Wood Decay Fungi
An Arboricultural View

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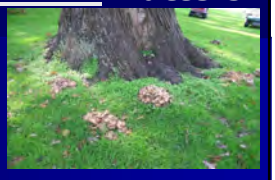
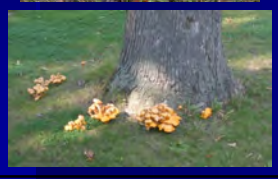
Goal

- Facilitate identification and assessment of common wood decay fungi
- Introduce Treerot.com

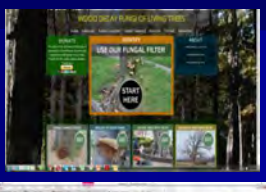
Identification REALLY Matters



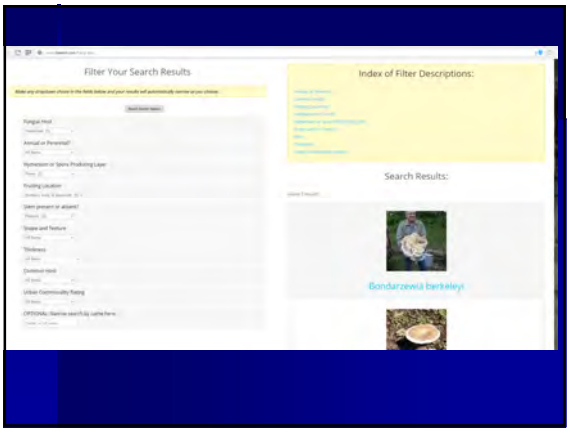


TreeRot.com Wood Decay Fungi of Living Trees

- Filters or Keys to ID decay fungi on living trees
- 60+ Wood Decay Fungi
  - Images
  - Important information on each decay fungus



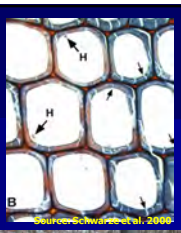
Photographing/Observing



Decay

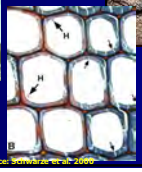
ling chi

usually translated as "death by a thousand cuts."



Source: Schwarze et al. 2000

Decay may produce no biological health symptoms as it degrades the apoplast



Source: Schwarze et al. 2000

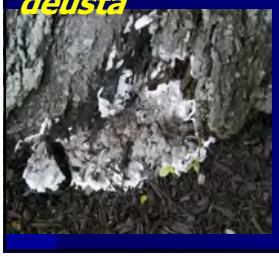
Decay May Produce No Biological Health Symptoms

Two Groups of Decay Causing Fungi

- Ascomycetes
  - –Much less common cause of decay
- Basidiomycetes
  - –Cause most of the decay in trees

Ascomycete Wood Decays

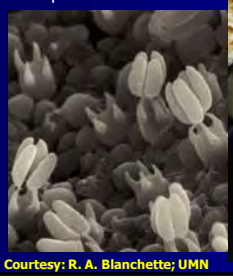
Kretzschmaria deusta



Xylaria polymorpha

Basidiomycetes

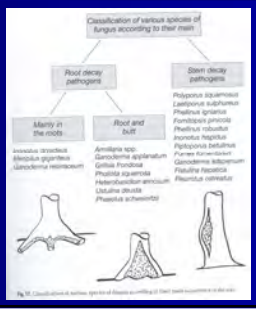
- **Basidiospores on a basidium**
  - Spores 5-10 microns



Courtesy: R. A. Blanchette; UMN

Naming of Wood Decay

- Simple, but allows communication when no conks are present
- Biological significance



