

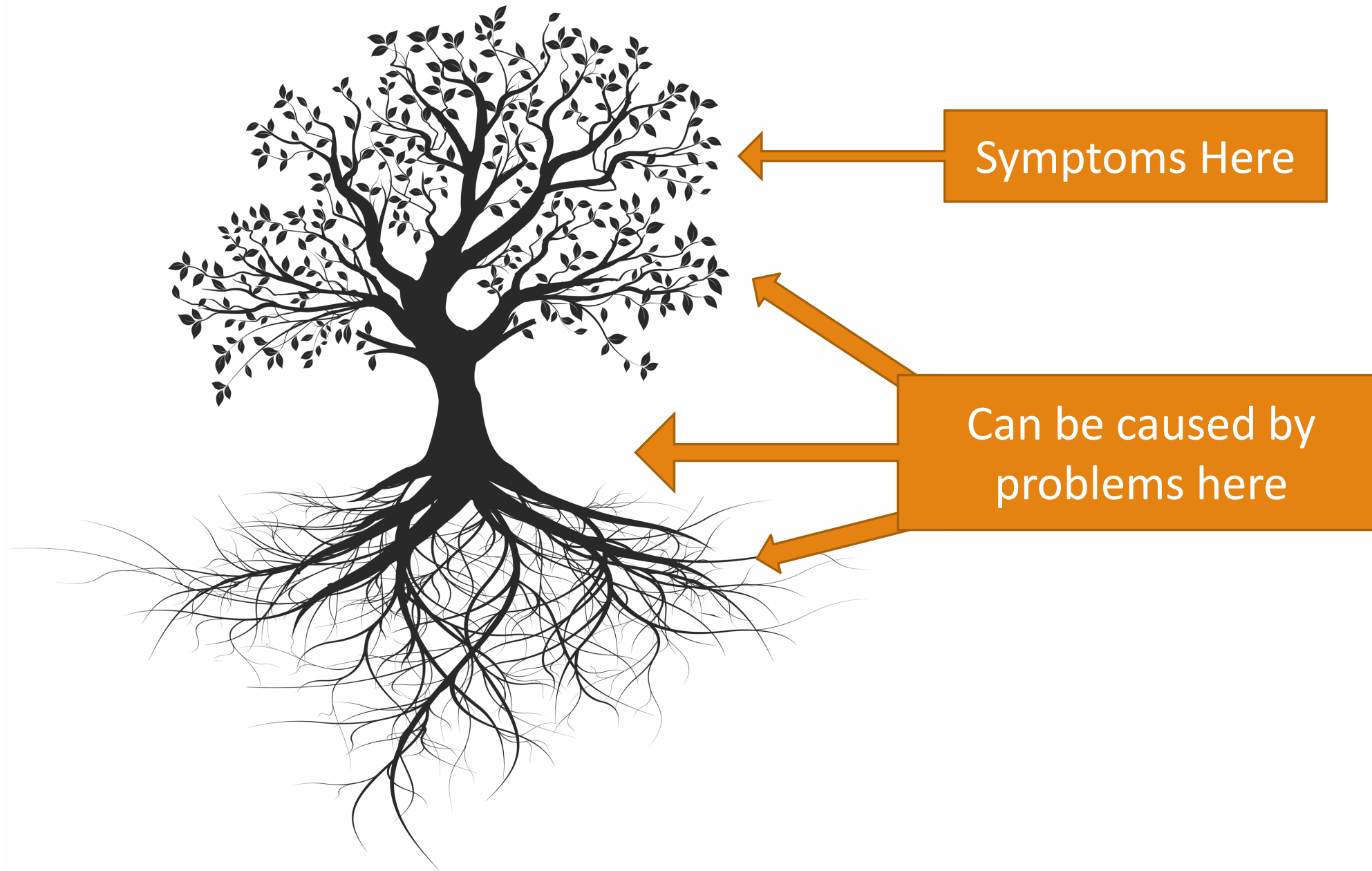


What's In Your Dirt?

Soil-borne Diseases

Tom Creswell

Lab Director and Diagnostician



The Diagnostic Process



Recognize
Normal

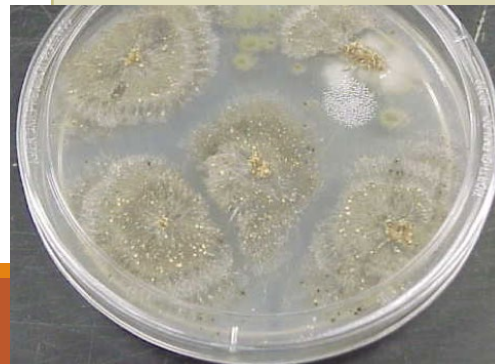
Note
Symptoms/Signs

Look for Patterns

Question
Everything

Samples
Lab Tests

Final Diagnosis



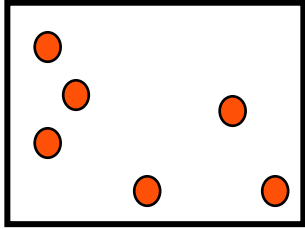
Plant and Pest
Diagnostic
Laboratory

PURDUE
UNIVERSITY

Jones
Jones Landscape Service
1234 Main St.
Anytown

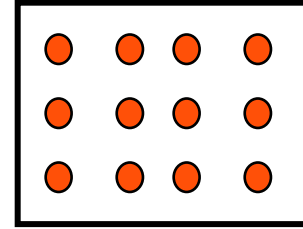
Final Report

Look for Patterns: Random vs. Uniform



- Random
- Biotic
- Infectious

Turfgrass
Necrotic ring spot



- Uniform
- Abiotic
- Noninfectious

Boxwood
Transplant stress



When you see....

