

Solutions for Rare and Threatened Eastern North American Native Woody Plants

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GO NATIVE Tree Farm

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Overview

- Introduction: species of concern
- American chestnut (*Castanea dentata*)
- American elm (*Ulmus americana*)
- Flowering dogwood (*Cornus florida*)
- Ash (*Fraxinus* sp.)
- Canadian hemlock (*Tsuga canadensis*)
- Black walnut and butternut (*Juglans* sp.)
- Hickories (*Carya* sp.)
- Conclusions and recommendations

Abstract

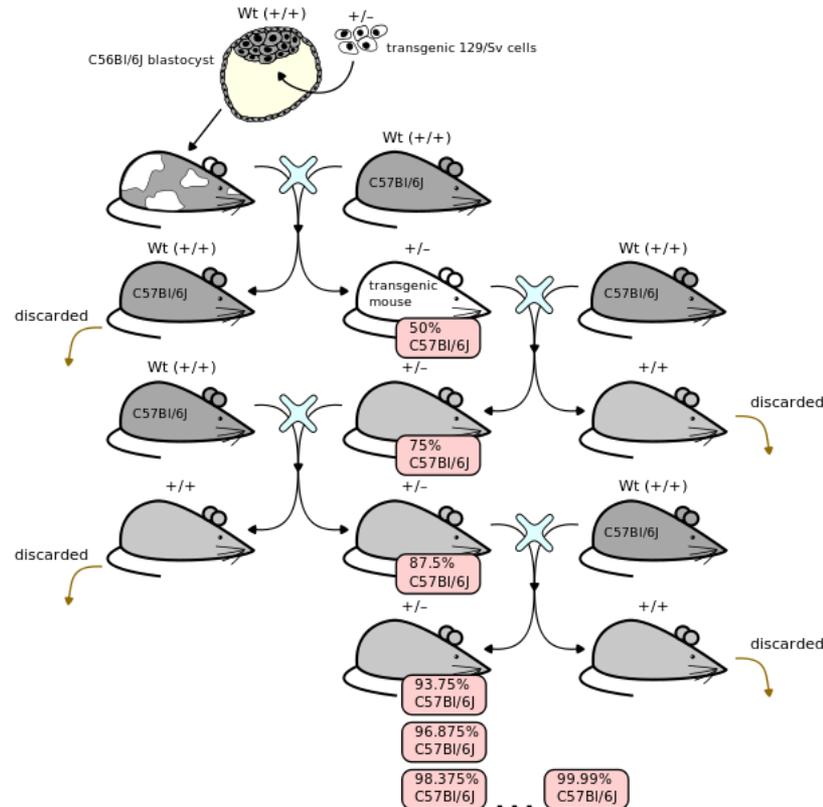
Eastern North American forest species are being besieged by an increasing number of invasive pest threats. An overview is presented of the most notable of these problems. Moreover, in most cases there is ongoing work to provide solutions to the problems. Some of these efforts are well known, but others are less well recognized. The purpose of this presentation is to review the eastern North American tree species of most concern, to identify the specific related threats, and to provide recommendations to the native plant community to provide recovery options.

American Chestnut

- The problem: chestnut blight fungus (*Cryphonectria parasitica*)
- The results
 - four billion trees died.
 - About 40 old survivors remain (1 in 100,000,000)
- Concepts for species recovery