Significance of Conks

- All conks are positive indicators of decay

Significance of Conks
Location of Decay

Inonotus dryadeus

Significance of Conks
Mode of Attack

- Cambium Killer
- Root and Butt Rot

Ganoderma lucidum

Significance of Conk Identification

- Some are good to eat
  - Hen of the woods
  - *Grifola frondosa*

- Some are medicinal
  - Reishi *Ganoderma lucidum*

Spore Producing Layer or Hymenium

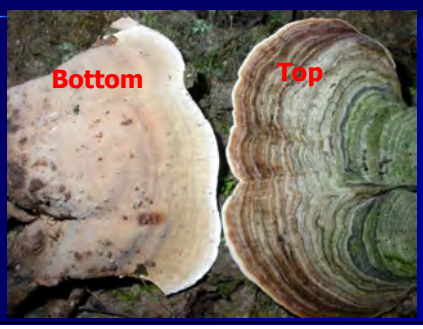
Types of Spore Layers

- Pores

- Gills

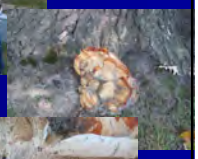
▪Daedaliod (Maze-Like)

Smooth



Meripilus sumstinei

Bondarzewia berkeleyi



Sparassis spathulata
Smooth

Grifola frondosus
Large pores

Spore Print
Gilled mushrooms

The Big Three

- Most common AND Most important
- Must knows!
- One lump or how many splits?
  - Morphologically similar o indistinguishable

#3

Ganoderma applanatum

Artist's Conk

White Rot

Stem, Butt and Buttress Root Rot

Very Wide Host Range

- Oaks
- Maples
- Virtually any hardwood

Perennial-very hard, large and woody

Perennial
3-5 years common, older possible

Produces annual pore layers

Can be rather large
1′ by 2′

Conk-Test Winner

- Usually single or a few conks per tree
- Usually within the bottom 10′

Developing Conk

Ganoderma applanatum

- 0.2% of all trees with conks
- Sample projection
  - 183 trees with GA total in 4 cities
- SW/SR average 0.39
- SW/SR range 0.16 to 0.7

3
Ganoderma applanatum

- Presence usually mean extensive internal decay
  - At least in the location of the conk
- Trees are often declining and decay is obvious
- Can spread by root contact
- Cause for immediate removal
- Future failure likely

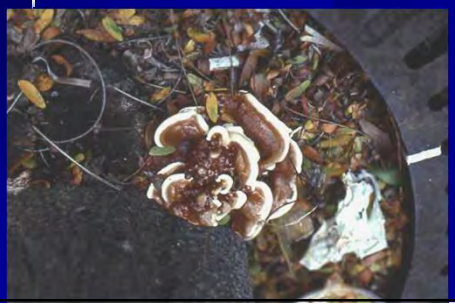
#2
Ganoderma lucidum
Reishi; Ling zi

- White Root and Butt Rot
- Annual
- Likely a complex of species

Very Wide Host Range

Crabapple

Honeylocust

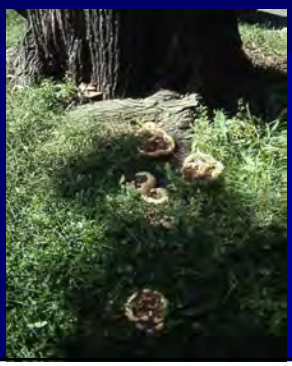


Red Oak

Annual and Tough

Appearing in latter part of summer

On roots or Butt



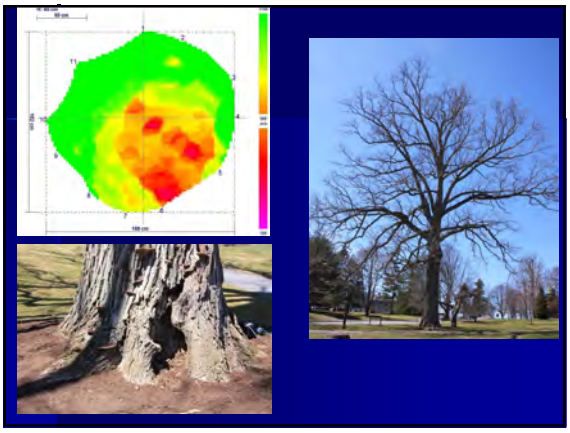
Shiny, brick-colored top with white margin


Twin lucidums

White Butt and Root Decay

- Cambium Killer

Ganoderma lucidum
Carya glabra



Ganoderma lucidum
Reishi; Ling zi

- 11 trees with conks
- .6% of trees with conks
  - **Sample projection 402 trees**
- Average SW/SR = .64
- SW/SR Range 0.24 to 1
- Decay often undetected in trunk!

