Tree and Shrub Diseases

Level II Master Gardener Training

Tree and Shrub Diseases

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Tree and Shrub Diseases

Powdery Mildews

• Causes
  – *Erysiphe* spp.
  – *Uncinula* spp.
  – *Phyllactinia* spp.
  – *Blumeria* spp.
  – *Oidium* spp.
  – *Microsphaera* spp.
  – *Sphaerotheca* spp.
  – *Podosphaera* spp.
  – *Brasiiliomyces* spp.
  – *Ovulariopsis* spp.

• Hosts
  – Virtually everything
  – Not conifers

• Favorable environment: High humidity

Tree and Shrub Diseases

Powdery Mildews

• Control
  – Remove/destroy diseased leaves
    • Burn (where allowed)
    • Deep bury
    • Hot compost
  – Reduce humidity
    • Plant less densely
    • Thin canopies
  – Use resistant cultivars/varieties

• Control
  – Use fungicides to prevent infections
    • Dinocap, dithiocarbamates, myclobutanil, triadimefon, triforine, sulfur or thiophanate-methyl
    • Baking soda (1.5 Tbsp/gal) and light weight horticultural oil (3 Tbsp/gal)
    • Alternate active ingredients (FRAC codes)
    • Apply when humidity >60-70%
    • Apply at 7-14 day intervals
Tree and Shrub Diseases

**Tar Spot**

- **Causes:** *Rhytisma americanum*  
  *Rhytisma acerinum*
- **Hosts:** Maples
- **Favorable environment:** Cool, wet weather

**Control**
- **DO NOT panic**
- Remove/destroy diseased leaves
  - Burn (where allowed)
  - Deep bury
  - Hot compost
- Use fungicides to prevent infections
  - Copper
  - Apply 3 applications: at bud break, 1/2 expansion of leaves, full leaf expansion

**Anthracnose**

- **Causes**
  - *Gloeosporium* spp.
  - *Colletotrichum* spp.
  - *Discella* spp.
  - Many other fungi
- **Hosts**
  - Any deciduous tree
  - Ash, maple, oak
  - Sycamore
- **Favorable environment:** Cool, wet weather

**Control**
- **DO NOT panic**
- Remove/destroy diseased leaves and branches
  - Burn (where allowed)
  - Deep bury
  - Hot compost
Tree and Shrub Diseases

*Anthracnose*

- **Control**
  - Use fungicides to prevent infections
    - Copper-containing fungicides, chlorothalonil, mancozeb, thiophanate methyl
    - Alternate active ingredients (FRAC codes)
    - Apply 3 applications: at bud break, 1/2 expansion of leaves, full leaf expansion

*Tree and Shrub Diseases

*Black Spot*

- **Cause:** *Marssonina rosae*
- **Host:** Rose
- **Favorable environment:** Cool, wet weather

**Tree and Shrub Diseases

Black Spot**

- **Control**
  - Remove/destroy diseased leaves and canes
    - Burn (where allowed)
    - Deep bury
    - Hot compost
  - Decontaminate pruning tools
    - 70% alcohol (spray disinfectants)
    - Commercial disinfectants
    - 10% bleach

- **Control**
  - Use fungicides to prevent infections
    - Chlorothalonil, copper-containing fungicides, mancozeb, maneb, myclobutanil, propiconazole, thiophanate-methyl
    - Neem oil
    - Baking soda (1.5 Tbsp/gal) and light weight horticultural oil (3 Tbsp/gal)
  - Alternate active ingredients (FRAC Codes)
  - Apply at 7-14 day intervals

- **Control**
  - DO NOT overcrowd plants
  - Prune to thin established plants
  - DO NOT overhead water
  - DO NOT overwater

- **Control**
  - Plant resistant rose varieties
  - Promote rapid drying of leaves and canes
    - DO NOT overcrowd plants
    - Prune to thin established plants
  - DO NOT overhead water
Tree and Shrub Diseases
Scab (Apple and Pear)

