

# 2018 Season surprises: Soilborne diseases for the grower radar

2019 Winter Commercial Tree Fruit  
School



**PennState Extension**

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# It could be worse: OVERIRRIGATED

High water in the Puddingstone Dam Reservoir partially submerged a 10-acre Valencia orange grove so that pickers gather the fruit in rowboats and bathing suits (California, 1941)





## Fruit trees and waterlogging tolerance: Being prone to soilborne disease issues

➤ Monitor trees during 2019 season

	Extremely tolerant	Very tolerant	Moderately tolerant	Sensitive	Very sensitive
Fruit tree	Quince	Pear	Apple Citrus Plum/Prune	Japanese plum	Apricot** Cherry Peach



# When there is too much water... Diseases can be problematic

## Common symptoms of crown/root issues

### Direct – soilborne diseases

- Southern blight
- Fusarium root rot
- Phytophthora crown/root rot

### Indirect – stress

- Cytospora/Leucostoma canker (AKA perennial canker)
- Rapid apple decline?



## Mitigation strategies





## **Roots/wood issues (all tree fruit)**

- **See purple/discolored leaves = look at the graft union and roots (NOT the leaves/branches)**



**Graft union death:**  
**Virus (ToRSV)**  
**Fungal (white/black rot)**  
**Bacterial (fire blight)**

**Healthy roots =  
presence of  
rootstock  
suckers**

**Graft union dead =  
tree girdled =  
death**

Tree  
Dead  

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Faji



**Orange/brown rootstock/  
roots = soilborne fungal  
pathogens**

**Look at crown  
Look at roots**





# New root rot disease for PA tree fruit growers in 2018: Southern blight caused by *Sclerotium delphinii*

**July 2018: First observed in commercial orchard in Adams County in 2018 planting Crimson Crisp/B9**

**August 2018: 4 additional sites (Penn State FREC)**

- 2018 Gala/M9
- 2016 Golden Delicious/M9
- 2007 Cameo/B9
- 2011 Crimson Crisp/B9

## **Locations**

- No rhyme or reason
- One tree here and there; or A LOT of trees affected
- Previous crop at site varies: nothing (grass) to woods 30 yrs ago



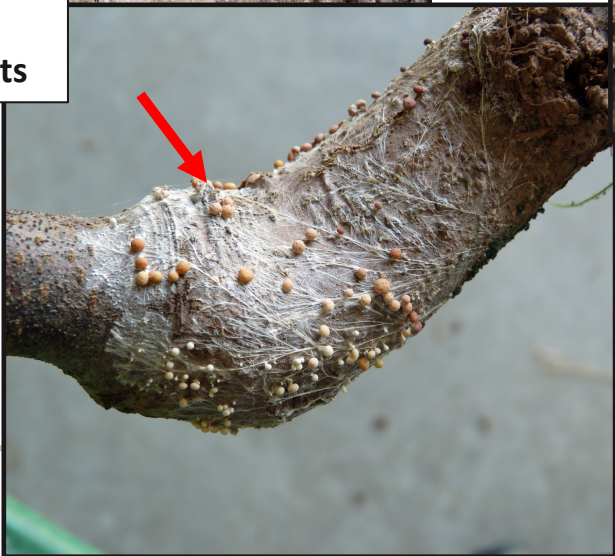


*Sclerotium delphinii*

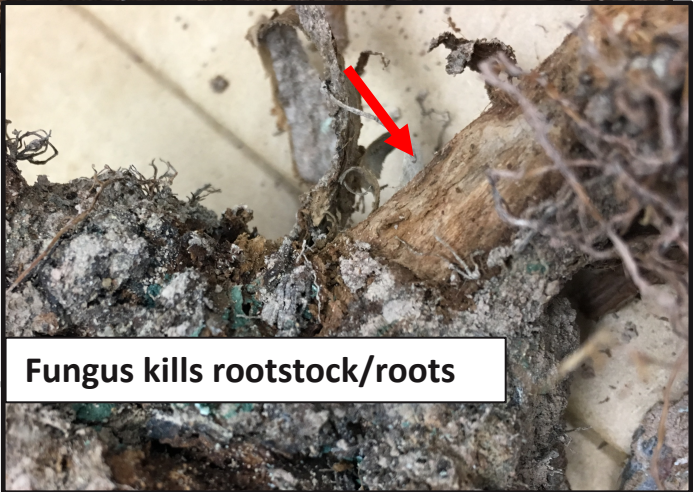
White mycelia on trunk appears under moist conditions; can disappear



Sclerotia: found on base of tree, on roots



Will this sneak up on growers during 2019 season?