#2
Ganoderma lucidum
Reishi; Ling zi

#1
Armillaria mellea

- Honey mushroom,Shoe string root rot,Oak decay fungus
- White Root and butt rot

Armillaria

- Species Complex Mycolgia 1989. 81:216-225.
  - Without infertility testing in culture untangling the *A. mellea* complex "would have been an impossible task"

Mushrooms appear in late August to October

Armillaria mellea

- **Identifying Features-Mushrooms**

1. Honey-colored caps
2. Cespitose clusters
3. Ring around the central stem
4. White spore print

Honey-colored caps

Cespitose or dense clusters attached to roots (buttress)

Central Stem

Ring around the stem

Armillaria mellea

- Identifying Features-Mushrooms

1. Honey-colored caps
2. Cespitose clusters
3. Central Stem
4. Ring around stem
5. White spore print

Armillaria mellea

- Other Identifying Features-On Roots

1. Rhizomorphs
2. Mycelial fans

White, butt and root rot

Rhizomorph infection of roots

- Stimulated by tree stress
- Roots leak sugars and other compounds

Rhizomorphs

Rhizomorphs

- Vegetative Structures
- Can grow in soil
- Resting structures
- Can directly infect roots
- **NOT PROOF POSITIVE OF DECAY OR DISEASE**

Armillaria (Clitocybe) tabescens
"Ring less Armillaria"

- Appears to mostly kill cambium
- Usually associated with branch dieback
- Can progress rapidly

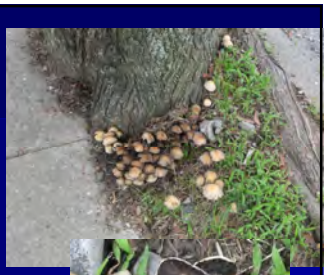
Armillaria (Clitocybe) tabescens
"Ringless Armillaria"




Reliable

Armillaria

- Less in true urban areas
- Very common where forest soils or forest edges were in the near past
- Fruiting is relatively rare




Ustulina

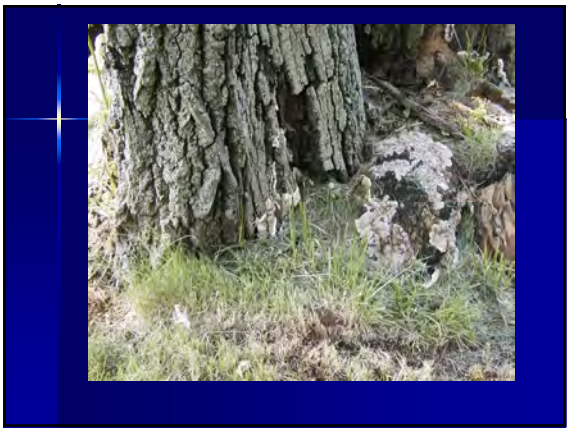
Kretzschmaria

(Hypoxylon deustum)