• Causes
  – Venturia inaequalis
  – Venturia pirina

• Hosts
  – Apple/crabapple
  – Pear
  – Mountain ash

• Favorable environment: Cool, wet weather

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Tree and Shrub Diseases
Scab (Apple and Pear)

• Control
  – Plant resistant varieties
    • “Growing Apples (Pears) in Wisconsin” [https://learningstore.uwex.edu/](https://learningstore.uwex.edu/)
  – Remove/destroy diseased leaves
    • Burn (where allowed)
    • Deep bury
    • Hot compost
  – Thin trees to promote air flow

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Tree and Shrub Diseases
Rhizosphaera Needle Cast

• Pathogen: Rhizosphaera kalkhoffii
  (Rhizosphaera spp.)

• Hosts (major)
  – Colorado blue spruce
  – Other spruces: Engelmann, black, Serbian, Sitka, white (Black Hills)

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Tree and Shrub Diseases
Rhizosphaera Needle Cast

• Hosts (minor)
  – Pines: Austrian, mugo, eastern white pine
  – Douglas fir
  – Hemlock
  – Balsam fir and other firs

• Favorable environment
  – Wet weather
  – High humidity
**Tree and Shrub Diseases**

**Rhizosphaera Needle Cast**

- **Control**
  - DO NOT plant Colorado blue spruce
  - DO NOT crowd trees when planting
  - Thin healthy branches to increase airflow
  - Prevent tree stress
  - Prune diseased branches
  - Decontaminate pruning tools

**Pathogen:** Dothistroma pini

**Hosts**
- Austrian pine
- Mugo pine
- Ponderosa pine

**Favorable environment:** Wet weather

**Dothistroma Needle Blight**

- **Control**
  - Plant disease-free trees
  - Plant resistant/immune tree species
  - Destroy infected materials
  - Burn (where allowed)
  - Deep bury
  - Hot compost

**Pathogen:** Dothistroma pini

**Hosts**
- Austrian pine
- Mugo pine
- Ponderosa pine

**Favorable environment:** Wet weather
Tree and Shrub Diseases

Dothistroma Needle Blight

- **Control**
  - Use fungicides to prevent infections
    - Copper
    - Early June
    - Apply 1 treatment, or 2 treatments spaced 3-4 weeks apart

Gymnosporangium Rusts

- **Causes**
  - *Gymnosporangium juniper-virginianae* (Cedar-apple rust)
  - *Gymnosporangium globosum* (Cedar-hawthorn rust)
  - *Gymnosporangium clavipes* (Cedar-quince rust)

Tree and Shrub Diseases

Gymnosporangium Rusts

- **Hosts**
  - Junipers
  - Woody rosaceous plants
    - apple, crabapple, hawthorn, quince, pear, serviceberry
- **Favorable environment**
  - Cool to moderate temperatures
  - Wet

- **Control**
  - Grow only the juniper or rosaceous host
  - Use resistant cultivars/varieties
    - “Juniper Diseases” [https://store.extension.iastate.edu/Product/Juniper-Disease]
  - Remove galls
  - Decontaminate pruning tools

- **Control**
  - Destroy infected materials
    - Burn (where allowed)
    - Deep bury
  - Use fungicides to prevent infections
    - Ferbam, triadimefon
    - Alternate active ingredients (FRAC codes)
    - Apply at 7-21 day intervals [mid-May through mid-June (rosaceous hosts), early July through August (juniper hosts)]
Tree and Shrub Diseases

Black Knot

- **Cause:** *Apiosporina morbosa*
- **Hosts**
  - *Prunus* species
  - Plums
  - Cherries
- **Favorable environment:** Wet weather

