Mammoth Cave International Center for Science and Learning

Mammoth Cave National Park
Western Kentucky University

Restoring American Chestnuts to Mammoth Cave National Park

Research Project Summary December 2007

Background:

The American chestnut (*Castanea dentata*) was once an important part of the eastern forest ecosystem. At one time it was estimated that 25% of the canopy trees in the eastern U.S. were American chestnuts. The nuts provided a large, stable, and nutritious food source for wildlife. American chestnuts also provided valuable food and economic resources for rural communities.

In the late 1800s, a fungus was accidentally introduced from Asia. It was discovered in 1906 at the Bronx Zoo when the zoo's American chestnuts began to die from an unknown disease. The fungus produces spores that are spread by wind, insects, and birds. If the spores enter a crack in an American chestnut's bark, the fungus will quickly begin to grow, sending its mycelia into the tree's xylem and phloem; thus cutting off the tree's supply of nutrients. The American chestnut showed little to no resistance and the fungus quickly spread throughout the eastern U.S. By 1950, almost all of the mature American chestnuts in the U.S., literally millions of trees, were dead.

Only a few mature American chestnuts survived. These trees are widely scattered and show signs of past or present battles with the blight – indicating that they have some level of resistance to the fungus. Occasionally, young American chestnuts can be found as root sprouts from blight stricken trees. However, these young sprouts often succumb to the blight within a few years and die, only to be replaced by new sprouts. Researchers and organizations across the U.S. are searching for ways to combat the blight and to restore the American chestnut to the eastern forests.

The Question: Do American chestnuts survive better when planted on north / northeast facing slopes or in canopy openings?

Most American chestnuts currently found within Mammoth Cave National Park are root sprouts located on north / northeast facing slopes. Prior to the blight, young American chestnuts would often grow slowly for many years in the shady forest understory. Then when an opening in the canopy occurred, the trees would grow rapidly in response to the increased light. Which is more important – the direction of the slope or the increased light?

The Project: Plant and monitor American chestnuts on N/NE facing slopes and in canopy openings.

American chestnut seedlings were obtained from the American Chestnut Cooperators' Foundation (ACCF). These seedlings are 100% pure American chestnuts developed through intensive cross-pollination of the surviving mature American chestnuts and their offspring.

A large American chestnut at Mammoth Cave National Park.

Between 2003 and 2006, researchers, volunteers, and National Park Service biologists planted approximately 6,000 American chestnut seedlings in Mammoth Cave National Park. A uniquely numbered metal tag was attached to each tree for identification purposes.

The project was divided into two segments. In 2003 and 2004, the seedlings were planted on N / NE facing slopes. If a canopy opening happened to be found on a correctly facing slope, then it was used. Otherwise, the trees were planted within the existing forested landscape. In 2005 and 2006, the focus was reversed. These trees were planted in canopy openings. If a canopy opening happened to occur on a N / NE facing slope, then it was used. Otherwise, they were planted within any existing canopy opening regardless of the slope.

Volunteers helping to plant American chestnuts at Mammoth Cave National Park.

Preliminary Results: Approximately 58% of the plots have been surveyed. The overall survival rate for American chestnuts planted at Mammoth Cave National Park is approximately 25%.

Thirty out of 52 plots have been surveyed and 25% of the American chestnuts in those plots are surviving. The best growth recorded so far was by a tree planted under the canopy in 2003. The tree was 9 feet tall when it was last surveyed – six feet taller than when it was planted. However, that observation alone does not indicate that trees planted on N / NE facing slopes survive better than ones planted in canopy openings. This is an ongoing project and it will take many years of data collection before we can make any scientific conclusions. Only long-term monitoring will tell us whether the direction of the slope or the increased light provided by canopy gaps is more important to the long-term growth and survival of American chestnuts at Mammoth Cave National Park.

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- Support science-informed decision making.
- Communicate relevance of research and provide access to research knowledge.
- Promote resource stewardship through partnerships.