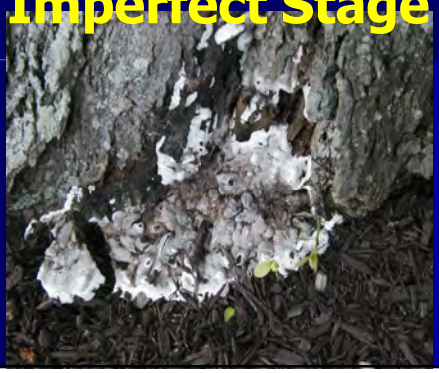
deusta

Burnt Crust Fungus

Root and Butt Rot Cambium Killer



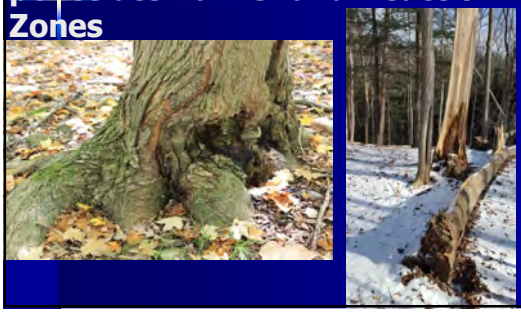
Imperfect Stage



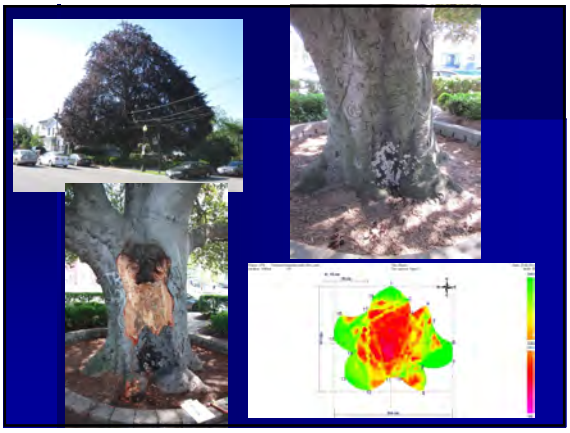
Soft Rot-Brittle Decay

Large Open Decayed Areas on Sugar Maple

Will kill bark, cambium and sapwood, kill woundwood, penetrate Barrier and Reaction Zones



Sounding NOT useful for decay assessment



Kretzschmaria deusta

- 0.6% of trees with *Ustulina*
- Sample projects 512 trees in four cities
- SW/SR average .51
- SW/SR range 0.19 to 1
- All on Sugar and Norway maple

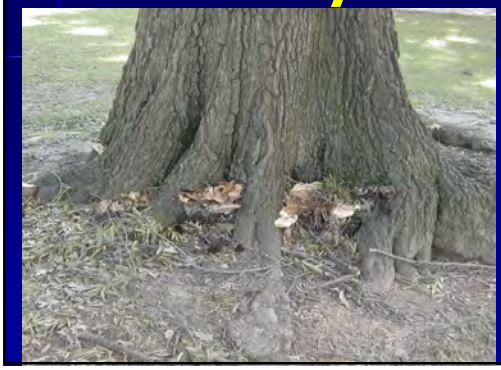
Kretzschmaria deusta

- Common on Sugar Maple and Lindens
- Approach with care
  - Trees may be extensively decayed
- Soft rot decay is similar in strength loss to brown rot
- Common on stumps

