What's Causing Oak Decline?

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CAES

Oak Decline

- A complex interaction of abiotic stress and pests
  - Environment
    - Drought
    - Climate change
  - Insect
    - Red oak borer
    - Two-lined chestnut borer
  - Disease
    - Foliar diseases
    - Canker diseases
    - Vascular diseases
    - Root rot diseases

Foliar Diseases

Joseph OBrien, USDA Forest Service, Bugwood.org

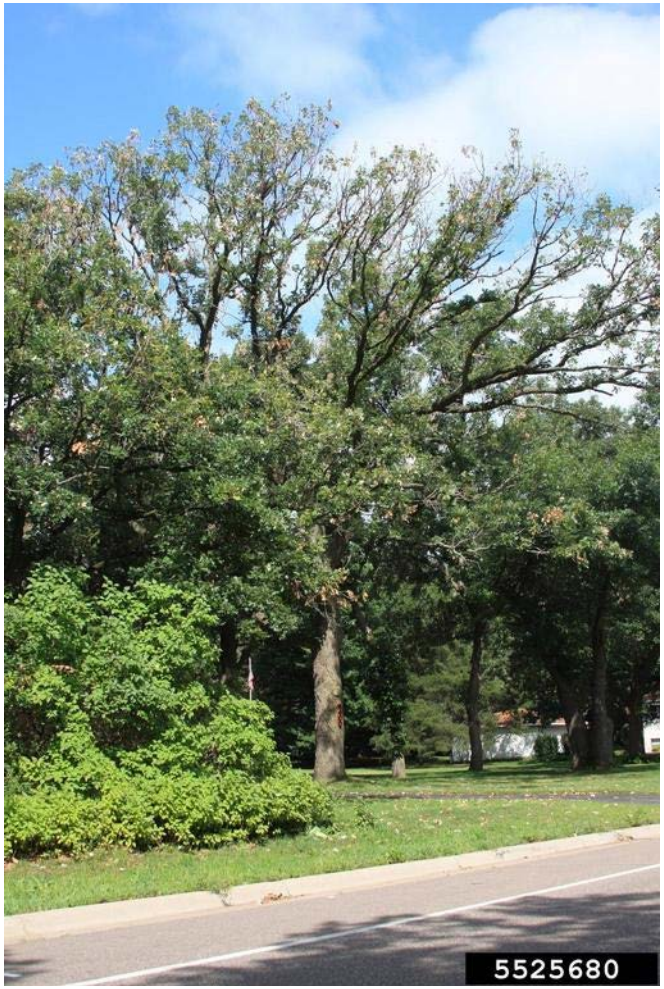
Anthracnose
(*Apiognomonia errabunda*)

Foliar Diseases (cont.)

Leaf blister
(*Taphrina caerulescens*)

Foliar Diseases (cont.)

Bur oak blight
(*Tubakia iowensis*)



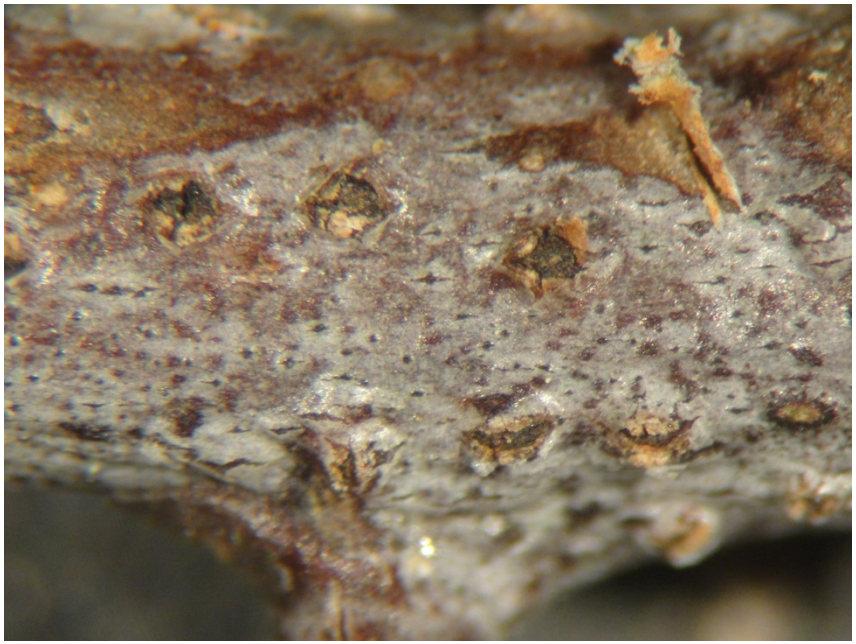
Steven Katovich, USDA Forest Service, Bugwood.org

Foliar Diseases (cont.)

Powdery mildew
(*Microsphaera alphitoides*)

https://apps.extension.umn.edu/garden/diagnose/plant/images/oak/disease/pmildew3_600px.jpg

Canker Disease



Botryosphaeria canker (*Botryosphaeria* sp.)

