

# The Vascular Wilts and Others

“What’s Up Doc?”

2017 Texas Tree Academy  
Wednesday, September 27, 2017  
Waco Convention Center  
9:00 to 5:00

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# The Vascular Wilts

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- Often the most spectacular of the diseases caused by biotic pathogens,
- Pathogens that infect and colonize the xylem,
  - Usually vectored by insects, but not always.....
- Several examples:
  - Oak wilt
  - Dutch elm disease
  - Bacterial leaf scorch
  - Native elm wilt
  - Verticillium wilt
  - Fusarium wilt

# Sample No. 29 = Mat scars

## Oak wilt sign – the fungal mat

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Scars

# Which of the following is true of fungal mats?

- A. They form in the spring following the year the tree was infected,
- B. They only last a few weeks,
- C. They are where the fungus has sex,
- D. All of the above.



# Sample No. 29 = Mat scars

## Oak wilt sign – the fungal mat

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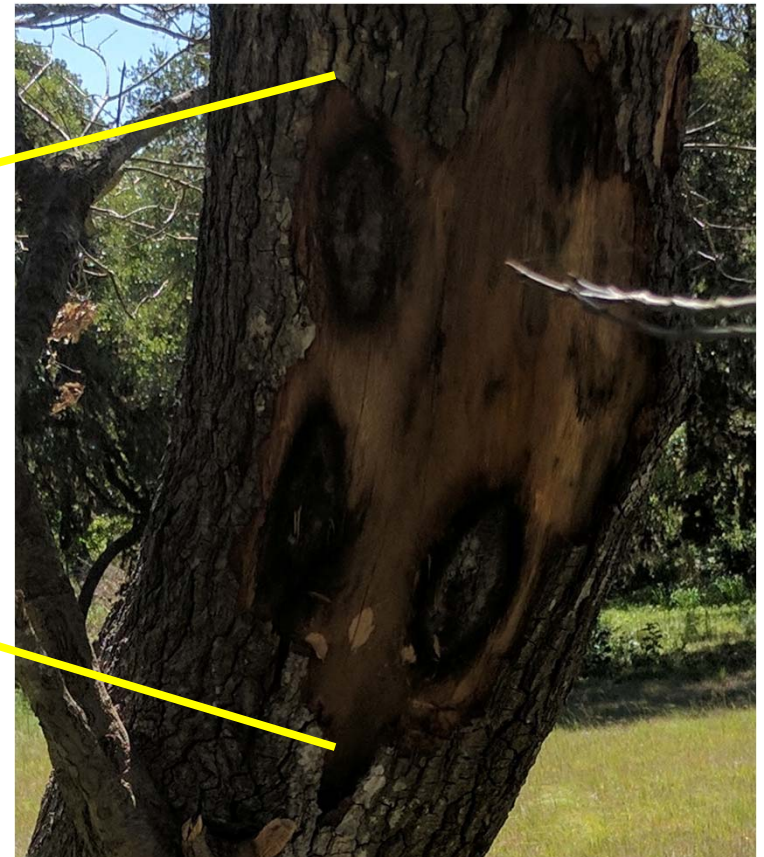
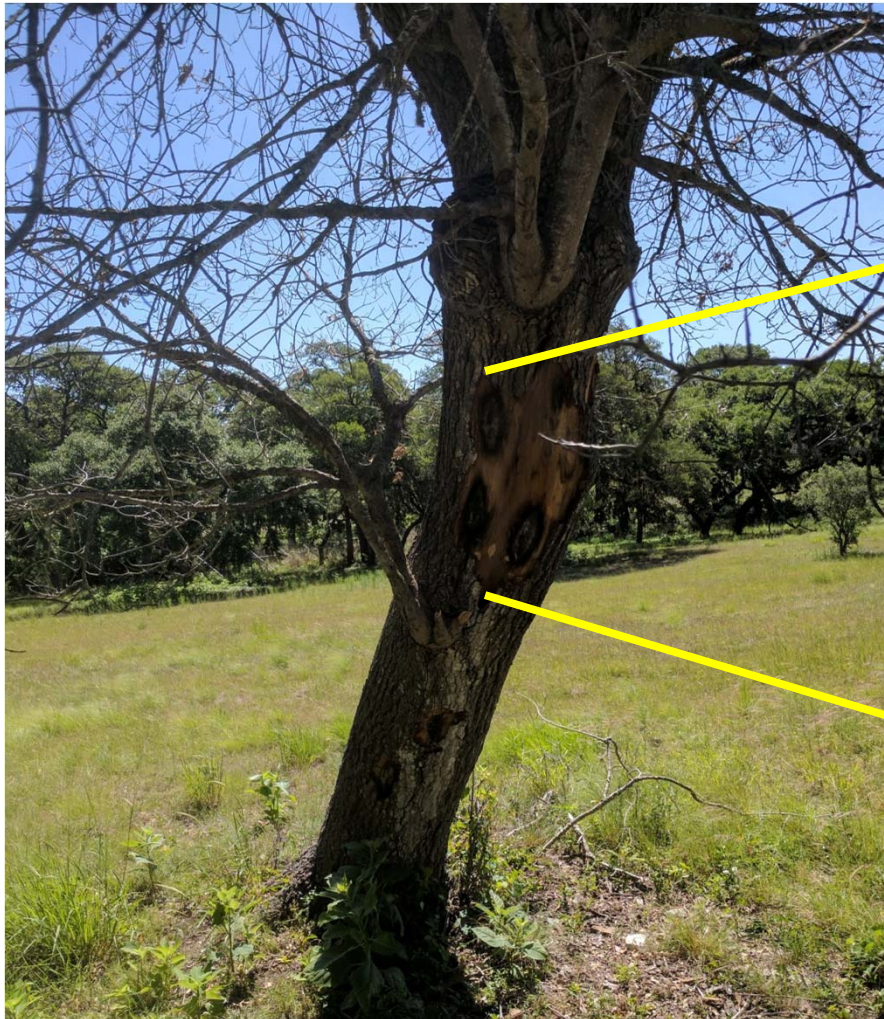
June, 2016 : *Quercus buckleyii*