Inonotus dryadeus

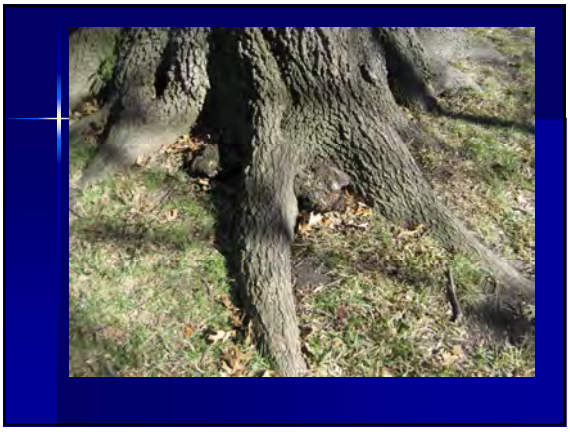
Warted Polypore

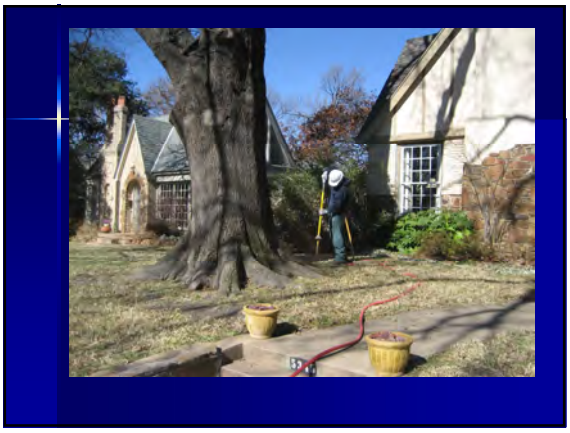
Annual-July-Octobe

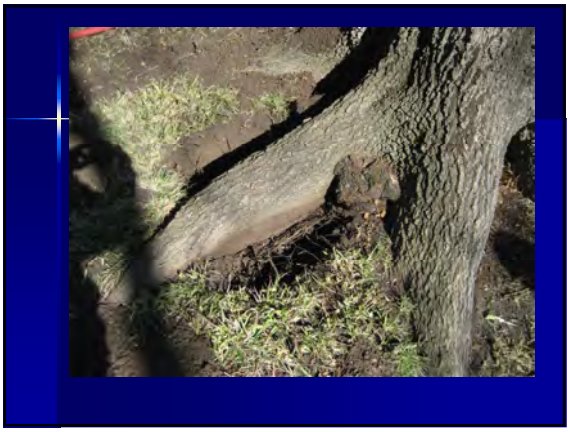


Guttation

Inonotus dryadeus
"Warted polypore"







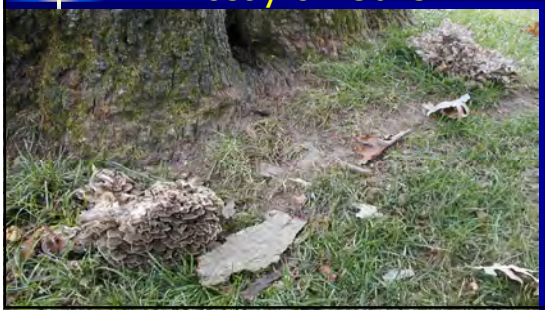
Inonotus dryadeus

- Mostly on oaks
- Root and butt rot
  - More restricted to roots
- Trees may show little outward symptoms of infection
  - Eventually may fail
- Must test for decay
  - Difficult in roots