Tree and Shrub Diseases

Black Knot

- **Control**
  - Do not plant infected *Prunus* stock
  - Buy black knot-resistant varieties if available
  - Accolade flowering cherry (*Prunus* ‘Accolade’)
  - Sargent’s cherry (*Prunus sargentii*)
  - Amur chokecherry (*Prunus maackii*)
  - Remove volunteer plums/cherries
  - Prune diseased branches

Tree and Shrub Diseases

Black Knot

- **Control**
  - Decontaminate pruning tools
  - Destroy infected materials
    - Burn (where allowed)
    - Deep bury
  - Do not use fungicides

Tree and Shrub Diseases

Crown Gall

- **Cause**
  - *Agrobacterium tumefaciens*
  - *Agrobacterium vitis*
- **Hosts**
  - Plants in 93 plant families
  - Trees and shrubs (deciduous and coniferous)
  - Herbaceous plants
- **Favorable environment:** None
### Tree and Shrub Diseases

#### Crown Gall

**Control**
- DO NOT buy infected plant
- Buy well-adapted, winter-hardy plants
- Avoid wounding plants during transplant
- Consider root dips of *A. radiobacter*
- Prune out galls
- Decontaminate pruning tools

#### Dutch Elm Disease

**Causes**
- *Ophiostoma ulmi* (*Ceratocystis ulmi*)
- *Ophiostoma novo-ulmi*
- *Pestotum ulmi* (*Graphium ulmi*)

**Hosts**
- High susceptibility
  - American, Belgian, English, red, rock, September, European white, winged

**Transmission**
- Elm bark beetles
  - *Scolytus multistriatus* (European)
  - *Hylurgopinus rufipes* (Native)
- Root grafts
  - Major method of movement in clumps of elms
  - *Ophiostoma* spp. can reach the roots during the first season of infection

**Favorable environment**
- Cool, wet conditions (for infection)
- Hot, dry weather (for symptom development)

**Hosts**
- Intermediate susceptibility
  - Cedar, European field (smooth-leaf), wych (Scots)
- Low susceptibility
  - Siberian, Chinese

**Control**
- Remove plants (including roots) and soil
- Destroy infected materials
  - Burn (where allowed)
  - Landfill
- Plant nonsusceptible plants
- DO NOT use bactericides
Tree and Shrub Diseases

Dutch Elm Disease

- Control
  - Remove diseased elms
  - Disrupt root grafts
    - Mechanically (vibratory plow or trenching machine)
    - Chemically (soil fumigant)
    - Physical barriers
  - Be careful using elm wood
    - Remove bark
    - Cover wood

- Mechanically (vibratory plow or trenching machine)
- Chemically (soil fumigant)
- Physical barriers

Tree and Shrub Diseases

Dutch Elm Disease

- Control
  - Prune diseased branches
  - Decontaminate pruning tools
  - Use fungicides injections
    - Propiconazole, thiabendazole
    - Prophylactic or therapeutic
    - Every 12-24 months

  - Plant resistant elms
    - Crosses between American and other elms
    - True American elms
      - American Liberty
      - Independence
      - Princeton
      - New Harmony
      - Valley Forge
      - Others

Tree and Shrub Diseases

Dutch Elm Disease

- Cause: Ceratocystis fagacearum (Chalara sp.)
- Hosts
  - Red oak group: Red, black, pin
  - White oak group: White, bur, swamp white
  - Chinese chestnut
- Favorable environment
  - Cool, wet conditions (for infection)
  - Hot, dry weather (for symptom development)
Tree and Shrub Diseases

**Oak Wilt**

- **Transmission**
  - Oak bark beetles
    - *Pseudopityophthorus ninutissimus*
    - *Pseudopityophthorus pruinosus*
  - Sap beetles
    - *Carpophilus* spp.
    - *Colopterus* spp.
    - *Cryptarcha* spp.
    - *Epuraea* spp.
    - *Clischrochilus* spp.

