Introduction

- Historical significance
- Oak today
- Adaptations
- Disease complex biology and life cycle
- Strategies
- Health Management Plan
Lumber industry relies heavily upon
- Represents 38% total hardwood volume
- 9% total sawtimber volume

Over 60 species

Versatile
- Wood products include high value veneers to railroad ties
- Aesthetically valuable
- Wildlife
- Urban environments

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Oak increases during post-European settlement (18th and 19th centuries)
- Land Clearing and Logging
- Fire
- Chestnut Blight
Northern red oak occurrence & ring width increases
20th century declines
- Fire suppression
- Urbanization
- Disease
Management Objective

Small woodlot management of northern red oak for lumber and wildlife habitat
Northern Red Oak
*Quercus rubra*

- **Range:** Covers much of the East and Midwest from Georgia to Canada

- **Common forest types:** White pine-Northern red oak-Red maple and White oak-Black oak-Northern red oak

Figure 1: Range of *Quercus rubra*. Photo courtesy of the U.S. Forest Service
Tree Adaptations

- Monoecious
- Intermediately tolerant
- Recruitment intensified post-disturbance through advanced regeneration/sprouting
- Long-lived (150-300 yrs)
- Mesic, well-drained upland slopes ideal
  - Competition limiting factor
- Will grow on poorer sites
  - Reduction in vigor
Precipitation and Temperature

- Mean annual rainfall: 30” in the northeast – 80” in the southern Appalachians
- Drought sensitive
- Mean annual temp: 4 – 16 degrees Celsius
OAK WILT FUNGUS

Ceratocystis Fagacearum
First detected in 1881 in Wisconsin
First formally described in 1944
Now present in 24 states
Origin is unknown – thought to be introduced via a single entry from Mexico or Central to South America
Invasive pathogen affecting 33 species of oak
Red oaks most susceptible
Figure 2: Distribution of oak wilt fungus (2009). Photo courtesy of the U.S. Forest Service.
Transmission:

Tree killed by oak wilt

Fruiting mats

Sweet odor

Nitidulid

Wow - that smells good!

Yum! that was sweet!

Vector transmission:
Oak bark beetles make feeding cavities in twigs. Nitidulids are attracted to fresh wounds.

Root-to-root spread through grafts
Insect vector introduces spores to healthy tree through wounds in spring

Fungal mats form fall and spring under bark – produce perithecia and ascospores and conidia (only within 1 year after tree death)

Spore infiltrate vascular tissue, stop transpiration

Xylem vessels become blocked and tree dies rapidly (weeks to months)

Endoconidia produced in roots – spreads to other oaks via root graphs
Symptoms:

- Wilting of leaves (top → down)
- Disease Centers
- Death within months
Predisposing Factors

- No natural resistance
- Reduced vigor from poor sites
- Ring porous vessel elements
- Monocultures/ Dominance of northern red oak in the forest (this is where root grafting is common)
- SPRING injuries and pruning
Inciting Factors

- Beetle inoculating trees through wounds
  - By accident
  - Unlike DED
- Fungus transmission via root graph
No contributing factors necessary
Health Management Plan – Pre-emptive Strategies

- Increase vigor
  - Site
  - Spacing
- Polycultures
Health Management Plan – Pre-emptive Strategies

- Quarantine
- Education
Avoid harvesting or pruning during the spring
  - If trees are wounded, cover with wound paint
Health Management Plan – Monitor and Survey

- Monitor for wilt symptoms in early to mid-summer
- During harvesting ops, look for signs of residual damage
Health Management Plan – Reactive Strategies

- Insert trenches
  - Primary line: all symptomatic trees and inner row of non-symptomatic
  - Secondary line: all symptomatic trees
- Destroy dead/dying trees
  - Mats can form on fallen trees
Success Story!!

- Community and government collaborative effort
- 3 active infection centers
- Tree cutting and chipping
- Successful eradication

Tree cutters remove infected oak trees from a neighborhood in Glenville, NY. (Photo by NY DEC)
Conclusion

- Oak fills an important economic and ecological niche
- Oak Wilt Fungus is lethal to northern red oaks
- Avoiding tree injury in the spring is the only way to prevent
- Maintain tree vigor by:
  - Appropriate site and stocking
  - Don’t harvest or prune in the spring when vectors are prevalent
- Monitor wilting symptoms
- Prevent the spread
  - Destroying infected trees prior to mat formation
  - Stop transport of oak firewood from areas prone to oak wilt
References


QUESTIONS?