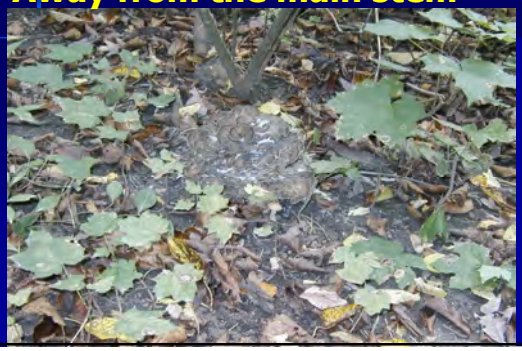
Grifola frondosa

Hen of the Woods; Maitake

Fruiting July – October
Mostly on Oaks

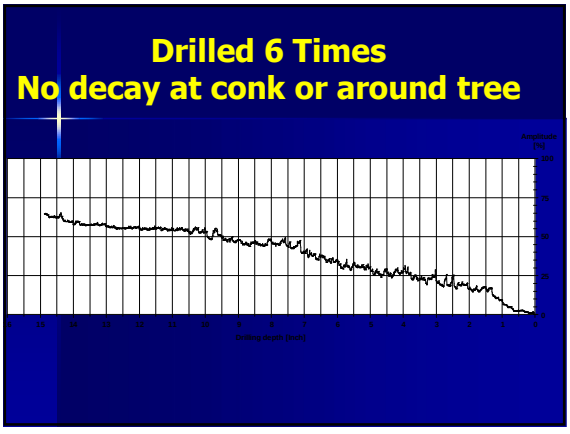


May fruit on roots
Away from the main stem



Large Pores

Drilled 6 Times
No decay at conk or around tree



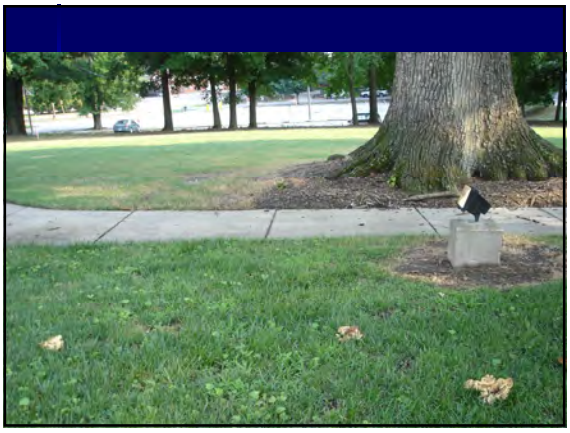
Grifola frondosa

- Root and butt rot of oaks
  - Decay may just be in roots
- Seldom reason alone for removal
- Need to test for decay
- Good edible-cultivated on sawdust
- Medicinal

Meripilus giganteus Giant Polypore

Annual, simultaneous decay of oaks

Usually away from main trunk attached to roots




Largest of all annual fungi


Easily visible Pores

Color variations

Stains black when touched

Turns mushy black when old

Leading to root failure

Meripilus giganteus Giant polypore

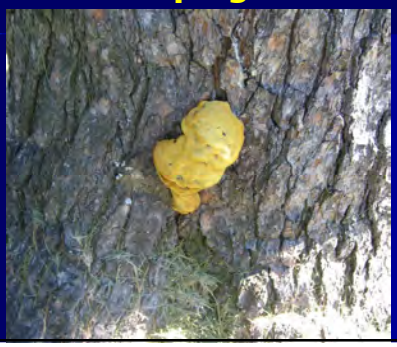
- Common on oak and beech
- Removes both cellulose and lignin at same time
- Leads to tree failure by roots

Phaeolus schwienitzii Cow Pile Fungus

Brown cubical root and butt rot of conifers

Fruiting August - October

Developing Conk



On roots and trunks

Cow Pile a.k.a Meadow Muffin

Very soft and watery

Pore layer bruises black
Angular pore openings

Brown Cubical Decay

Phaeolus schweinitzii

- Serious brown root and butt rot
- A must know on conifers

Laetiporus sulphureus

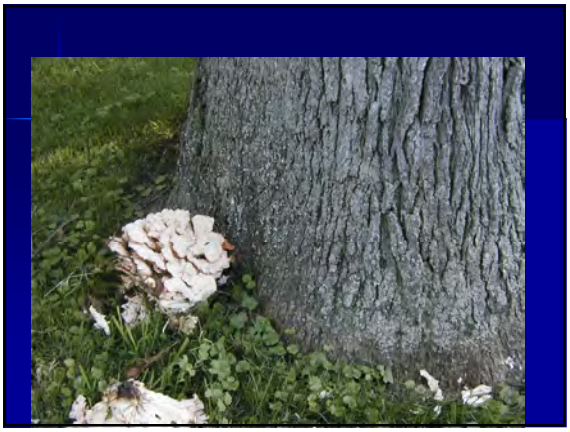
Sulfur Shelf a.k.a Chicken of the Woods

- Brown Butt and stem rot
- A complex of species

Fruiting July - October

Common on Stumps

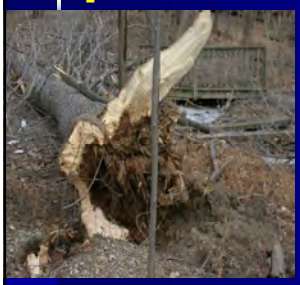
Can Fruit on Main Stem



Pores are too small to see

Brown Rot with Mycelial Sheets in Wood

May be One of Most Important Butt Rots?