Sept. 2016

# Sample No. 29

Oak wilt sign – pressure pad, mycelial mat



May, 2017

# Presence of fungal mat

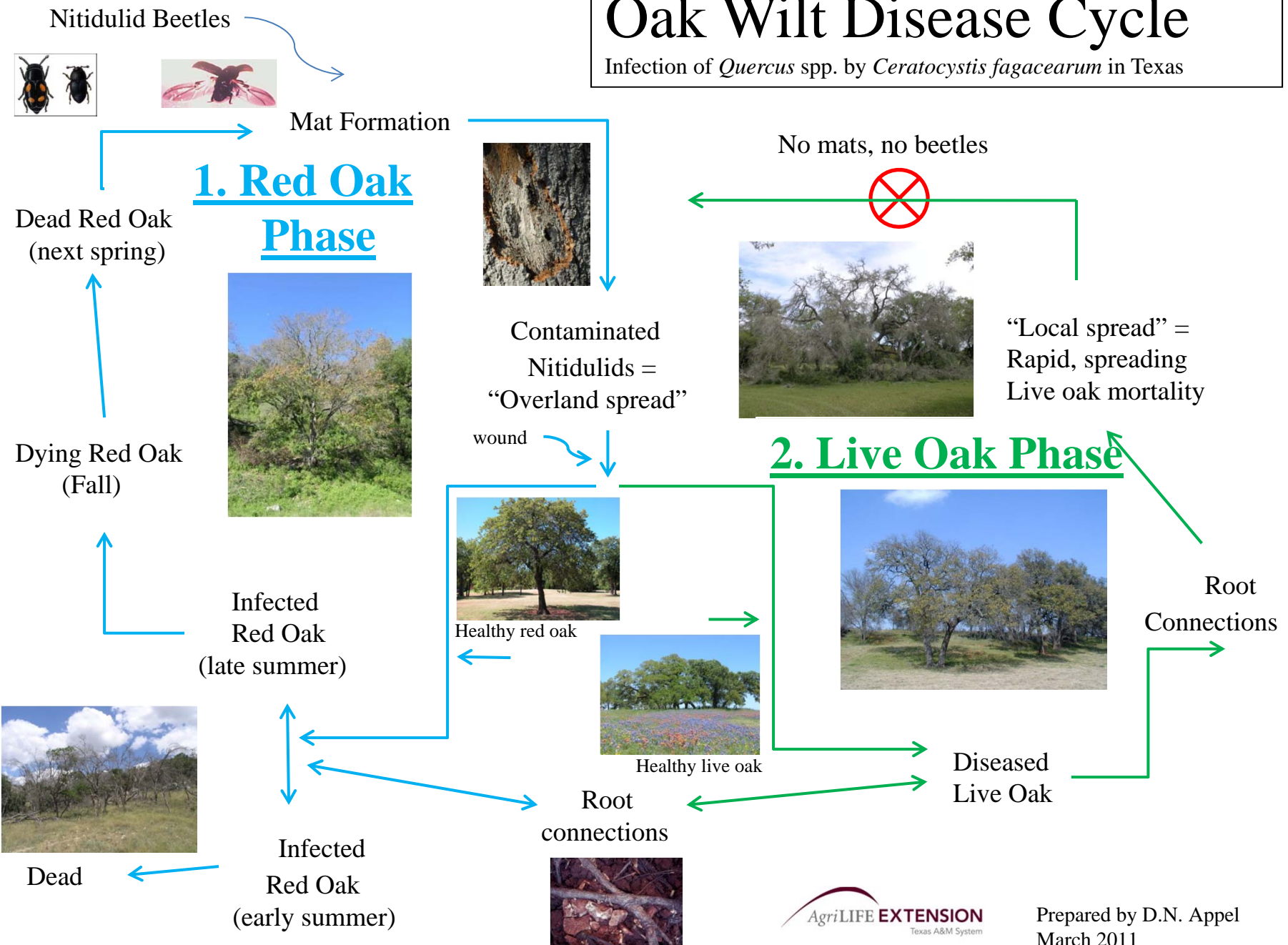
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- only red oaks,
- mostly during the spring
- Feb. 1 – end of June),
- only last a few weeks,
- sweet smell when fresh.