Fungus kills rootstock/roots



**Southern Blight in apple trees: *Sclerotium delphinii* = root rot fungus  
(Similar to *Sclerotium rolfsii* = carrots, soybeans, peanuts, tomatoes)**



**Why did it show up?**

- Can survive in soil a long time = sclerotia
- Factors promoting disease incidence
  - Temps 77 - 95°F
  - High levels of soil moisture
  - Good aeration
  - High abundance of organic debris
- Trees 1 – 3 yr old most susceptible



# Management strategies during August 2018







**Is the apple block salvageable?**

**Control: Sanitation (Do first!)**

- Remove trees AND soil surrounding roots (= remove white mycelia and sclerotia)
- Carefully place into a bag(s)
- Remove from orchard

**Control: Soil solarization**

- Affected areas covered in black plastic
- Heats up soil = “cooks” any remaining fungi present







Photo: J.P. Jones, apsnet.org



Photo: G. Odvody, apsnet.org

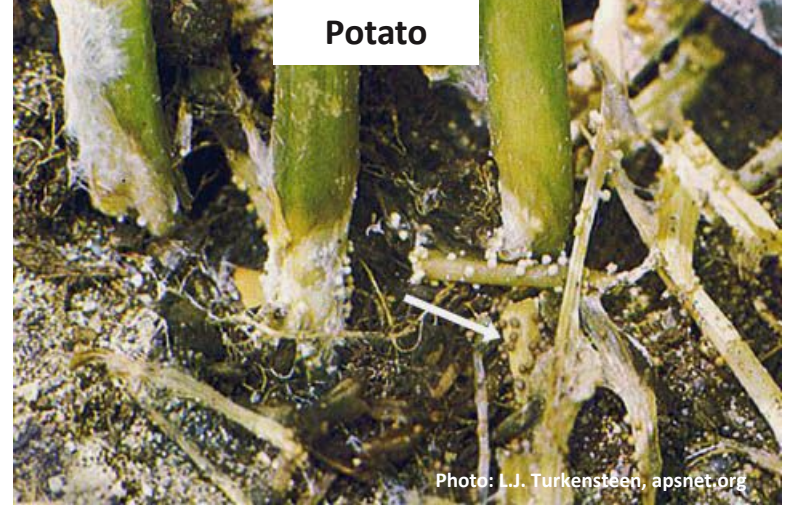


Photo: L.J. Turkensteen, apsnet.org

## Control: Chemical?

### ➤ Soil drenching (possible...?)

- Omega (fluazinam): Labeled for *Sclerotium rolfsii* (carrot southern blight)
- Labeled for apples for foliar sprays; not soil drenching
- Working with Syngenta for a 24(c) label (additional use)

## Prevention:

- IF possible, avoid planting trees where this pathogen can show up on other crops: clover, tomatoes, potatoes, sorghum, soybeans (very large host range)
  - Fumigation/biofumigation
  - Crop rotation: Corn IS NOT a host (inoculum decreases when soil in corn)
- Keep soil around base of trees free of dead, organic matter



## Crown and root rots caused by *Fusarium* spp. and *Phytophthora* spp.



- Can survive in the soil a long time
- Favors saturated soils (the pathogen wakes up!)
  - Favor standing water
- Some diseases favor low oxygen = *Fusarium* spp.
- Management (Preventative):
  - Phytophthora
    - Ridomil, ProPhyt, Rampart (and similar), Aliette
  - Fusarium
    - Limited (Rampart labelled)
      - Fumigation of site for future plantings



## Cytospora/Leucostoma canker: Not soilborne, but may become more an issue due to supersaturated soil conditions



**Most of the stone and pome fruit varieties are susceptible**

- **More important in peaches, nectarines, sweet cherries, apricots, and plums**
- **Susceptibility differs with crops and varieties**
  - **All are more susceptible during dormancy.**