- Stunting
- Small leaves
- Nutritional deficiency symptoms
- Overall yellowing
- Wilting

Suspect a root problem



Girdling Roots





Girdling Roots



Planting

Deep

Examine the whole plant and its site



Depth of planting combined with a very wet spring



Yellowing caused by high soil pH and Fe/Mn deficiency



Maple



Birch

Root Rot caused by poor drainage

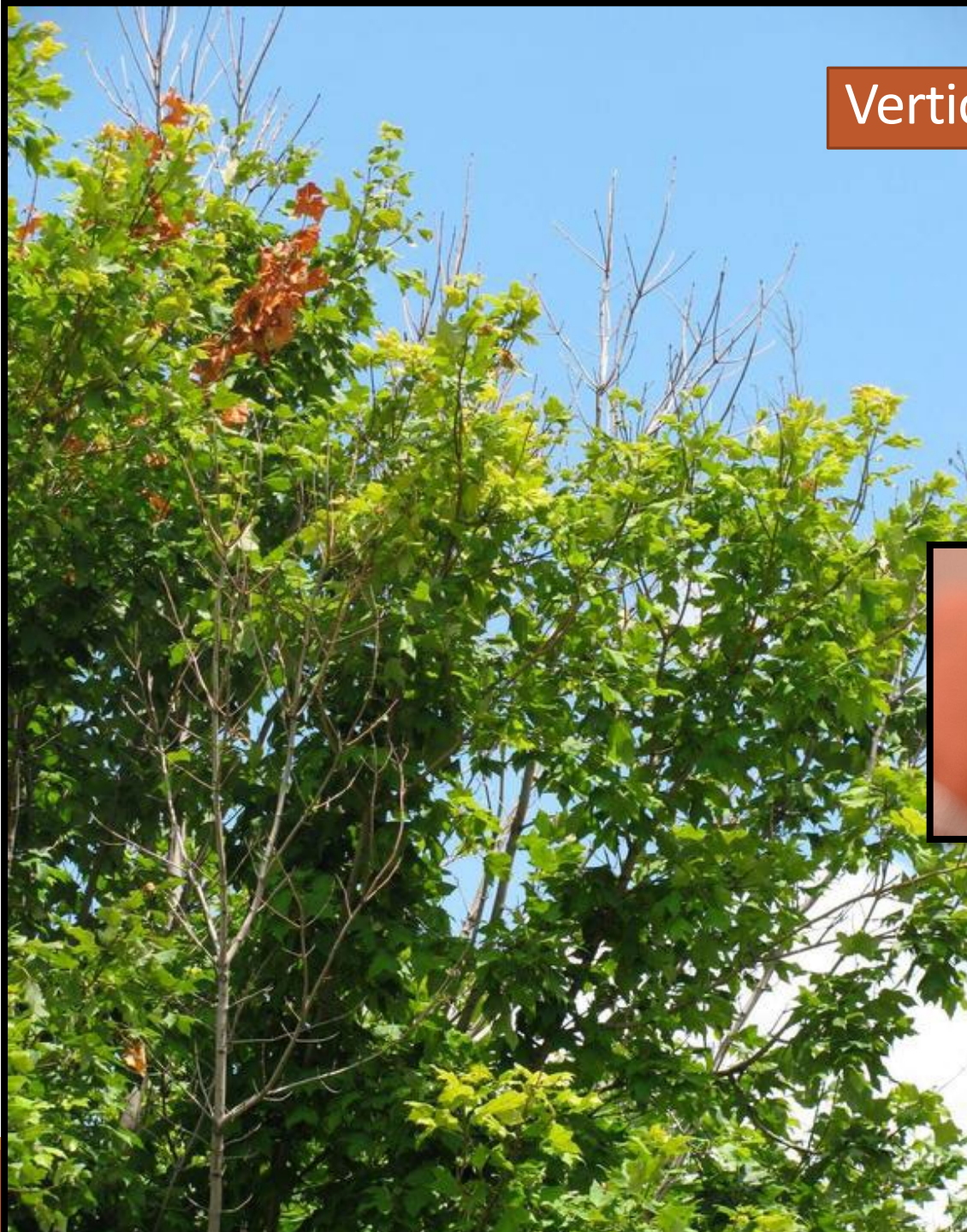


When you see...

- Wilting, often “recovering” at night
- One side (or stem/branch) wilted
- Dark streaks in sapwood below bark
- Usually more mature plants affected

Suspect a vascular wilt disease

Verticillium Wilt





Verticillium Wilt

- Wide host range, maple most common
- Remains inactive in soil for years
- Infects roots when a new tree is planted
- Moves up vascular system
- Avoid other stress factors
- Prune out affected branches
- Fungicides not effective
- Excavating soil doesn't work
- Replant with resistant tree

Root, Crown, and Butt Rots





Armillaria Root Rot

- Found in Temperate to Tropical climates
- Reported from nearly every state.
- May attack hundreds of species of trees, shrubs and vines
- Occurs in forests, landscapes and in waste areas

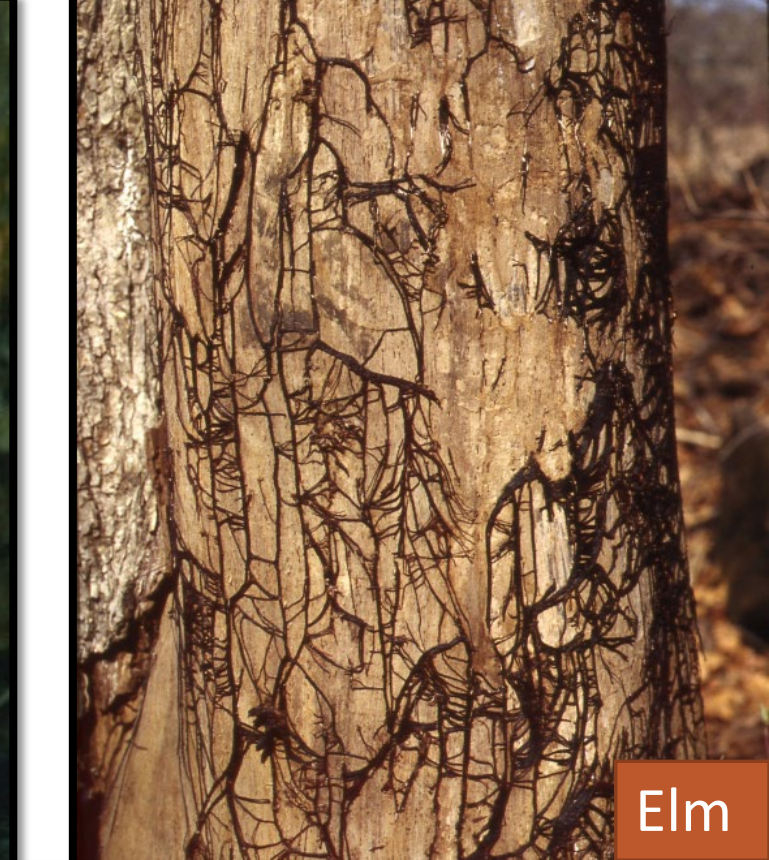


Rhizomorphs or “Shoestrings”