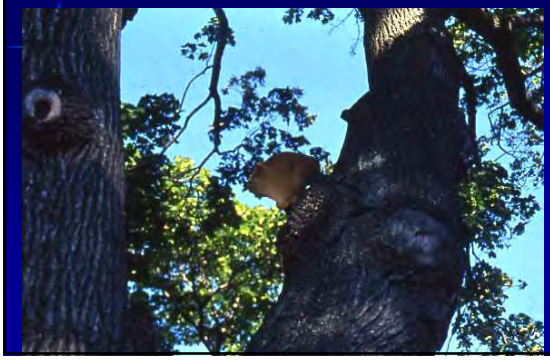
Laetiporus sulphureus

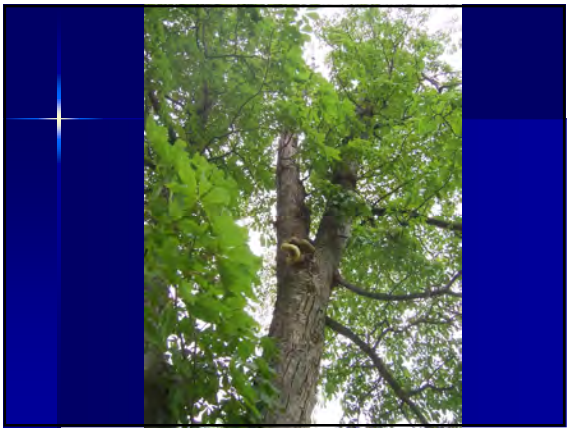
- Brown rot of butt and trunk
  - One of the few
- Often associated with advanced decay
- Can be reason for immediate removal
- Choice edible-Eat the end of the mushroom

Polyporus squamosus

Dryad's saddle; Scaly polypore

Fruiting May-Nov.





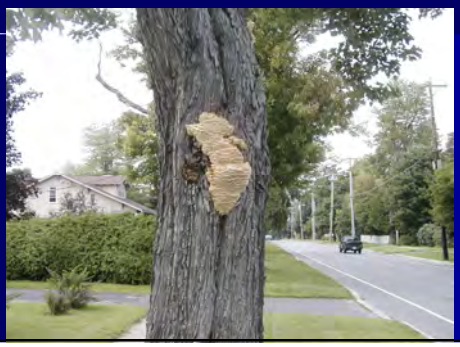
Polyporus squamosus

- Fruit almost any time during the growing season
- Associated with other defects
  - Pruning wounds
- Limited decay in most cases
  - Cavities may develop in the vicinity of the fruiting body

Climacodon septentrionalis

Northern Tooth

Fruiting August- October



Very Common on Maples

Climacodon septentrionalis

- Heart rot of maples and hardwoods
- Conks often appear on an annual basis
  - Often associated with wounds or other defects
- Need to test for decay

Xylaria polymorpha

Dead Man's Fingers
(An Ascomycete)

Xylaria polymorpha

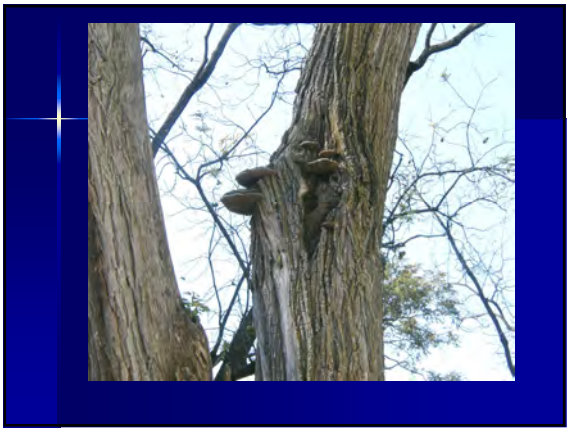
- Causes root rot and root death
- Not reason for removal
- Tree health may be affected

True Heart Rotters

- Infect through "old" wounds
- Fit traditional pattern of decay development
- Decay progresses slowly
- Typically are not immediate cause for concern

Phellinus robineae

Aka *Fomes rimosus*



Phellinus robineae

- Identifying feature of black locusts
  - One of few fungi that can decay heartwood
- Follow in on borer damage
- Have to test for decay
  - Otherwise we would be removing every tree
- Difficult to deal with in risk assessment
  - Often associated with other defects
  - Black locust is a high risk species

Perenniporia fraxinophilia

Perenniporia fraxinophilia

- Trunk and branch decay-many other similar appearing species
- Require testing for decay

Phellinus spp. aka *Fomes*
Other Common Heart Rotters

Pleurotus ostreatus

Oyster Mushroom; Hiratake

Fruiting Summer - Fall

Pleurotus ostreatus

- Sap rot on living or dead trees
- Tree are usually in later stages of decline
- Likely a reason for removal due to health reasons