American Chestnut: Four Concepts for species recovery

1. Backcrossing with Chinese chestnut: The American Chestnut Foundation (TACF)

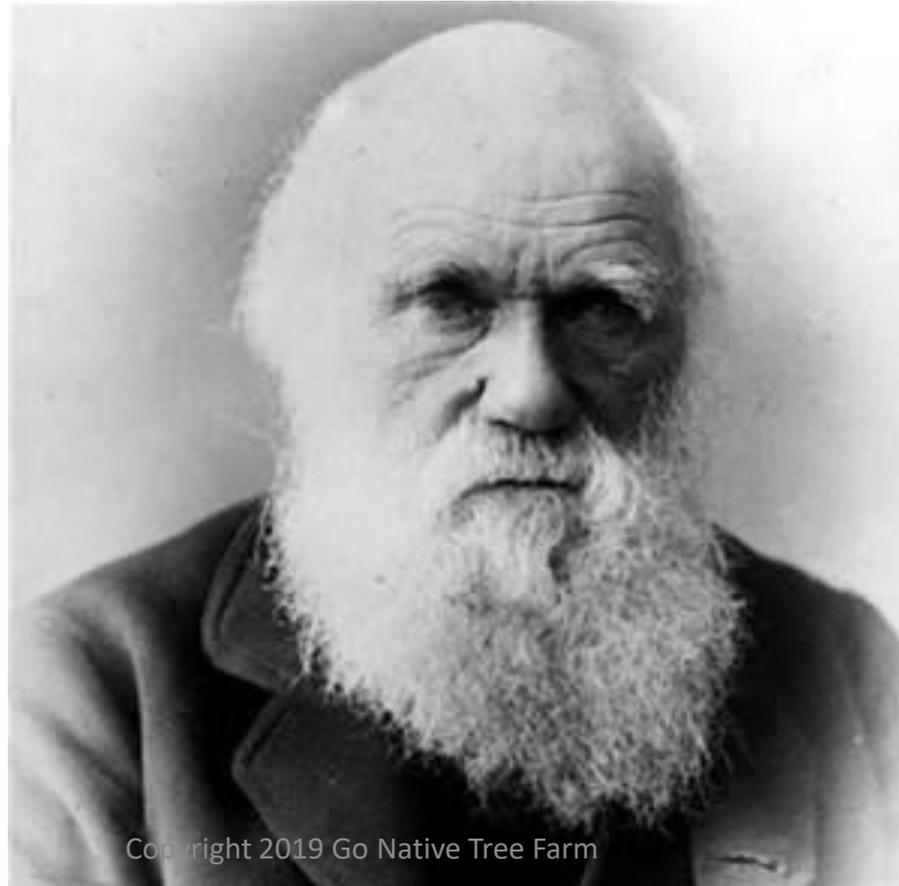


American Chestnut: Concepts for species recovery

species recovery

2. Natural selection /selective breeding.

Charles Darwin



American Chestnut: Concepts for species recovery

3. Genetic Weakening of the Fungus via Inoculation.
A hypovirulent form of the fungus has been released into the eastern forest by TACF and others.



American Chestnut: Concepts for species recovery

4. Gene altering (GMO). Dr. William Powell /SUNY ESF.

- New and controversial.
- Technically a new species is being created.

Genetically modified organism.

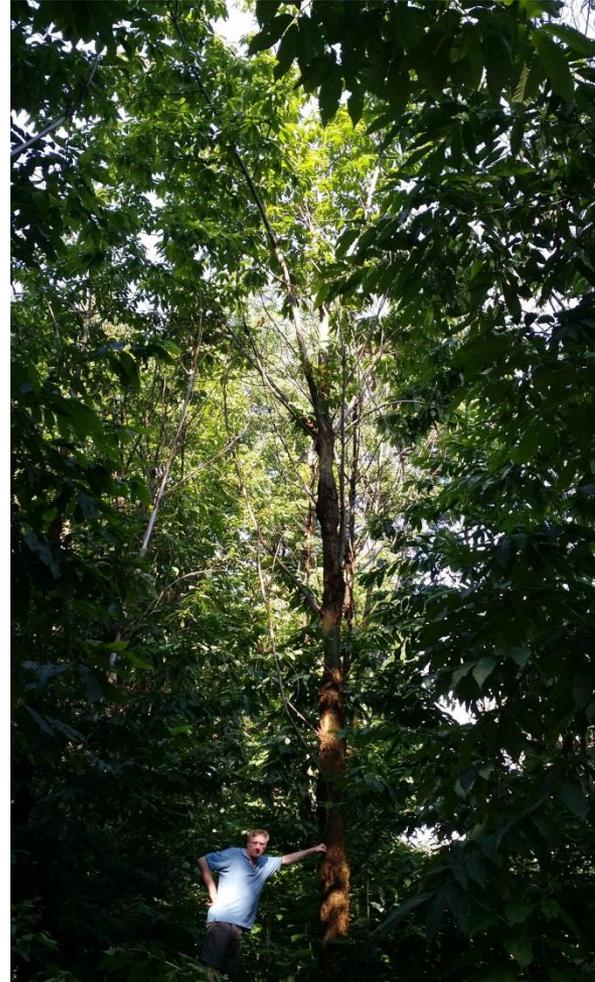


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American Chestnut: Concepts for species recovery