# Oak Wilt Disease Cycle

Infection of *Quercus* spp. by *Ceratocystis fagacearum* in Texas





# Sample No. 30

## Oak Wilt Symptom - vein banding

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**Green vein banding symptom of oak wilt**

# III. Management Options: Diagnosis

## Foliar symptoms

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Live Oak Symptoms

vs.

Red Oak Symptoms



# Oak Wilt Control Options

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- Always starts with diagnosis,
- Prevention - avoid wounding in spring,
  - Feb. 1 through end of June,
- Prevention - use wound paints,
- Prevention - cautious movement of firewood,
  - Cover when necessary,
- Direct control – trenching,
- Direct control - intravascular injection with fungicides,
- Plant resistant trees.

# III. Management Options: Diagnosis

## Confusing Oak Wilt With Other Problems – Bacterial Leaf Scorch

- Classic BLS scorch can resemble oak wilt in red oaks,
- Distinguish by:
  - rate of symptoms and mortality,
  - culturing (OW) and ELISA (BLS).



<http://texasforests.tamu.edu/>

# III. Management Options: Diagnosis

Confusing Oak Wilt With Other Problems – Drought

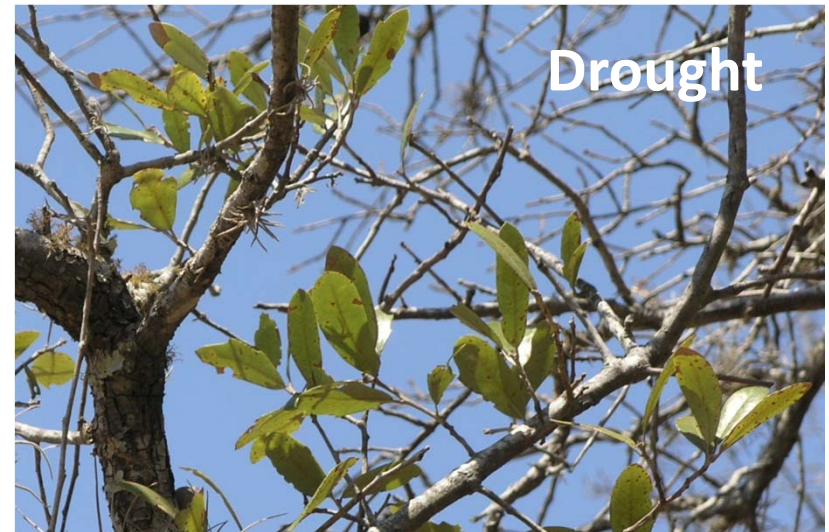
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- Anecdotal evidence this may have occurred during the 1950s drought,
- Oak wilt can be a very difficult disease to diagnose
- Symptoms may resemble drought,
  - dieback, slow decline in some live oaks
  - failure to find specific foliar symptoms is common,
  - red oaks pose further complications
    - foliar symptoms of oak wilt and drought can be similar.
- The services of a diagnostic laboratory may be needed.

# III. Management Options: Diagnosis

Comparison of Oak Wilt and Drought Symptoms in Live Oak Foliage

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# III. Management Options: Diagnosis

Comparison of Oak Wilt and Drought Symptoms in Live Oak Trees

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Oak Wilt



Drought

# III. Management Options: Diagnosis

Foliar Symptoms in Red Oak: Oak Wilt vs. Drought

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# Sample 11 = Dutch elm disease vector

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**Elm bark beetle galleries**

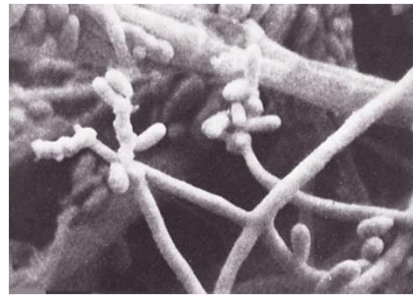
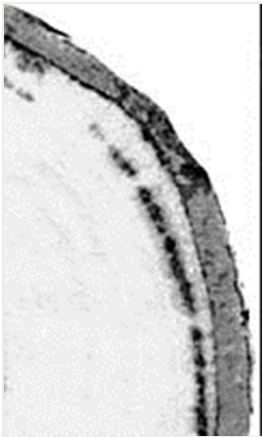
# Where did Dutch elm disease start in the United States?