Beech



Elm



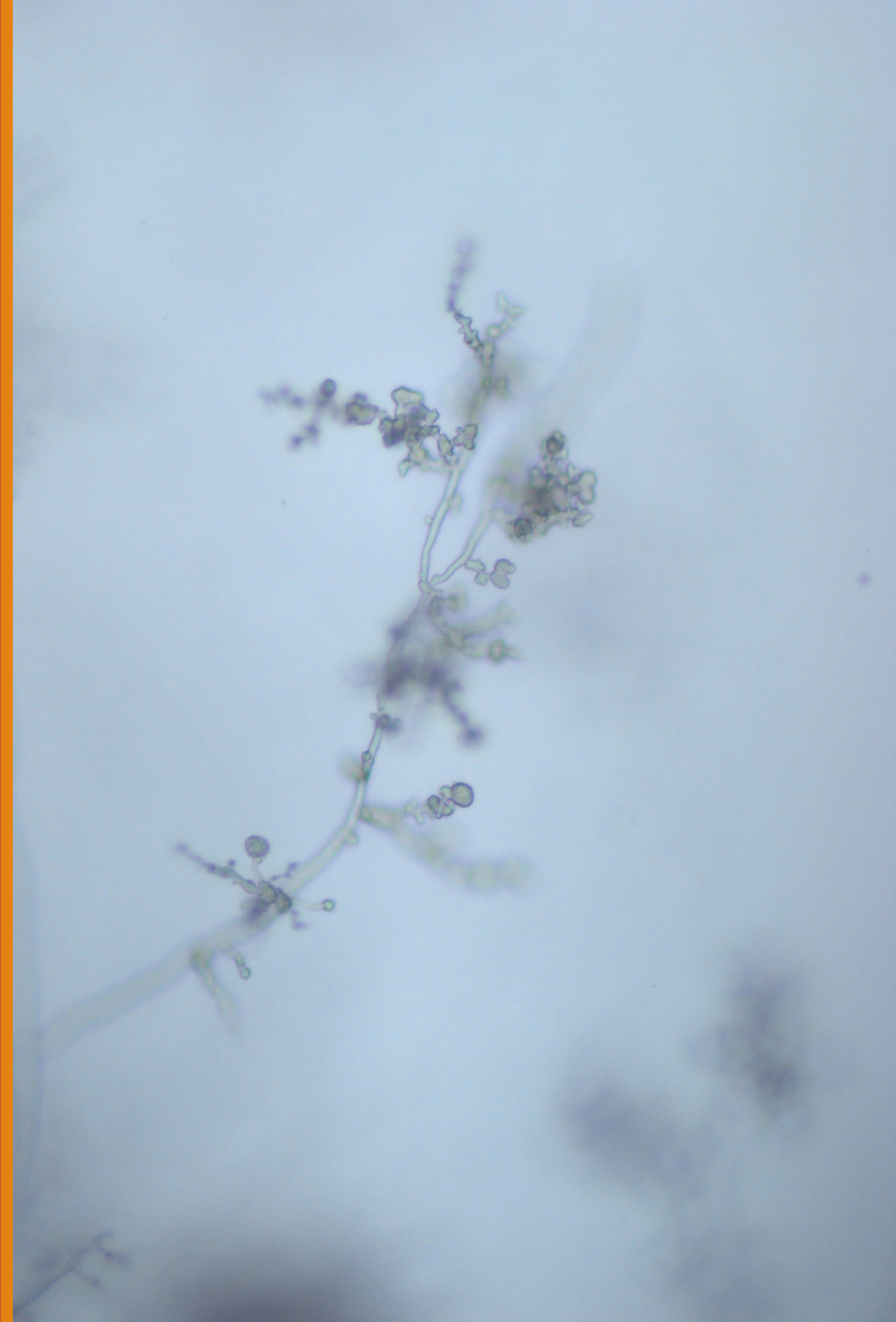
Armillaria root and crown rot

Armillaria Root Rot Management

- Remove diseased trees and as many roots as possible
- Replant with grasses (turf or ornamental) for several years
- Possible to plant shrubs again after about 5 years with caution.
- No fungicides are effective

Phytophthora – The Plant Destroyer

- Water mold – loves water and moisture
- Wide host range; may depend on species of Phytophthora present
- Soil-borne; difficult to manage
- Symptoms differ based on host and type of infection
 - Bleeding cankers and trunk staining
 - Foliar/stem Blighting
 - Root and Crown rot