- **Control**
  - DO NOT prune or wound oaks from bud break to 2-3 weeks past full leaf development
  - Disrupt root grafts
    - Mechanically (vibratory plow or trenching machine)
    -Chemically (soil fumigant)
    - Physical barriers
  - “Oak Wilt Management: What are the Options?”
    (https://learningstore.uwex.edu/)

- **Control**
  - Remove diseased (and healthy) trees
  - Be careful using oak wood
    - Remove bark
    - Cover wood
  - Use fungicide injections
    - Propiconazole
    - Prophylactic or therapeutic
    - Every 12-24 months
**Tree and Shrub Diseases**

**Verticillium Wilt**

- **Causes**
  - *Verticillium dahlia*
  - *Verticillium albo-atrum*
  - Other *Verticillium* spp.
  - New *Verticillium* spp.

- **Hosts**
  - Many woody ornamentals
    - Common: Maple, ash, redbud, smokebush
    - “New”: Seven son flower, wafer-ash, buttonbush
  - Many herbaceous plants
  - Many vegetables (tomato, potato, EGGPLANT)

- **Favorable environment**
  - Cool, wet weather (for infection)
  - Hot, dry weather (for symptom development)

- **Control**
  - Avoid Verticillium-infested areas
  - Pretest soils/mulches/composts for the presence of Verticillium
  - Fumigate heavily infested soils
  - Keep broad-leaf weeds under control
  - Avoid municipal mulches

- **Wood Chips as an Inoculum Source**
  - Amur maple
    - 30.0%/25.0% (Treated)
    - 0.0%/0.0% (Non-Treated)
  - Green Ash
    - 23.7%/10.5% (Treated)
    - 0.0%/0.0% (Non-Treated)
  - Redbud
    - 10.7%/13.3% (Treated)
    - 0.0%/0.0% (Non-Treated)
**Tree and Shrub Diseases**  
**Verticillium Wilt**

- **Control**
  - Use immune/resistant plants
    - CONIFERS: Pines, spruces, firs, junipers
    - DECIDUOUS TREES/SHRUBS: Beech, birch, ginkgo, hackberry, hawthorn, hickory, honey locust, mountain ash, white oak, bur oak, poplar, serviceberry, sycamore, willow
  - Prevent stress
  - Prune diseased (wilted) areas
  - Decontaminate pruning tools

- **Control**
  - Make plants comfortable until they die
  - Remove and destroy diseased plants
    - Burn (where allowed)
    - Compost (?)
  - DO NOT use fungicides

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**Trees and Shrubs Diseases**  
**Nectria Canker**

- **Pathogen:** *Nectria* spp.
- **Hosts**
  - Many woody ornamentals
  - Honey locust
- **Favorable environment**
  - Injuries/wounds
  - Wet weather

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**Tree and Shrub Diseases**  
**Nectria Canker**

- **Control**
  - Choose well-adapted trees and shrubs
  - Reduce environmental stresses/injuries
  - Water and fertilize properly
  - Prune properly when maintenance pruning
  - Prune diseased branches
  - Disinfect pruning tools
Tree and Shrub Diseases  
**Nectria Canker**

- **Control**
- Destroy infected materials
  - Burn (where allowed)
  - Deep bury
- DO NOT use fungicides

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Tree and Shrub Diseases  
**Golden Canker**

- **Cause:** Cryptodiaporthe corni
- **Host:** Pagoda dogwood
- **Favorable environment**
  - Water stress
  - Heat stress

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Tree and Shrub Diseases  
**Golden Canker**

- **Control**
  - Prune diseased branches
  - Decontaminate pruning tools
  - Destroy infected materials
    - Burn (where allowed)
    - Deep bury

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Tree and Shrub Diseases  
**Golden Canker**

- **Cause:** Erwinia amylovora
- **Hosts**
  - Many woody rosaceous plants
    - Apple, crabapple, pear, mountain ash, cotoneaster
- **Favorable environment**
  - Wet weather
  - Hail (or other wounding)
Tree and Shrub Diseases