- A. New York City
- B. Detroit
- C. Cincinnati
- D. Lexington



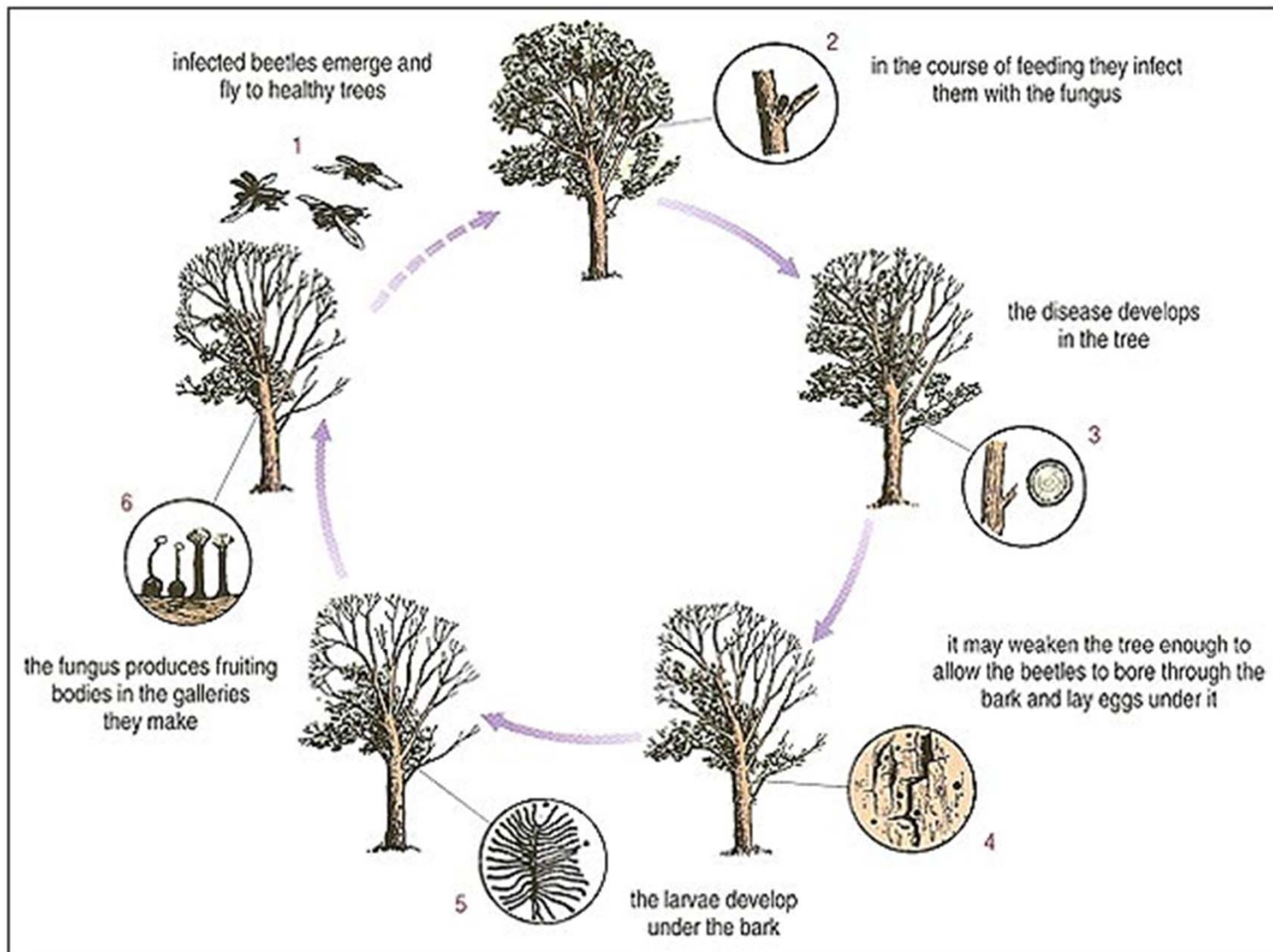
# Dutch Elm Disease

## The Pathogen

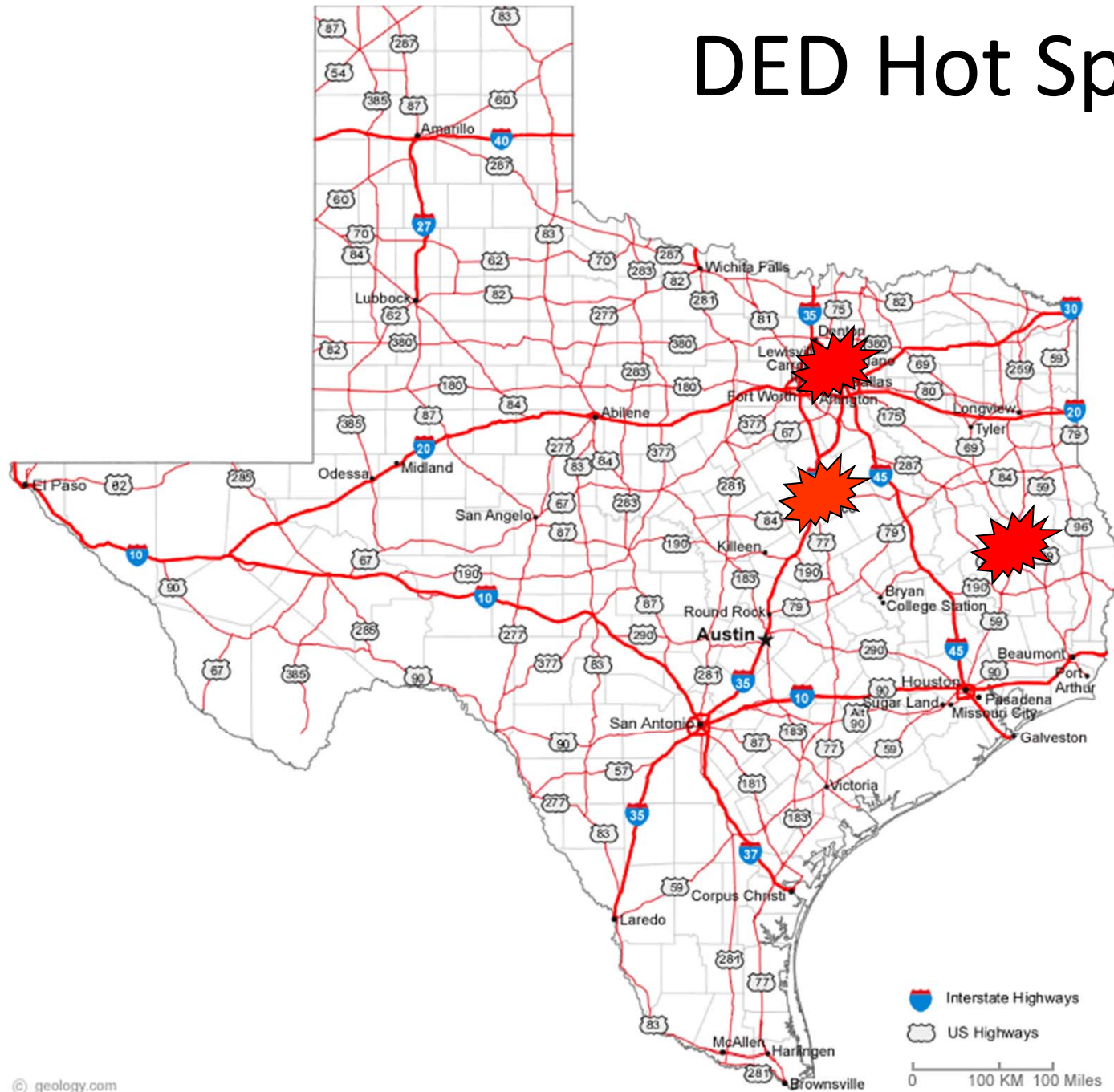


- *Ophiostoma novo-ulmi*,
- Vascular parasite,
- Invaded North America in mid 1920s,
- Spread throughout native elm population,