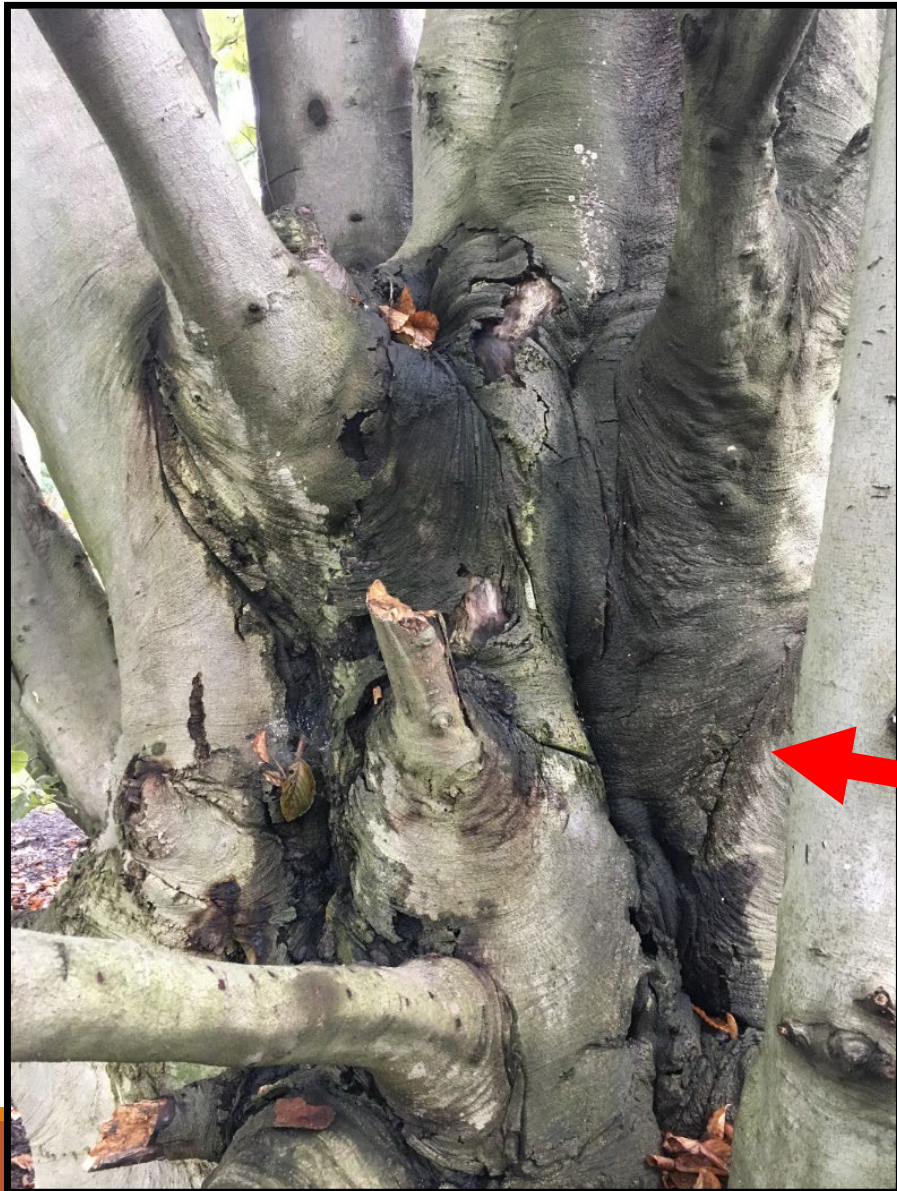
Phytophthora Bleeding Canker



European Beech



Phytophthora Bleeding Stem Canker



European Beech

Phytophthora Bleeding Stem Canker



Maple

How to sample for lab testing



Phytophthora – Root and Crown Rot



Root and Crown Rot – Boxwood

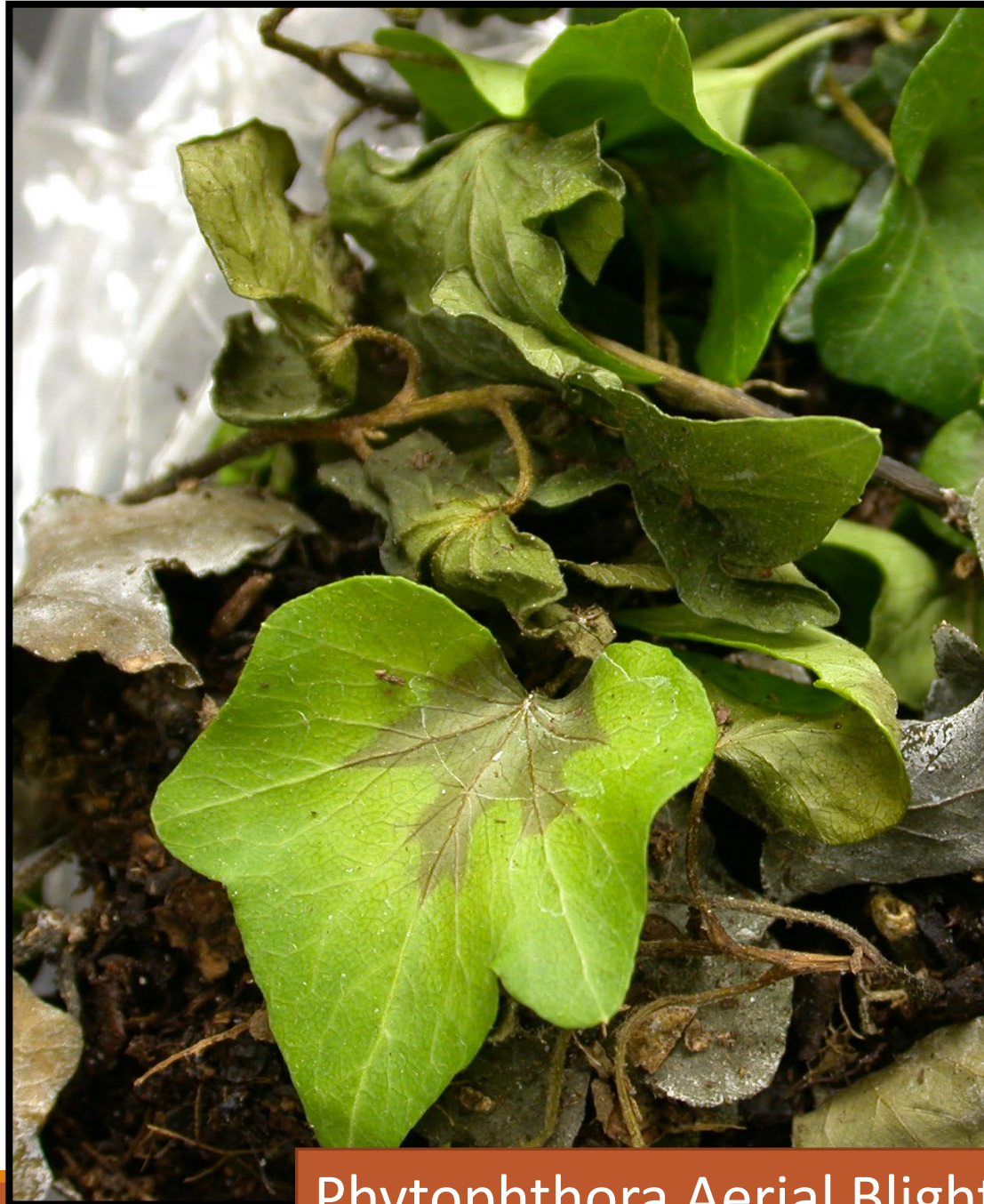
- Roots are discolored and will eventually turn very dark brown/black
- Above ground symptoms may indicate general decline or dieback of portions of the plant

Annuals and Perennials



Phytophthora root and stem rot - Coleus





Phytophthora Aerial Blight – English Ivy



Phytophthora aerial blight - Vinca



Pythium species are everywhere!

- Can be pathogens or not
- May kill young plants or cause root rot on older plants
- Cause damage more often on annuals and perennials but may harm young woody plants

