RESTORATION OF THE AMERICAN CHESTNUT

SARA FITZSIMMONS – PSU AND TACF

OHIO FORESTRY ASSOCIATION
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AMERICAN CHESTNUT
American Chestnut: The Tree

- High-value timber species
- Nuts valuable to wildlife
- Tannins used in tanning leather
American Chestnut: The Tree

- Nuts valuable to people and livestock
- Culturally significant
Chestnut Blight

First identified NYC in 1904

Fungus - *Cryphonectria parasitica*

a girdling canker

Spread quickly, functionally wiped out chestnut as overstory tree by 1950’s
Spread of the Chestnut Blight

Approximate movement of 20 to 50 miles per year because of American chestnut’s density and almost complete susceptibility to the blight.
Early Restoration Attempts

Replace with Chinese chestnut trees

Backcrossing to Chinese

Cultural methods –

Tree surgery
Fungicide
Forest gap barriers
Restore the American chestnut tree to its native range.

Tremont Falls, Tennessee, 1920

photo courtesy Great Smoky Mountains National Park Library
How to Make a Disease-Resistant American Chestnut?

3BUR

Breeding, Bio-control, and Biotechnology United for Restoration
Breeding
BioControl

Uninfected Bark

Non-lethal Canker
Infect the **Fungus** with a **Virus**

- **Virulent**
  - no virus
- **Hypovirulent**
  - virulent **virus**
- **Hypovirulent**
  - weak **virus**
Biotechnology
Permitting

- Looking to deregulate in the next 2-5 years.
- Depends on regulatory approval by EPA, USDA, and FDA
Volunteers and Citizen Scientists are Key

• Record over 25,000 volunteer hrs / year
STRATEGIES FOR CADE
CONSERVATION
Natural Ranges of the American Chestnut and Allegheny Chinkapin

Legend
- Intersection of Ranges of American Chestnut and Allegheny Chinkapin
- Natural Range of the American Chestnut
- Natural Range of the Allegheny Chinkapin

Dane and Sisco, 2014
Current Status in the Wild

Current Status of Wild CADE

- Dalgleish et al. *Forests* 2016, 7, 4
  - 430 Million Trees
  - ~84% sprouts < 1” dbh

- Appalachian Trail Mega-Transect Data, http://ecosystems.psu.edu/research/chestnut/reports/mega-transect
  - 18,376 trees counted
  - Only 107 were > 4” dbh (0.5%)
Finding Flowering Trees

0.5% of 430M
~2M

Need two flowering trees together

Need full sunlight
Species Comparision

Top side of leaves:

Top row: Allegheny chinquapin

Bottom row: American, Chinese, European and Japanese chestnuts

Underside of leaves:
• Find the trees
• volunteers and public
• Verify species
• Staff and trained volunteers
Finding Flowering Trees
Storage
Dane and Sisco, 2014
- Locations, not trees
  - Clearcuts, etc.
- Locations known vs. Unknown
- ~50% around Meadowview
Where to Find Trees in Ohio?
Disease Management
Three Methods of Conservation

Nuts

Transplants

Grafts
Three Methods of Conservation

Nuts

Transplants

Grafts
Three Methods of Conservation

Nuts

Transplants

Grafts
Haun Chestnut Harvest
Commercial Production of Raspberries and Chestnuts
Questions?
Email: sff3@psu.edu
Phone: 814-863-7192
In Situ Conservation

- Habitat Management
  - Clearcuts for perpetual sprouting
In Situ Conservation

- Habitat Management
  - Clearcuts for perpetual sprouting

- No planting and observation of a large area e.g. National Parks

Santoro, 2013

Figure 2: Location of the 57 large trees in Shenandoah used in this analysis and trails hiked to find them.
Ex Situ Conservation

• Challenges of vegetative propagation
  ○ Doesn’t readily root
  ○ Delayed graft incompatibility and blight infection
  ○ Tissue Culture on embryos

• Challenges of seed storage
  ○ Viability drops significantly after first 6 months.
  ○ 2 years, max
Plantings

• Public / Private Partnerships
• Over 100 locations
• 1983-present
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