# Disease Cycle – Dutch elm disease



# DED Hot Spots



# Dutch elm disease

Disease Biology

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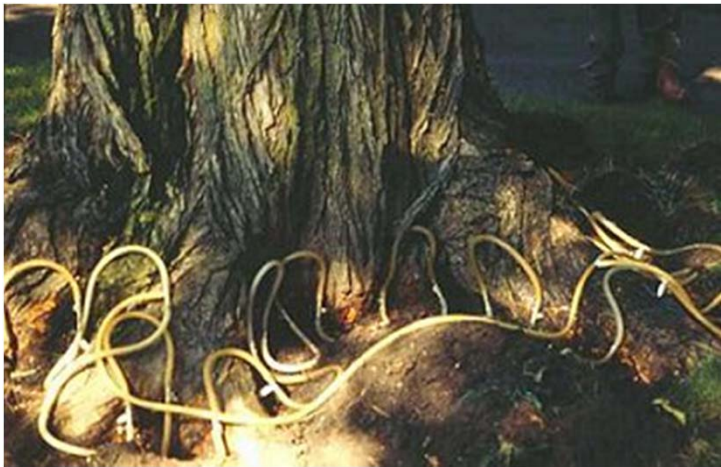
- Elm bark beetles are vectors,
- Also spreads through root grafts,
- Inoculum forms in beetle galleries,
- Every tree source of inoculum.