Damping-off

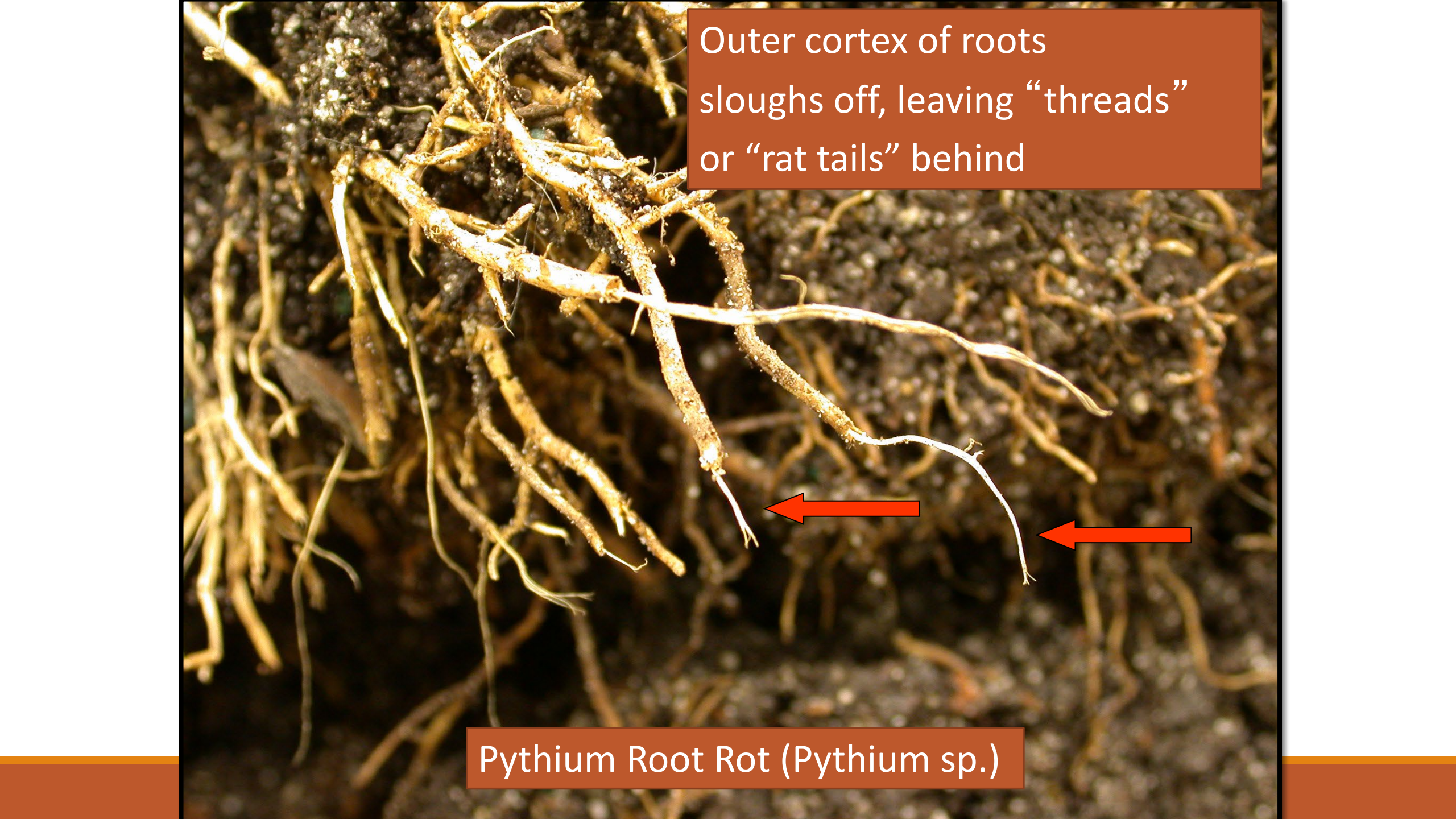
The decay of germinating seeds before emergence, or the collapse of young seedlings after emergence.



Rhizoctonia

Pythium

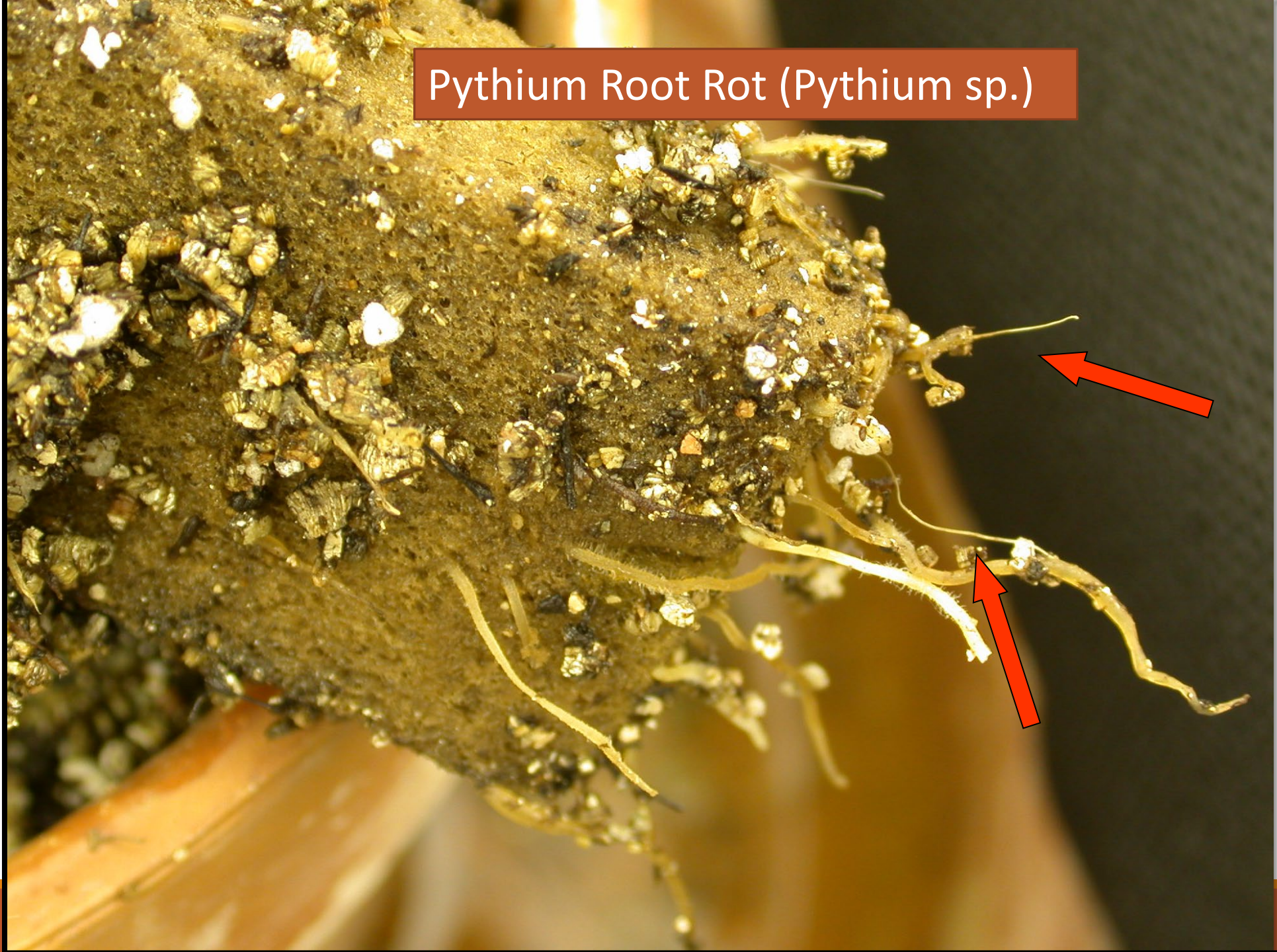




Outer cortex of roots
sloughs off, leaving “threads”
or “rat tails” behind

Pythium Root Rot (*Pythium* sp.)

