Armillaria Root Disease

Armillaria ostoyae

- Natural disturbance agent part of a healthy ecosystem provides important wildlife habitat and biodiversity
- Affects wide variety of species including deciduous and some shrubs (Douglas-fir is highly susceptible)
- grows on roots and survives on dead roots and stumps (15-25yrs.)
- Can spread from root to root contact or through soil via rhizomorphs (shoe strings)
- Causes death and mortality in trees of all tree species and ages. Can be widespread on roots even in relatively healthy looking stands
- Rapidly spreads in roots of freshly cut trees
- Often present in merchantable stands of timber

Tree Symptoms

Tree Symptoms

- reduced height growth rounded crown
- Resinosus or sap flow
- Thinning
- Yellowing
- Distress cones
- death

Mycelial Fans

More Fans

Fan Growth on Dead Roots (*A. ostoyae or A. sinapina?*)

Decay & Bioluminescence

Honey Mushrooms

Host suscept. - Armillaria SEDA

Spp.	Relative Susceptibility
Douglas-fir	High
Western Hemlock	High
Subalpine fir	High
Spruce	Moderate - High
Pine	Moderate
Western Larch (>25 yrs.)	Low
Western red cedar	Low
Deciduous	Low

Distribution/Hazard

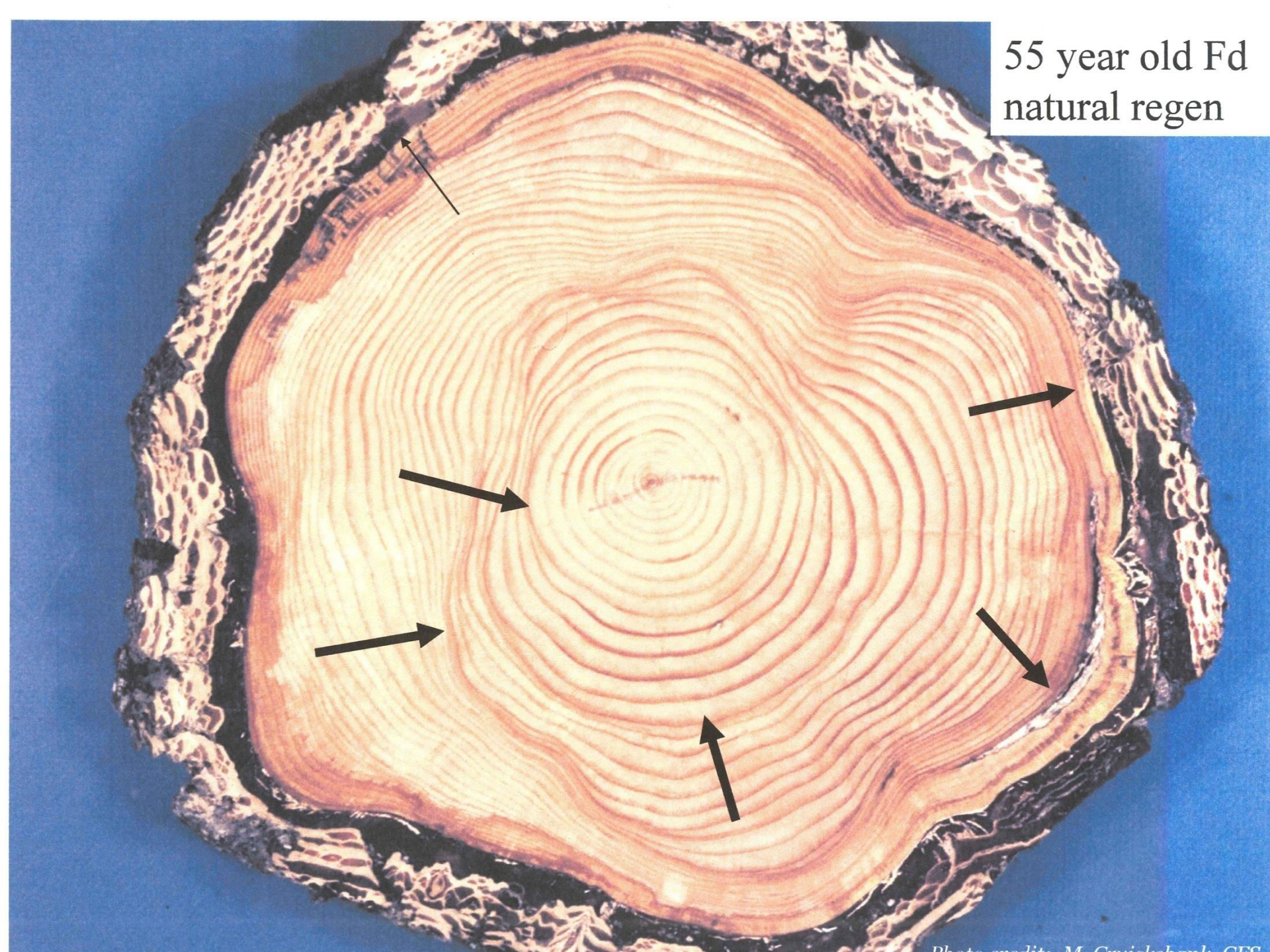
- ICH highest hazard
- Lower incidence in other subzones
- Mesic sites higher hazard than other site series
- Elevation and aspect limits as you move north