# Dutch elm disease

## Management

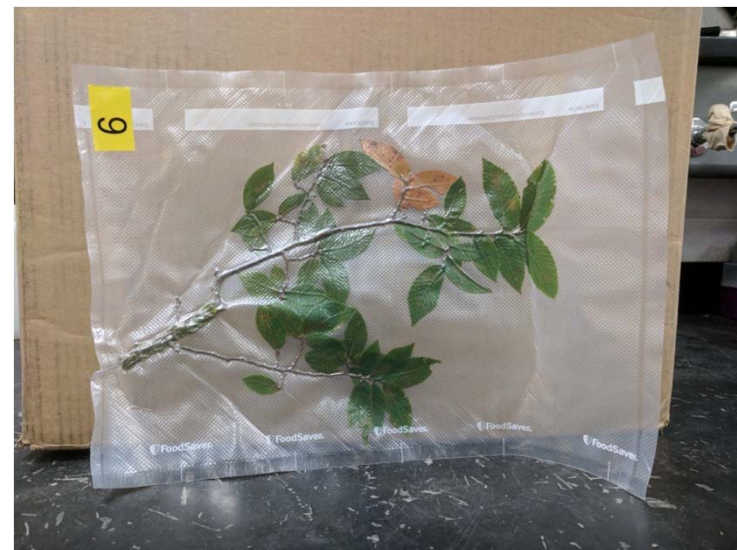
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- Detection,
- Isolation,
- Removal,
- Disposal,
- Injection,
- Host resistance.

# Sample 35 = Native elm wilt

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# Native elm wilt

Often confused with Dutch elm disease

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- Causal agent = *Dothiorella ulmi*,
- Old disease,
  - known in North America since 1929,
  - affects most *Ulmus* spp.,
  - resembles DED,
- Wilting, curling, chlorotic foliage,
  - brown diffuse streaking in branches,
  - may also cause flat cankers on twigs,
- Available controls are limited,
  - remedial pruning,
  - stress management, particularly drought.



Figure 42-2. Close-up of wilting foliage affected by *Dothiorella*, showing curling of leaves.



Figure 42-3. Brown streaks in wood of elm with *Dothiorella* wilt.

# Sample 16 – Bacterial leaf scorch

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# Bacterial leaf scorch is caused by:

- A. *Cryphonectria parasitica*,
- B. *Xylella fastidiosa*,
- C. *Armillaria mellea*,
- D. *Xanthomonas arboricola*.



# BLS on Cedar elm

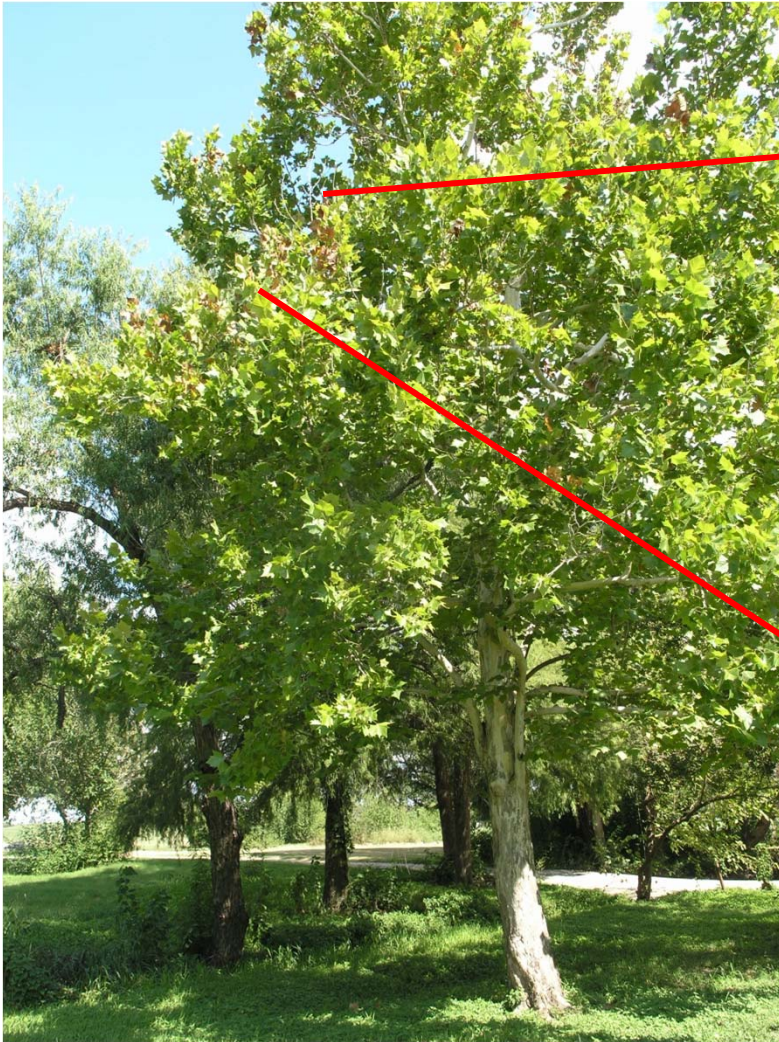
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**Vector-Glassywinged Sharpshooter**