Pythium Root Rot (Pythium sp.)





Pythium root rot
on petunia





Black Leg (Pythium sp.)
Geranium



Pythium and Phytophthora Control

- Start with healthy plants
- Provide good drainage
- Don't water or fertilize too much
- Remove infected plants to reduce spread
- Avoid moving soil to other beds
- Fungicides: limited use in landscape
 - Only in high value beds
 - Only if drainage is good

Black Root Rot

- Caused by the fungus *Berkeleyomyces* (= *Thielaviopsis*) *basicola*
- “Black root rot” refers to color of root tips due to black spores
- Found on 120 plant species in 33 families.
- More common on pansy, cyclamen, vinca, calibrachoa, petunia, poinsettia, holly

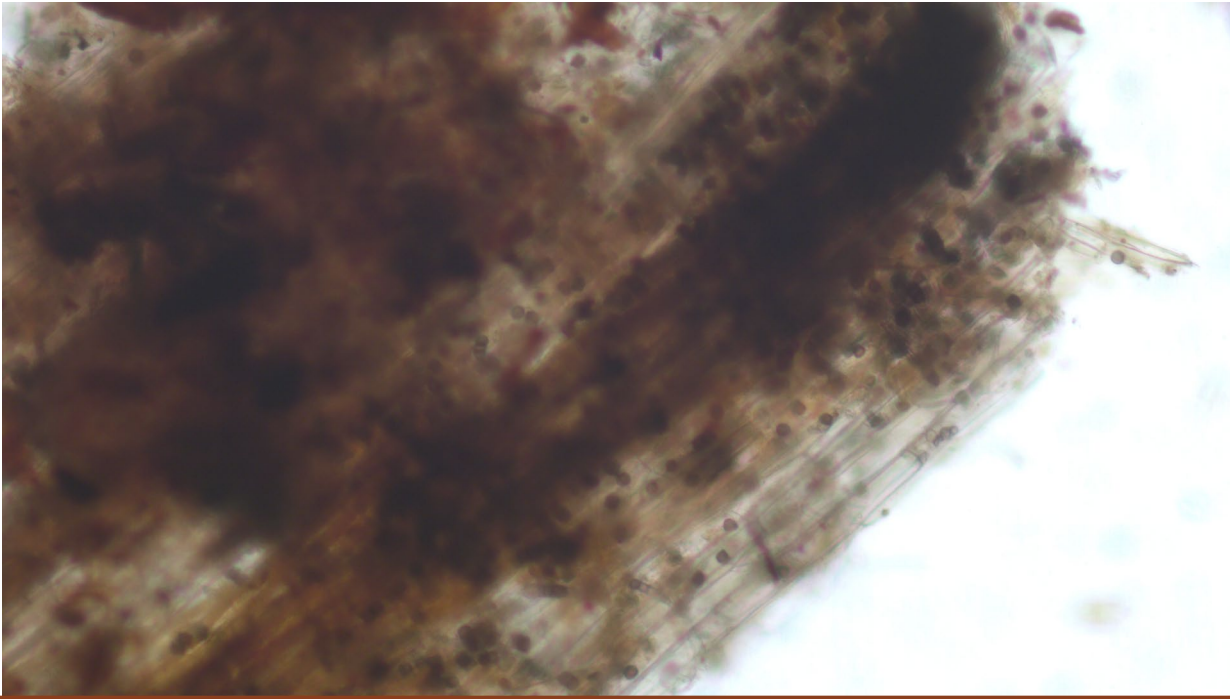


Yellowing/stunting: petunia, million bells,
snapdragon, verbena, begonia



Black Root Rot (*Thielaviopsis basicola*)

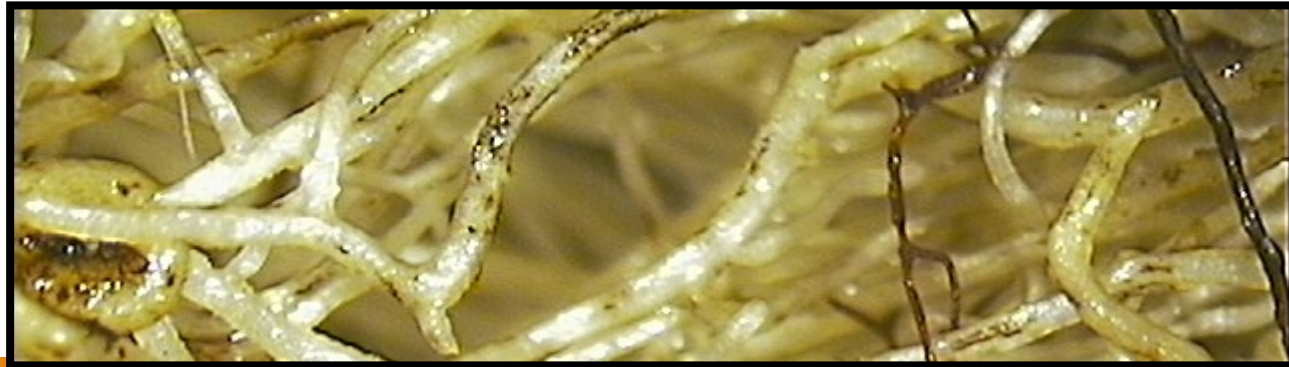




Black Root Rot



Spores in roots



Black Root Rot Management

Greenhouse/Nursery:

- Sanitation, Sanitation, Sanitation
- Water management
- Plant Spacing
- Fungicide drenches – not a cure
- Reduce pH to lowest acceptable level for good growth

Landscape:

- Avoid infested beds
- Start with healthy plants
- Start with larger plants
- Good drainage, optimum water and fertilizer