**Symptoms: elliptical canker; branch dieback; canker oozing gummosis**



## **Cytospora/Leucostoma canker: How the fungus wreaks havoc**

- **Cannot infect actively growing trees = new infections usually start in the late fall or early spring when the tree is dormant**
- **Infection takes place via wounds on bark**
  - **Occurs from February to early April**
  - **Colonization takes place around 36-46°F (slower); can also occur 50-59°F**
- **Grows in the bark during the winter whenever the temperature rises above freezing**
  - **Growth stops in the spring when the tree's defense and growth resume**
- **Increased duration of wetness and length + high humidity (90%) = increases disease incidence**
- **Continuous wetting the canker promotes spore formation and dispersal**
- **Delay pruning until late winter or early spring = greatly reduces risk of infection**
- **Lowest spore availability: March – May**



## Cytospora/Leucostoma canker: Management

- **Check your plant nutrients in soil and leaves each year in late June to early to mid-July**
  - **Provide balanced nutrients regularly**
- **Provide balanced N in the soil as its deficiency or excess causes problems.**
  - **Avoid N application in late summer / early fall = may delay tree dormancy and thereby induce cold susceptibility and increase plant stress**
- **Apply adequate K (provides resistance)**
- **Control borers; OFM = infection sites**
- **More info: see 2018 – 2019 Penn State Tree Fruit Production Guide – Disease section**





# Stressful 2018 = rapid apple decline incidences in 2019?

- Rule out soilborne diseases first
  - Rootstock is healthy = many rootstock suckers present + healthy root system





# Preventing soilborne disease issues: Chemical fumigation (BEFORE planting...for future sites, not for 2019 plantings)





# Chemical fumigation: What and how

- General biocides: pathogens, nematodes, weeds
  - Vampam HL
  - Telone II
  - Telone C-17
  - Telone C-35
  - Basamid
- Injected – diffuse upward and laterally
- High vapor pressure necessitates tarping
- Efficacy affected by temperature, rainfall, soil texture, etc.
- Recommendation: Apply fumigants late summer/early fall; plant trees following spring



→ Soil fumigants must be applied by certified applicators

→ Current regulations and requirements

EPA: Soil Fumigant Toolbox: <https://www.epa.gov/soil-fumigants>



# Preventing soilborne diseases: Cover crops as biofumigants

(For future plantings, not 2019 plantings)

- **Mustards, sudangrass, rapeseed**
  - Mustard cvs. Caliente 119 and 199
  - Rapeseed cv. Dwarf essex
  - Sudangrass cv. Trudan 8
  - Sorgham sudangrass cvs. 79, SS-222 and SS-333
- **Planting**
  - Sudangrass should be drilled at 30-50 lb/A
  - Mustards and rapeseed are planted at 8-10 lb/A
- **Growing conditions**
  - **Mustards:**
    - Needs enough moisture
      - Spring OR mid-August plantings do best
    - Needs 120 units/A nitrogen
    - Needs 20 units/A sulfur
  - **Sudangrass:** similar N requirements, but do better in warm, drier conditions
  - **Rapeseed:** fall planting





# Preventing soilborne diseases: Cover crops as biofumigants

(For future plantings, not 2019 plantings)

## Timely incorporation of a cover crop as a green manure

- These bio-active compounds are volatile
- As much as 80% can be lost if the cover crop is not incorporated within 15 minutes of mowing
- Chop cover crop into small pieces (flail mowing)
- Incorporate the cover crop immediately after mowing
- Irrigate or cultipack to trap compounds
- The more cover crop = the more bio-active compounds available





# Preventing trees falling victim to soilborne diseases: For future plantings

- Invest in trees with rootstocks tolerant to crown rot/replant issues: B.9, Geneva? rootstocks
- Raised beds?
  - Offer drainage
  - Risk of roots freezing?
- Re-evaluate planting sites: soil drainage an issue?
- Make sure site is not deficient in nutrients after a year like 2018
  - PSU Agricultural Analytical Services Lab: <https://agsci.psu.edu/aasl>
    - Soil analysis (kits available for purchase at PSU Extension County offices)