# BLS on Sycamore

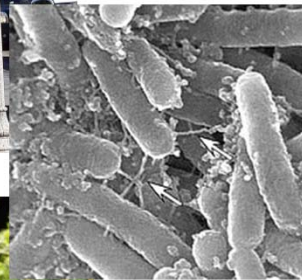
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# Bacterial Leaf Scorch

Pathogen, Hosts

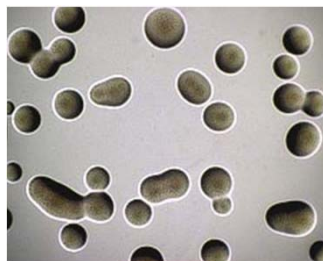
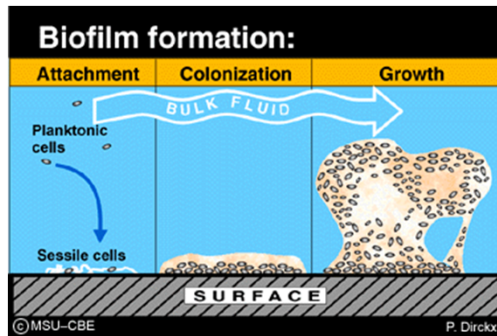
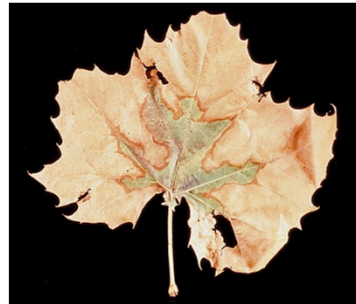
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- *Xylella fastidiosa*,
- Xylem limited, fastidious bacterium,
- Many different strains,
- Oaks, elms, sycamores, mulberry, catalpa, maple, birch, sweetgum, many fruits

# Bacterial Leaf Scorch

## Disease Biology



- Spread by insect vectors,
- Produces biofilms,
- Sharpshooters,
- Limited by low temperatures,
- Stress probably involved to some degree.

# Bacterial Leaf Scorch

## Management



- Best Practices to maintain tree health,
- Proper diagnosis critical,
- Vector management,
- Antibiotic injections (?),
- Treatments to improve stress response,
  - Cambistat®

**Cambistat 2SC**  
Improve the Durability of Urban Trees

**Tree Size Maintenance**  
Vegetative growth is reduced by approximately 50% over 3 years. The energy can be redirected to root development, defense, and storage.

**Heightened Tolerance to Drought, Heat, and Cold**  
Trees treated with Cambistat® have greater ability to withstand adverse climatic conditions. They also conserve their resources more effectively during drought.

**Improved Root to Crown Balance**

**Root System Enhancement\***  
A root system with greater capacity to explore the soil for water and nutrients will improve a tree's durability under all urban stress situations.

**Greater Defense to Insects and Disease**  
Studies show that plants treated with Cambistat® have less severe spotted leaf and disease issues than untreated controls at urban stress situations.

Do you struggle with what to do about trees planted too close to homes, streetsights and powerlines or with limited or damaged roots? Cambistat® is a proven growth regulator that can be a powerful tool to help you care for these trees.

When using Cambistat, a tree's vegetative growth equals the amount of one year over a three year period. By reducing that top growth, the tree has more energy for root growth, defense, and a better ability to combat all stresses it may occur.

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# Sample 32 = Crown Gall

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# Crown Gall

The “genetic engineer”

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- The bacterium *Agrobacterium tumefaciens*,
- Soil inhabitant,
- Extremely wide host range,
- Woody ornamentals, fruit crops, forest trees,
- Unusual mechanism of pathogenesis,
  - genetically transforms plant cell,
  - leads to gall formation.