Rhizoctonia



Rhizoctonia is very common, but builds up when using susceptible plants



Attacks seeds, seedlings, leaves, stems, and roots



Wide host range - most popular ornamental plants

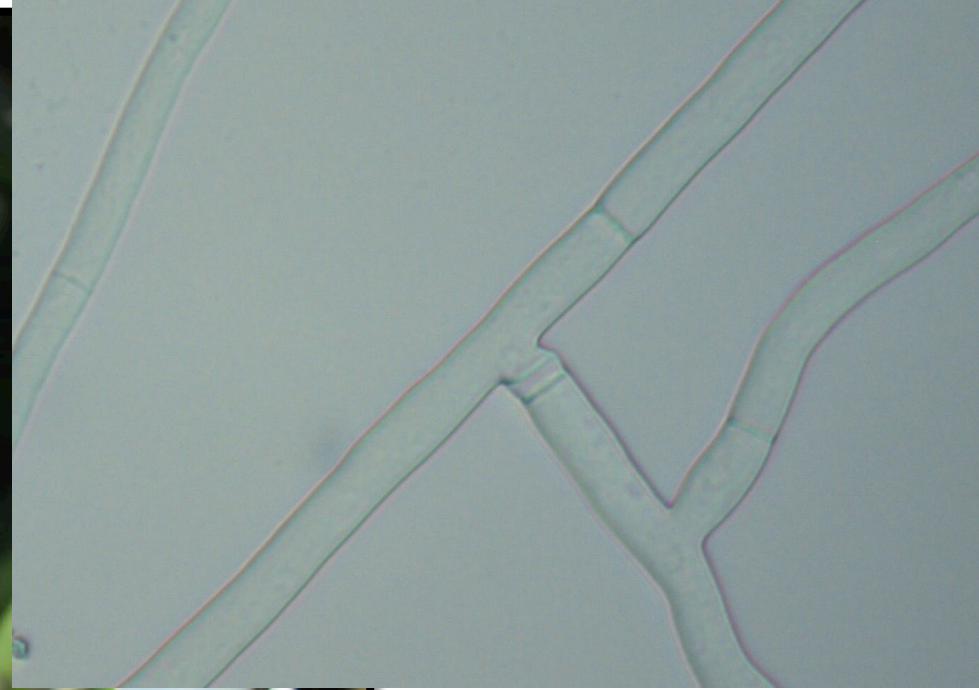


Rapid onset, usually in warmer weather



Rhizoctonia web blight

Look for 'webbing'
in humid weather



Rhizoctonia Crown Rot



Spread with
water and debris





Common symptoms:
Shredded lower stem

Rhizoctonia Crown Rot
of Chrysanthemum

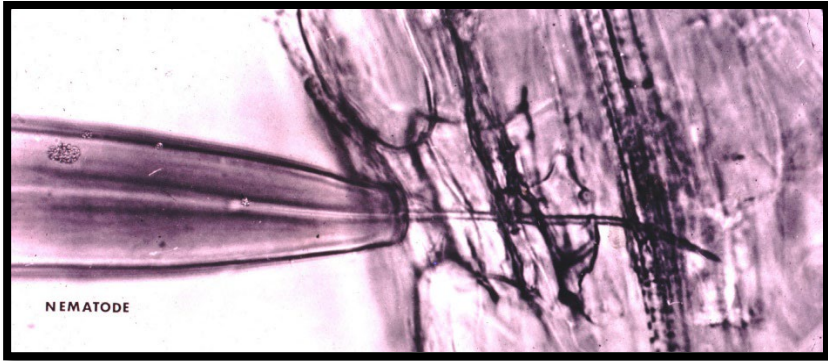
Rhizoctonia Control

- Favored by moist soil and warmer temps
- Survives in soil and plant debris
- Remove infected plants if practical
- Plant larger or more mature plants
- Preventive fungicide drenches more effective than for *Phytophthora* or *Pythium*
- Several fungicides with good activity

When you see ...

- Stunting
- Wilting
- Overall lack of vigor
- Truncated roots and root tips
- Nodules/swellings on roots or root tips