# Preventing trees falling victim to soilborne diseases: For 2019 plantings

- Planting new trees in 2019: Consider treating the roots prior to planting
  - Root dip: Aliette → 3 lb/100 gal; dip entire root system 30-60 min  
Rampart → 2 qt/100 gal: dip for 15-20 min; plant w/in 24 hr
  - Foliar spray: ProPhyt → 2-4 pt/A (in 100 gal/A); 30 – 60 day interval  
Rampart → 1 – 3 qt/A (in 100 gal/A): 2 – 4 wk interval
  - On soil: Ridomil
    - Apply 30 oz/1000 sq ft on herbicide strips; needs rainfall or irrigation to move product into plant; every 2-3 months when conditions favor disease
    - Ridomil Gold SL: see label for new plantings (wait 2 wk after planting; rate based on trunk diameter)
- Raised beds?
  - Offer drainage
  - Risk of roots freezing?
- Make sure trees/site is not deficient in nutrients
  - PSU Agricultural Analytical Services Lab: <https://agsci.psu.edu/aasl>
    - Soil analysis
    - Plant analysis (instructions and forms at website)





# Preventing trees falling victim to soilborne diseases: For current, established plantings (bearing)

- **Avoiding soilborne disease issues if conditions favorable (BEFORE symptoms)**
  - **Foliar spray**
    - **Aliette: 2.5 – 5.0 lb/A**
      - **High disease pressure: Apply on a 30-60 day**
      - **Moderate disease pressure: see label**
    - **ProPhyt: 2-4 pt/A (in 100 gal/A): Apply 30 – 60 day interval**
    - **Rampart: 1 – 3 qt/A (in 100 gal/A): 2 – 4 wk interval**
  - **On soil**
    - **Ridomil: 0.5 pt/100 gal water**
      - **Apply diluted mixture around trunk of each tree in early spring before growth starts; and in fall after harvest**
- **Make sure trees/site is not deficient in nutrients**
  - **PSU Agricultural Analytical Services Lab**



**Catastrophic disease damage  
(beyond your control):  
Contact your nearest FSA Service  
Center**



United States Department of Agriculture  
Farm Service Agency

## Related Topics

- [Disaster Designation Information](#)
- [Emergency Assistance for Livestock, Honey Bees, and Farm-raised Fish \(ELAP\)](#)
- [Emergency Forest Restoration Program \(EFRP\)](#)
- [Livestock Forage Program \(LFP\)](#)
- [Livestock Indemnity Program \(LIP\)](#)
- [Noninsured Crop Disaster Assistance Program \(NAP\)](#)
- [Tree Assistance Program \(TAP\)](#)
- [Loss Adjustment Standards Handbooks \(LASH\)](#)
- [Wildfires and Hurricanes Indemnity Program \(WHIP\)](#)

[Home](#) / [Programs and Services](#) / [Disaster Assistance Programs](#) / [Tree Assistance Program \(TAP\)](#)

## Tree Assistance Program (TAP)

The Agricultural Act of 2014 (the 2014 Farm Bill) authorized the Tree Assistance Program (TAP) to provide financial assistance to qualifying orchardists and nursery tree growers to replant or rehabilitate eligible trees, bushes and vines damaged by natural disasters. The 2014 Farm Bill makes TAP a permanent disaster program and provides retroactive authority to cover eligible losses back to Oct. 1, 2011.

The Bipartisan Budget Act of 2018 made several changes to TAP, including removing the per person and legal entity program year payment limitation ceiling of \$125,000. It also increased the acreage cap, and growers are eligible to be partly reimbursed for losses on up to 1,000 acres per program year, double the previous acreage.

### Related Information:

- [Final Rule](#) (April 14, 2014)
- [Fact Sheet](#)
- [Florida Citrus Greening Fact Sheet](#)

- **Rapid apple decline is recognized**
- **Issues from 2018 – too much rain = disease/decline problems in 2019**

**Also contact:  
For PA: Your Tree Fruit  
Extension Educator and Dr.  
Kari Peter  
Other states: Your state  
specialist/Extension agent**



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