# Crown Gall Control

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- Nursery:
  - Steam soil (at 140°F for 30 minutes) or solarize (double-tent at 160°F for 30 minutes or 140°F for 1 hour),
  - Sanitation – clean cutting tools,
  - Biocontrol = The K-84 strain of *Agrobacterium tumefaciens* (formerly *A. radiobacter*),
- Native trees:
  - Do NOT cut gall away from tree.

# Sample 23 – Pine x oak rusts

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*Cronartium  
quercuum*

*Cronartium  
fusiforme*

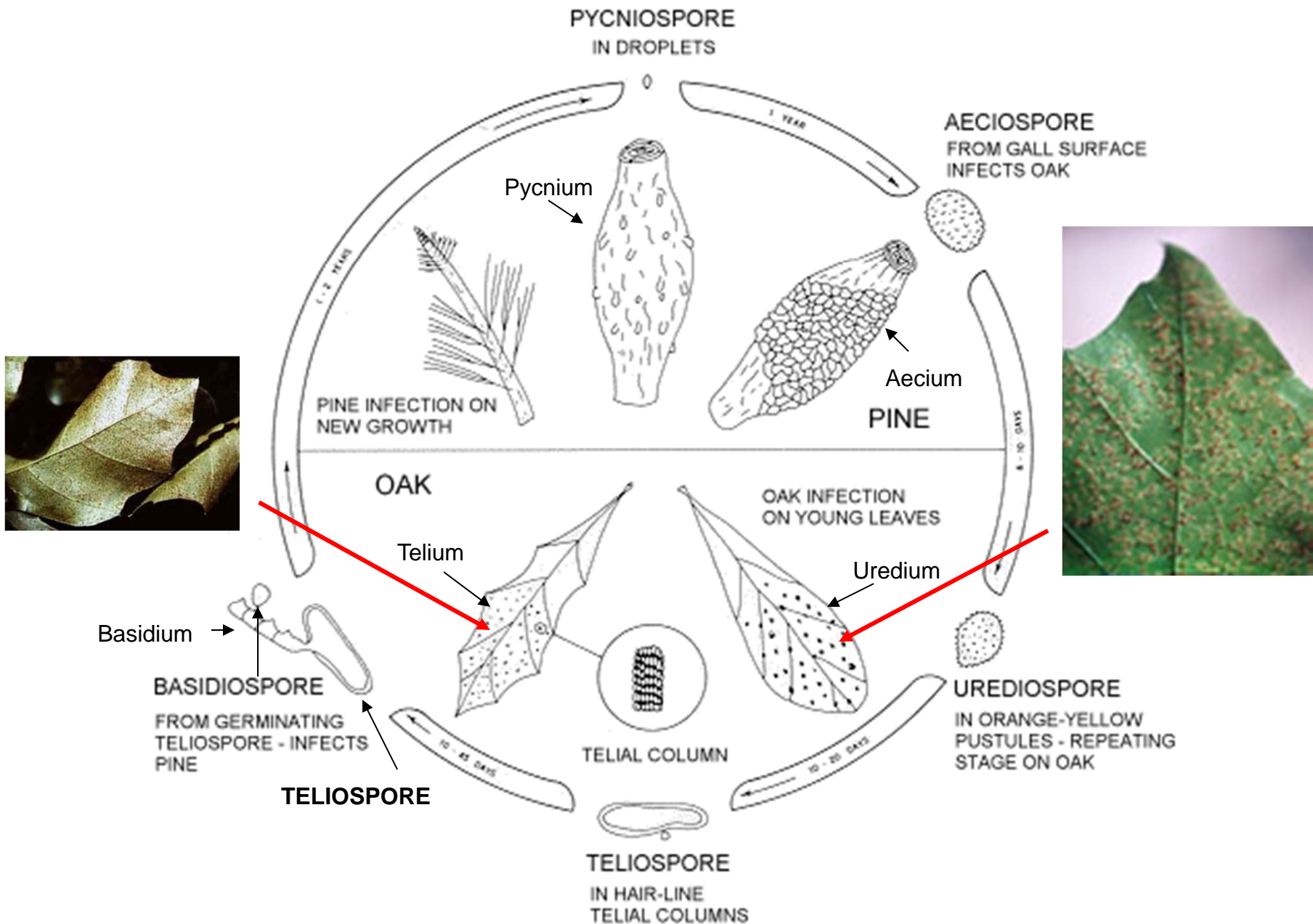


# The Pine x Oak rusts

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- Special group of diseases with complex life cycles
  - *Cronartium* spp.
  - An “obligate” parasite,
- Two alternate hosts: *Pinus* and *Quercus*,
  - Red oaks,
  - Loblolly and slash pines,
- Considered to be the most serious disease of southern pines.

# LIFE CYCLE OF *Cronartium fusiforme*



# Control of pine x oak rusts

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- Remove alternate host (the oaks),
- Can spray in nurseries,
- Remedial pruning,
- Resistance breeding.