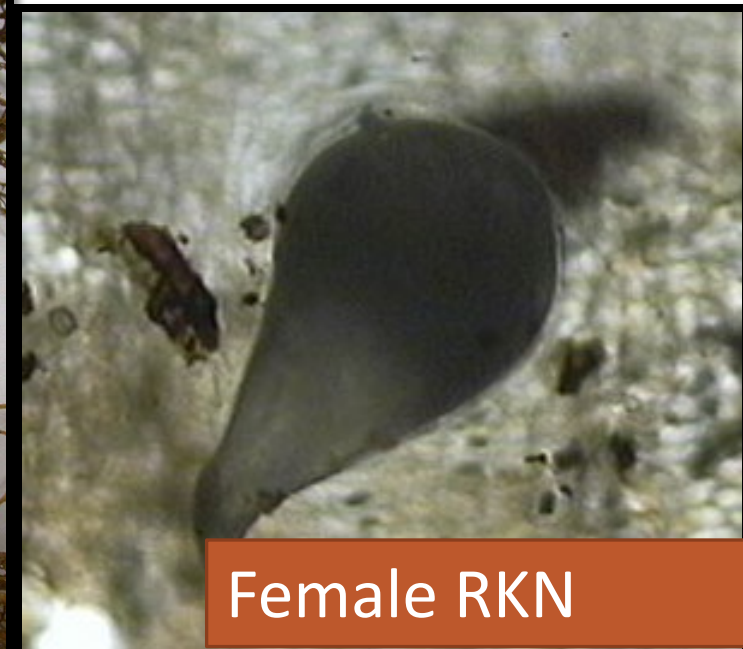
Suspect root-parasitic nematodes



Liriope



Dogwood



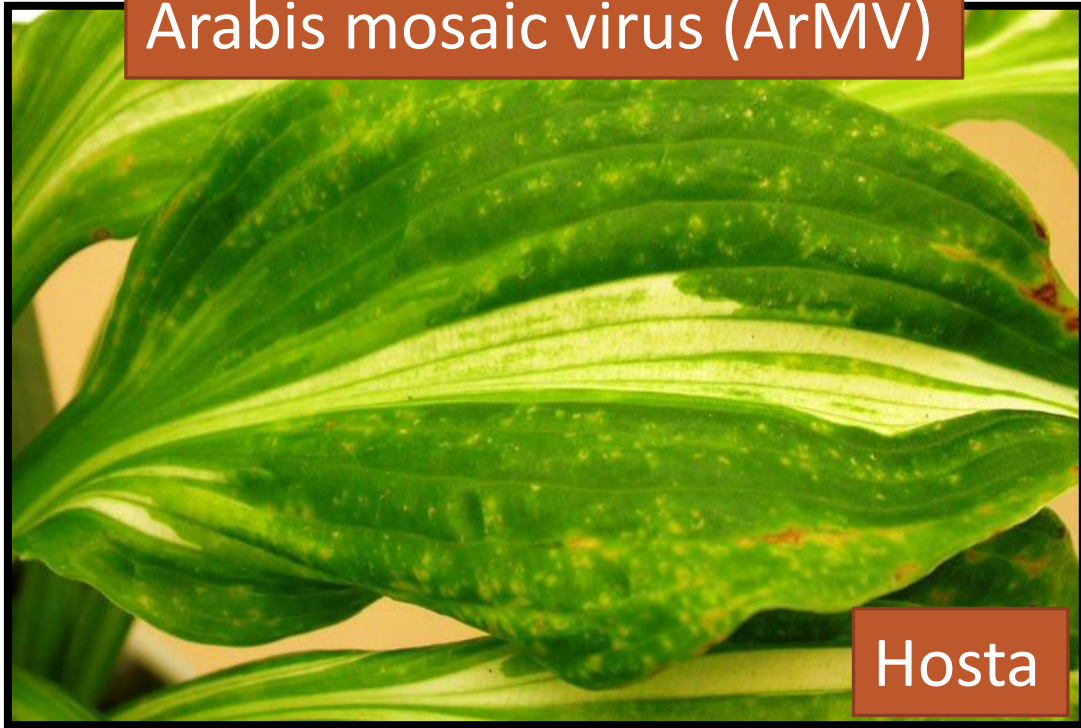
Female RKN

Root Parasitic Nematode Control

- Not a big concern in clay soils
- In sandy soils
- Long rotations with non-hosts (after ID)
- Incorporation of organic matter
- Planting French marigolds
- Drenches too costly and toxic for landscape use
- May carry viruses

Viruses: Spread by nematodes in the soil

Arabis mosaic virus (ArMV)



Tobacco ringspot virus (ToRSV)



Tobacco rattle virus (TRV)



Virus Control

- Purchase clean plants
- Pesticides are ineffective once infection has occurred
- Promptly remove symptomatic plants
- Be cautious about plant choice in soils with known nematode infestations or previous virus infections

No Cure for Viruses

The only effective control for viral infections is prevention

Turf Diagnostics:

- Diagnostics Can Be Complicated ... sometimes not disease
- Many different reasons turf turns brown
 - Many issues that look the same
- Not always easy to tell why
 - Symptoms depend on environmental conditions
 - Heavily influenced by inputs
 - Water stress (too much or too little)
 - Fertilizer





Shade and
Foot Traffic



Fertilizer burn



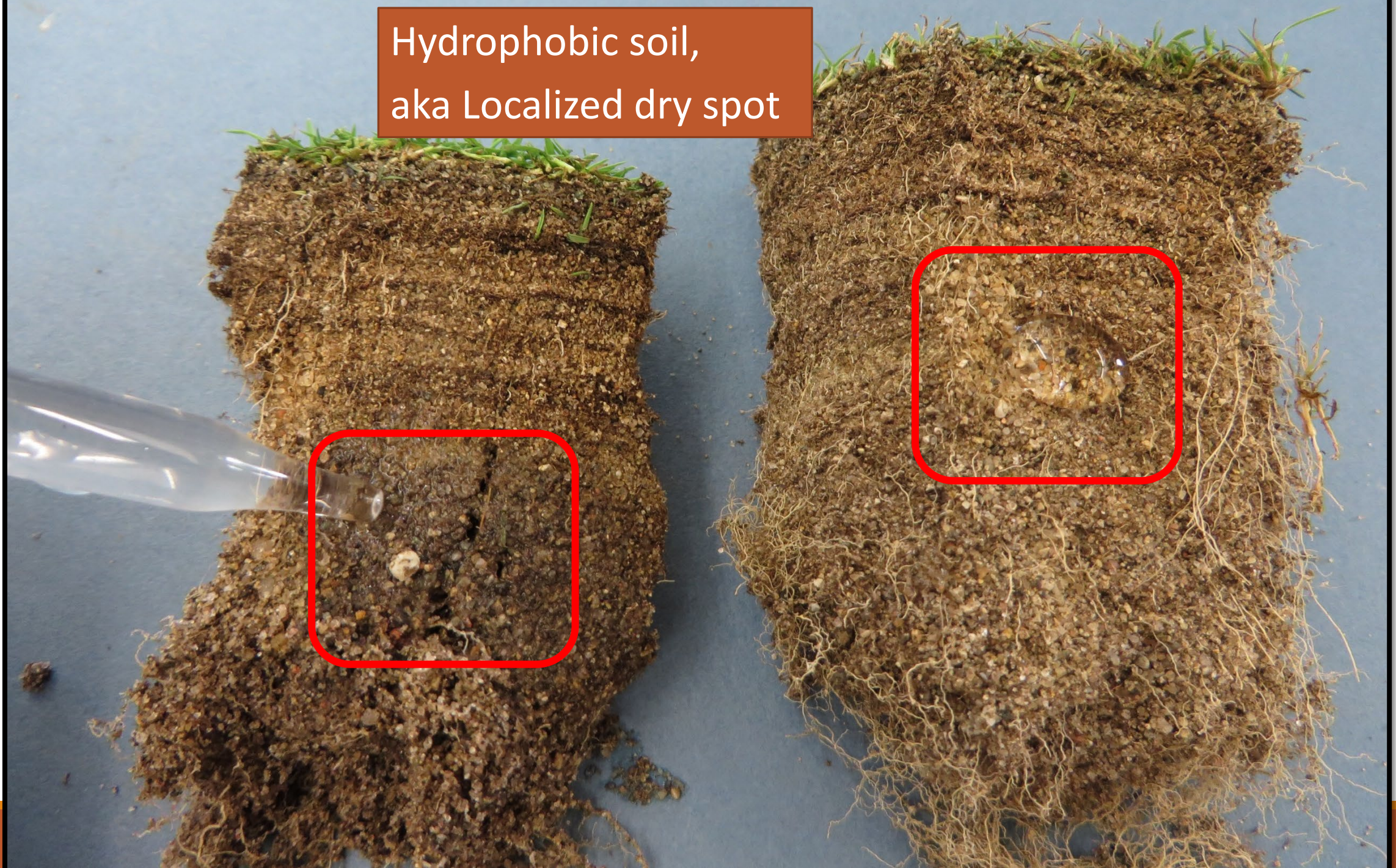
Not fertilized

Fertilized

Hydrophobic soil,
aka Localized dry spot



Hydrophobic soil,
aka Localized dry spot



Soil-borne diseases of turf



Bluegrass:
Summer
patch





Fairy Ring

Fescue: Brown Patch
Rhizoctonia solani





1: GET A DIAGNOSIS



2: FOLLOW
RECOMMENDATIONS
FROM LEE MILLER

Turf Disease Management