Fire Blight

- **Control**
  - Plant resistant varieties where available
  - “Top Ornamental Crabapples for Wisconsin” [https://pddc.wisc.edu/fact-sheet-listing-all/](https://pddc.wisc.edu/fact-sheet-listing-all)
  - Prune diseased branches
  - Decontaminate pruning tools
  - Destroy infected materials
    - Burn (where allowed)
    - Deep bury

Tree and Shrub Diseases

Bacterial Canker

- **Causes**
  - *Pseudomonas syringae pv. syringae*
  - *Psuedomonas syringae pv. mors-prunorum*
- **Hosts:** Stone fruits (plum, cherry, peach)
- **Favorable environment**
  - Wet weather
  - Wounding

Tree and Shrub Diseases

Bacterial Canker

- **Control**
  - Minimize wounding
  - Prune diseased branches
  - Decontaminate pruning tools
  - Destroy infected materials
    - Burn (where allowed)
    - Deep bury
  - DO NOT use bactericides
**Tree and Shrub Diseases**

**Bacterial Blight**

- **Cause:** *Pseudomonas syringae pv. syringae*
- **Host**
  - Lilac
  - Other trees and shrubs
- **Favorable environment**
  - Wet weather
  - Cold temperatures

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**Tree and Shrub Diseases**

**Bacterial Blight**

- **Control**
  - Space lilacs to promote good air flow
  - Reduce any stresses
  - Avoid overhead watering
  - Prune diseased branches
  - Decontaminate pruning tools
  - Destroy infected materials
    - Burn (where allowed)
    - Deep bury

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**Tree and Shrub Diseases**

**Cytospora Canker**

- **Pathogen:** *Leucocytospora kunzei*
- **Hosts**
  - Spruces (particularly Colorado blue spruce)
  - Douglas fir
  - Many other conifers
- **Favorable environment:** Wet weather
Tree and Shrub Diseases

**Cytospora Canker**

- **Control**
  - DO NOT plant Colorado blue spruce
  - DO NOT crowd trees when planting
  - Thin branches to increase airflow
  - Prevent tree stress
  - Prune diseased branches

**Diplodia (Sphaeropsis) Tip Blight**

- **Pathogen:** *Diplodia pinea* (Sphaeropsis sapinea)
- **Hosts (major)**
  - Austrian pine
  - Other pines: red, jack, Scots, mugo
- **Hosts (minor)**
  - Other conifers: cedars, cypresses, firs, spruces, junipers, yews

**Favorable environment**

- Wet weather (for infection)
- Drought (for extensive colonization)

Tree and Shrub Diseases

**Cytospora Canker**

- **Control**
  - Destroy infected materials
  - Burn (where allowed)
  - Deep bury
  - Decontaminate pruning tools
  - DO NOT use fungicides

Tree and Shrub Diseases

**Diplodia (Sphaeropsis) Tip Blight**

- Favorable environment
  - Wet weather (for infection)
  - Drought (for extensive colonization)
Tree and Shrub Diseases
Diplodia (Sphaeropsis) Tip Blight

- Control
  - DO NOT plant Austrian pines
  - Prevent tree stress, particularly water stress
  - Thin branches to increase airflow
  - Prune diseased branches
  - Decontaminate pruning tools
  - Remove infected cones (?)

Tree and Shrub Diseases
Diplodia (Sphaeropsis) Tip Blight

- Control
  - Destroy infected materials
    - Burn (where allowed)
    - Deep bury
  - Use fungicides to prevent infections
    - Thiophanate-methyl, chlorothalonil
    - Alternate active ingredients (FRAC Codes)
    - Apply from bud break through shoot elongation
    - Apply every 14 days

Tree and Shrub Diseases
Phomopsis Tip Blight

- Pathogen
  - Phomopsis juniperovora
  - Phomopsis spp.