Cerrena unicolor

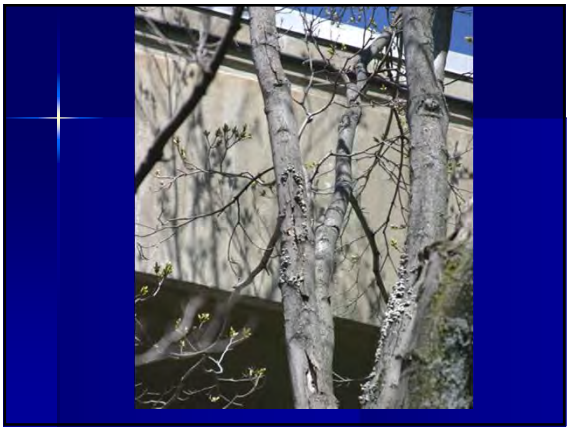
Canker and Saprot

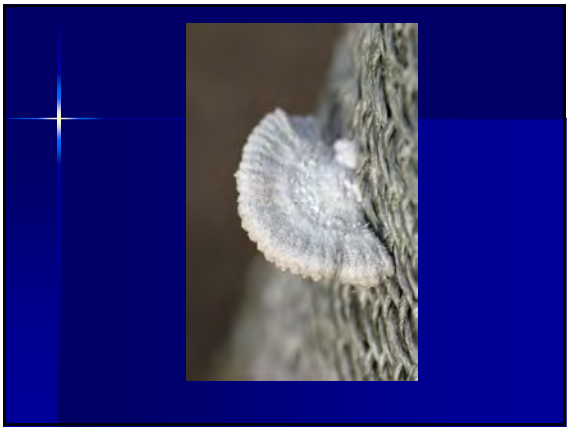
Cerrena unicolor

- Common as a Sap rot
- Once established can kill cambium
- Associated with horntail wasp that spread the fungus during oviposition

Schizophyllum commune

Split Gill Fungus





Schizophyllum commune

- Sap rot on tree that have been damaged
  - Sunscald, stem wound, decline
- Can colonize healthy bark after it is established
- Common on poorly performing newly planted trees

Sap Rots

Trametes *versicolor*
and many others

- Small, numerous fruiting structures
- Dead bark and cambium
- Decay is moving bark side in

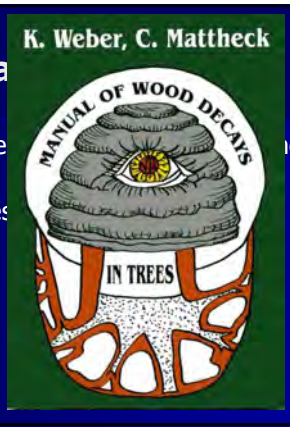
Sap Rot

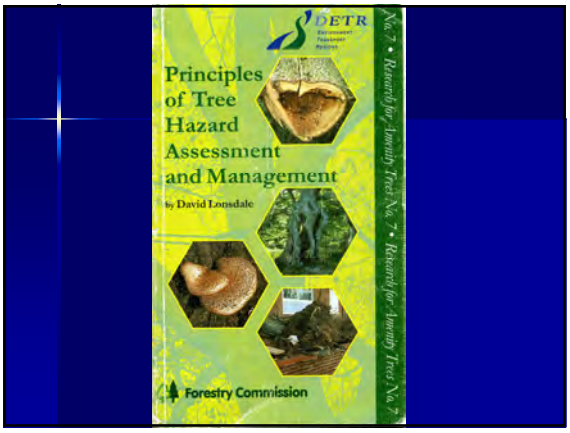
Sap Rots

- Presence of numerous small fruiting bodies
- Indicates dead bark and decaying sapwood
- Branch may be totally dead or just starting to decay
- Some (such as *T. versicolor*) can move to health tissues

Summa

- Know the ion trees
- Other Res




DETR
Principles of Tree Hazard Assessment and Management
by David Lonsdale
Forestry Commission
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