

Abstract

The American chestnut was once one of the dominant trees in eastern United States forests. The chestnut was an important resource, supporting a subsistence lifestyle in many parts of Appalachia and large populations of wildlife. In the first half of the 20th century, chestnut blight drastically reduced American chestnut populations. Many strategies have been employed to restore the tree to its native range. This project explores the viability of both historic and current restoration strategies. My research suggests that the best strategy to restore American chestnut is to create a blight-resistant tree using the backcross breeding method supported by The American Chestnut Foundation. This method is expensive and once blight-resistant seedlings are developed, introducing them into the forests will present a host of additional problems. The great support of TACF members and partner organizations makes overcoming these obstacles possible.

Over 4 billion American chestnut trees spanned eastern U.S. forests, from Maine to Florida, covering an estimated 200 million acres.



The American Chestnut Foundation, April 2010. <<http://www.acf.org/media.php>>
Natural Chestnut Range

The American chestnut:

"Redwoods of the east"

Used in Appalachia as

- A versatile lumber
- Subsistence and market food source
- Fodder for livestock
- Diet for wild game

Chestnut Blight

- A lethal fungal infestation native to Asia
- Accidentally introduced in 1904 on imported Asian chestnuts
- Fungal spores spread wildly and by 1950 virtually all mature American chestnuts died

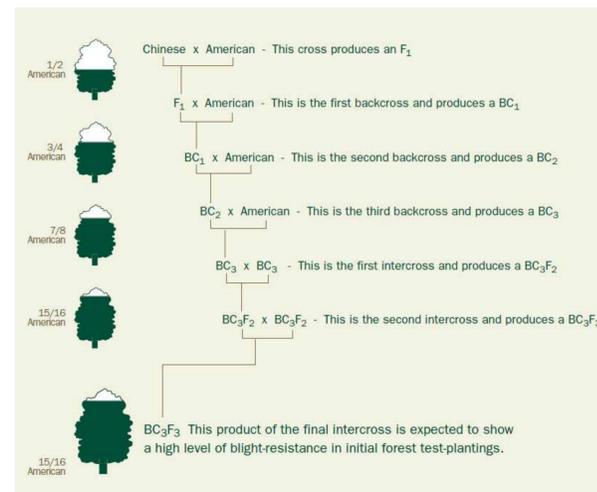


The American Chestnut Foundation, April 2010. <<http://www.acf.org/media.php>>
Blight canker on young trees

Attempted Strategies

- **Spatial Management:** cutting swaths of chestnut forests to quarantine infections
- **Infection Treatment:** applying chemical or biological treatments to individual trees
- **Hypovirulence:** using viruses or bacteria to weaken the blight fungus
- **Transgenics:** inserting genes from another species to increase blight resistance
- **Intercross Breeding:** crossing American chestnut with blight-resistant American chestnuts to produce consistent resistance

A Viable Solution to Blight: A hybrid chestnut tree



The American Chestnut Foundation, April 2010. <<http://www.acf.org/media.php>>
Backcross Breeding Chart

Backcross Breeding Method

Blight resistant Chinese chestnuts are bred with American chestnuts resulting in a F1 that is resistant to blight but dissimilar from American in form.

To increase American appearance, F1 is crossed with American chestnuts three times until BC3 is produced.

BC3 produces seeds that are sometimes blight resistant and sometimes not.

BC3 trees are then intercrossed with other BC3 trees and selected for blight-resistance to increase the consistency of heritable blight-resistance.

The Next Step:

Reintroducing Backcross Trees to Forests

Challenges	Proposed Solution
Hybrid intolerance or excessive vigor in forest ecosystem	Breeding for regional adaptation and seedling monitoring
Lack of genetic diversity	Ex vitro restoration; American chestnut biology
Native and exotic pests	Silvicultural research and invasive species prevention and management
Opposition to land conversion to make room for seedling plantings	Initiatives to use reclaimed coal mine lands
Costs of seedling rearing, establishment, and management	Organizational and individual popular support

Benefits of Restoration

Economic incentives

- Lumber
- Potential food market
- Increased game population

Cultural benefits

- Restoration of a Legacy Tree
- Return of important cultural symbol
- Invasive species management success story

A Win-Win Situation

Every year, thousands of acres of Appalachian lands are reclaimed from retired coal mines and need to be restored. Chestnut seedlings thrive on this well-drained disturbed soil.



United States Office of Surface Mining April 2010. <<http://arri.osmre.gov/AC/OS08.shtm>>
Planting chestnuts on reclaimed coal mines

Conclusion

Victory over the blight: Experts expect the first blight-resistant chestnut seedlings will be ready within the next decade.

Outlook: Despite challenges, restoration of the American chestnut will be successful in many parts of its native range. The greatest challenges the tree faces are not insurmountable in theory. Restoration supporters that include dedicated groups and individuals will provide the resources necessary to restore the chestnut to eastern forests.

Acknowledgements:

Thank you to Dr. Jean Lavigne and Dr. Troy Knight for guiding and reviewing my research, and to all the interviewees who helped shed light on the latest chapter in the chestnut story.