- Host: Junipers

- Favorable environment
  - Cool temperatures
  - Wet weather
  - Factors stimulating excessive host growth

Tree and Shrub Diseases
Phomopsis Tip Blight

- Control
  - Use resistant varieties
    (https://store.extension.iastate.edu/Product/Juniper-Diseases)
  - DO NOT crowd trees/shrubs when planting
  - Prevent tree/shrub stress
  - Avoid over-fertilization with nitrogen
  - Prune diseased branches
  - Avoid excessive pruning
  - Decontaminate pruning tools

Tree and Shrub Diseases
Phomopsis Tip Blight

- Control
  - Destroy infected materials
    - Burn (where allowed)
    - Deep bury
  - Use fungicides to prevent infections
    - Mancozeb, copper, thiophanate-methyl
    - Alternate active ingredients (FRAC Codes)
    - Bud break through period of rapid growth
    - 7-21 day application interval
Tree and Shrub Diseases
Ash Yellows

• **Cause**
  – *Candidatus Phytoplasma fraxini* (Ash yellows phytoplasma)

• **Hosts**
  – White ash
  – Green ash
  – Other ash
  – Lilac

• **Favorable environment**
  – High leafhopper populations (*Scaphoideus*)

• **Control**
  – Make infected trees comfortable until they die
  – Remove infected trees
  – Destroy infected materials
    • Burn (where allowed)
    • Deep bury
  – Avoid growing susceptible trees and shrubs

Tree and Shrub Diseases
Chlorosis

• **Cause**: Micronutrient (Fe or Mn) deficiency

• **Affected plants**
  – Oaks (especially pin oak)
  – Red Maples
  – Rhododendrons
  – Other woody (and herbaceous) plants
Tree and Shrub Diseases

Chlorosis

- Management
  - Plant the right plant in the right location
  - Monitor soil pH and soil nutrients
  - Decrease pH using sulfur or aluminum sulfate
  - Add chelated Fe and/or Mn as needed
  - Make sure trees are adequately watered
  - Minimize damage to tree root systems

Tree and Shrub Diseases

Herbicide Injury

- Causes
  - Growth regulator herbicides
    - 2,4-D
    - Dicamba
    - Imprelis!
  - Other herbicides

- Affected plants: Anything and everything

Tree and Shrub Diseases

Herbicide Injury

- Management
  - Apply herbicides only when needed
  - Follow application directions exactly
  - Apply herbicides only when wind speed is low (< 5 mph)
  - DO NOT apply herbicides too close to nontarget plants
  - Apply herbicides at low pressure

Tree and Shrub Diseases

Herbicide Injury

- Management
  - Use amine rather than ester forms of herbicides
  - Adequately test herbicides prior to registration!
Tree and Shrub Diseases

**Winter Injury**

- **Causes**
  - Water stress
  - Extreme winter temperatures
  - Insufficient snow cover
  - Cycling winter temperatures

- **Affected plants**
  - Evergreens (yews, Alberta spruce, boxwood)
  - Deciduous trees (fruit trees, redbud)

**Management**

- Water trees and shrubs adequately
- Plant trees and shrubs
  - Properly
  - In protected locations (sensitive plants)
- Insulate sensitive plants where possible
- Pray for
  - Lots of snow
  - A slow, gradual spring warm up

Other Abiotic Disorders

- Salt Injury
- Tatters
- Construction Injury
- Water Stress
- Girdling Root
- Lawn Mower Injury

Non-Diseases: Fungi/Fungal Allies

- Giant Puffballs
- Stink Horns
- Bird’s Nest Fungi
- Lichens
- Slime Molds
Tree and Shrub Diseases
Where to Go for Help

Plant Disease Diagnostics Clinic
Department of Plant Pathology
University of Wisconsin-Madison
1630 Linden Drive
Madison, WI  53706-1598
(608) 262-2863
pddc@wisc.edu
http://pddc.wisc.edu
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