Infection Sources

- In young stands most infections arise from rhizomorphs that extend out from infected roots and stumps
- As the trees grow and mature root to root contacts become an important means of spread

Callus Formation

- Healthy trees form calluses at the site of lesions that can stop the spread of Armillaria
- If trees become stressed for some reason (eg. drought, harvesting) Armillaria may once again become active
- The location and timing of lesions can sometimes be determined by looking at a stump cross section


55 year old Fd
natural regen

Consequences of large number of trees with inactive lesions

- Mortality not a good measure of below ground incidence
- Areas with low and scattered mortality (no centres) make mapping very difficult at the stands level (continuous variable)
- Mapped polygons often represent different “levels” of disease rather than centres

More consequences

- Increase of inoculum post harvest makes it more difficult to predict future mortality based on present mortality (opportunistic or stress pathogen)
- On coast Armillaria mortality drops off as vigourous stands mature (resistance increases with age)
- disease function of amount of inoculum overall tree vigour (could be climate change implications)

Root rot in natural vs. managed stands

	Natural	Managed
Species composition	Deciduous, cedar, brush	Susceptible conifers preferred
Tree/root density	Low	High
Regen delay following disturbance	long	1-2 years
Inoculum in soil	Moderate- many diseased roots removed when diseased trees fall over	High- stumps don’t blow over

Goal of root rot management

- Get commercial trees back on site without making the root disease worse than it was

Detection/Surveys

- heli surveys (interior)
- walkthrough surveys
- transect surveys
- Sketch mapping can be difficult because root centers are often not well defined and healthy trees may be interspersed with diseased trees
- Areas with high root disease often have a high deciduous component
- Goal of survey is to come up with a stratification/treatment map or polygon

Management

- Very difficult to manage in the interior
- No alternate species
- Cutting can lead to an intensification in disease severity

What to Do?

- Avoid partial cutting
- Stump
- regenerate a variety of species that will grow well on the site and hope for the best

Planting Recommendations

- When planting highly susceptible species (Fd, Hw) use 50% mixture of low susceptible species (Lw, Cw, Decid.) that are ecologically suitable
- more than 30% moderately susceptible species (Sx, Pl) use 30% mixture of low susceptible species that are ecologically suitable

Take Home: Plant a mixture of low susceptible species and avoid planting Douglas-fir as much as possible

05/03/2014 21:03

Summary

- Armillaria grows on roots and survives in dead roots and stumps
- Causes typical root disease symptoms and resinosis
- Can be recognized by fans, shoestrings, mushrooms, and basal resinosis
- Poses difficult challenges for timber management