Vascular Diseases

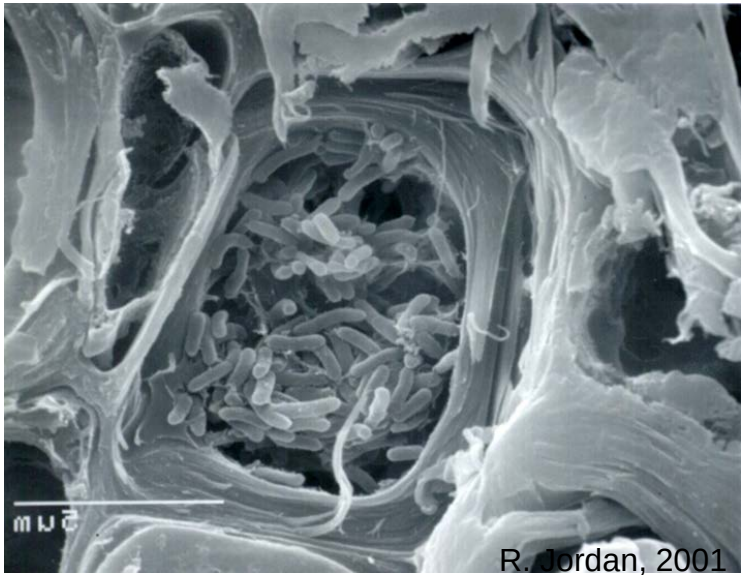
Oak wilt (*Ceratocystis fagacearum*)

Vascular Diseases (cont.)

Bacterial leaf scorch (*Xylella fastidiosa*)

Vascular Diseases (cont.)

- Vascular disease - xylem
- Transmitted by insects
  - Leafhoppers
  - Treehoppers
- Host
  - 359 plant species in 75 families (EFSA, 2016)
  - Oak, maple, sweet gum, elm, sycamore, ash, dogwood
  - Infected trees can decline and die in several years


R. Jordan, 2001

Blue green sharpshooter

Vascular Diseases (cont.)

- Hosts
  - *Quercus robur* (pedunculate oak or English oak)
  - *Q. petraea* (sessile oak)
  - *Q. cerris* (turkey oak)
- Description
  - Dieback and decline in Europe (1900s)
  - Decline over 3-5 years - named 'Acute Oak Decline' (AOD) (2009)
- *Insect*
  - *Agrilus biguttatus* (two spotted oak borer)
- Bacteria (Brady et al. World J. Mirobiol Biotechnol, 2017)
  - *Gibbsiella quercinecans*
  - *Brenneria goodwinii*
  - *Rahnella victoriana*
- Drought stress

Denman et. al. Forestry 2014;87(4):535-551

Vascular Diseases (cont.)

Denman et. al. Forestry 2014;87(4):535-551

Acute oak decline

Vascular Diseases (cont.)

Denman et. al. Forestry 2014;87(4):535-551

Root Rot Diseases

Theodor D. Leininger, USDA Forest Service, Bugwood.org

Armillaria root rot

Root Rot Diseases (cont.)

Joseph OBrien, USDA Forest Service, Bugwood.org

Armillaria root rot

Root Rot Diseases (cont.)

Joseph OBrien, USDA Forest Service, Bugwood.org

P. cinnamomi

Phytophthora root rot

Root Rot Diseases (cont.)

Phytophthora root rot of Fraser fir

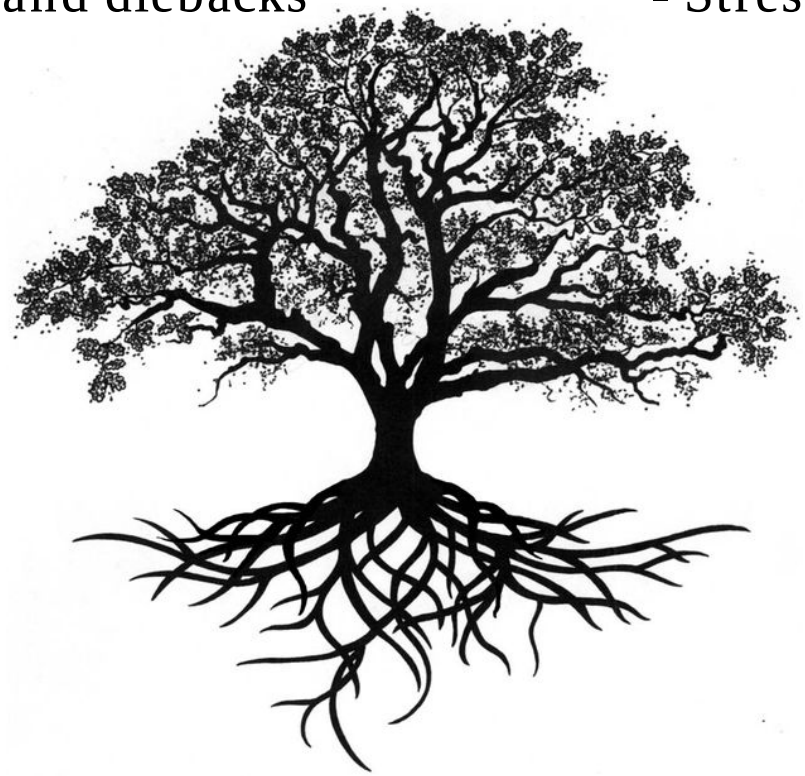
Root Rot Diseases (cont.)

Phytophthora root rot of Fraser fir

Summary

Foliar and canker diseases
- Early defoliation and diebacks

Drought and warm winter temperature
- Stress and physical injury



Soil-borne diseases
-Vascular and root rot diseases