identification, as could the CDFA Plant Pathology Laboratory.

Important: before collecting or sending any samples, call or email the laboratory to get detailed instructions on how to submit the samples, and on important details such as lab's capabilities and fees charged.

b. Hiring a professional arborist

1. A variety of professionals can provide help on wood decay fungi, but the most common ones are arborists, who should hold either an ISA certification (find an "ISA Certified Arborist") or and ASCA registration (find an "ASCA Registered Consulting Arborist"). Some arborists are employed by tree care companies, whereas others have their own consulting practice.

2. While many arborists can provide a general assessment of a tree and wood decay fungi, a more structured approach is used to evaluate the risk that a tree may pose to its surroundings. In urban settings, the most common process is the "Tree Risk Assessment," which requires that the arborist also hold a Tree Risk Assessment Qualification (TRAQ) in addition to their certificate. A Tree Risk Assessment will produce a risk rating, ranging from low to severe, and will usually include recommendations for mitigating risk. Note that "no risk" is not a rating that is allowable under this system, and arborist following the ISA practices will not issue such a risk rating.

Note also that Tree Risk Assessment is not typically included in a general "tree evaluation." It requires a close consultation between the arborist and the client, and results in additional costs. It may not be needed in all situations; it is best to discuss with the arborist your specific needs, preferences, and plans for your tree before agreeing to any services.

Note that wood decay fungi play important roles in the environment. They are "the cleanup crew" that enable the natural self-pruning of senescent shaded tree branches. They decay stumps, and transform wood into soil organic matter critical to both plants and soil organisms. It is only when they affect standing trees near people or infrastructure that these fungi become potentially worrisome.

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"Cavities": Joseph OBrien, USDA Forest Service, Bugwood.org, Jason Sharman, Vitalitree, Bugwood.org

"Lean" Joseph OBrien, USDA Forest Service, Bugwood.org

"Ribs" Igor Laćan, UC Cooperative Extension

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“Eastern dwarf mistletoe” *Arceuthobium pusillum:* Joseph OBrien, USDA Forest Service, Bugwood.org

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“Oak leaf gall” *Polystepha pilulae:* Bruce Watt, University of Maine, Bugwood.org

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