- Our preferred approach: natural selection
- We obtained 50 seedlings in 2001 from ACCF. The plants came from manual pollination of two of the forty old survivors.
- After nearly 20 years, three blight resistant trees resulted. Measured for PA Big Trees web site in 2019.
- Trees are over 50 feet tall and over 12" caliper.
- We collect about 1000 nuts/year. These are third generation old survivors. Plants are being propagated for forest recovery. 70% show blight resistance.
- Third generation seedlings are available for sale.

American Chestnut: Concepts for species recovery



American Elm: Concepts for species recovery

- The problem: Dutch elm disease.
- The result:
 - Over one billion trees died.
 - about 5000 old survivors remain (1 in 100,000)
- Concepts for species recovery

American Elm: Concepts for species recovery

1. Cutting grown plants from resistant trees.
 - Liberty, Valley Forge, Princeton, Etc.
 - These are CLONES.
 2. Seed grown plants from old survivors.
 - Our preferred approach.
 - Source: grove of healthy trees on Columbia Avenue, Lancaster, PA.
 - Oldest tree is six feet in diameter, ca. 1777.
 - Measured for PA Big Trees web site in 2018.
- Conclusion: plant seed grown trees from resistant parent trees.

American Elm: Species Recovery

Seed Grown Plants from Grove of DED Resistant Old Survivors



From PA Big Trees Web Site:

- Height: 83 feet
- Spread: 111 feet
- Diameter: 5.8 feet
- 3321 Columbia Avenue, Lancaster
- Largest *Ulmus americana* in Lancaster County, PA

Flowering Dogwood

- The problem: dogwood anthracnose (*Distula destructiva*) is an Asian fungus brought to NA 50 years ago on Kousa dogwoods.
- The result: Over one billion dogwoods died in the forest understory.
- Recovery solutions.
 - Natural selection has not been apparent.
 - Plant them in sunny breezy locations. The fungus does not like such locations.

Canadian Hemlock

- The problem: Hemlock wooly adelgids, a Eurasian insect.
- The result: up to one billion trees died.
- Recovery solutions.
 - Plant them in sunny breezy locations. The adelgids do not like sunny breezy locations!
 - Predator beetle species are being evaluated and bred for pest control. PA is involved in this work. Available for sale.
- Both approaches are good.

Ash (*Fraxinus* species)

- The problem: emerald ash borer, a Eurasian insect.
- The result: up to one billion trees are dead and/or dying.
- Recovery solutions.
 - Plant blue ash (*Fraxinus quadrangulata*). Recent work has shown this species is largely unaffected. (shorter term solution)
 - Predator species are being evaluated and studied for pest control, i.e. parasitic wasps. (longer term solution).

Walnuts and Butternuts

(Juglans species)

- Problem # 1: Thousand canker beetle, a Eurasian insect.
- Problem #2: butternut canker, a Eurasian fungus.
- The result: up to one billion trees are dead and/or dying.
- Recovery solutions.
 - States are creating Juglans quarantine zones.
 - Natural selection may be benefiting the butternuts from butternut canker.
 - Parasitic insects are being evaluated for TCD.
 - DON'T stop planting walnuts and butternuts.

Hickories (*Carya* species)

- Problem : Forest clearing has eliminated them from most areas; they do not naturally recover quickly. Conservation /recovery has been slowed by difficulty of propagation from taproot growth habit and difficult transplanting.
- The solution: Plant them back. Improved propagation techniques have been recently developed to handle the taproot constraints. See Go Native Tree Farm web site for illustration of growing techniques.

Conclusions and Recommendations

- An overview has been presented for the primary threats to eastern North American native forest trees.
- The specific threats have been discussed.
- Recovery solutions are being evaluated and pursued by government, plant industry, and academia.
- Questions?