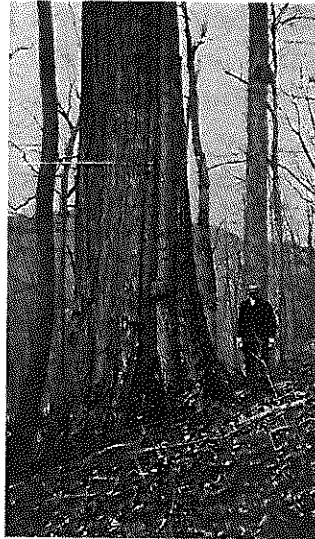


The American Chestnut

Paired text to
Worldwide Loss of Bees!



You've probably never seen an American chestnut tree—at least, not one that's fully grown. But only one hundred years ago, this enormous tree covered the eastern coast of the United States. People constructed buildings from its smooth, glowing wood. They ate nuts from the trees every fall and winter. Now the American chestnut has practically disappeared. Scientists are working hard to find a way to save it—but time is running out.

The American chestnut, *Castanea dentata*, stands tall at almost 100 feet with a trunk diameter of 10 feet. Its wood is hard and naturally resistant to termites and other pests, making it ideal for buildings and furniture. It is a deciduous tree — throughout the seasons the leaves change color from green to orange, yellow and red, making the mountains look as though they are on fire and, eventually, they fall.

When chestnuts were common in the United States, they could be found all the way from the northern tip of Maine to the warm, southern foothills of Mississippi. In some states, like Pennsylvania, 30% of the hardwood forests were of chestnut trees. The total number of chestnut trees in North America was estimated to be at least one billion! Now there are only a few thousand surviving. Scientists are careful to protect them, in the hope that, within these trees' genes, is the secret to saving the species.

What caused the decline of the American chestnut? It all began when travel between continents increased in the past hundreds of years. For thousands of years the chestnut trees in North America were isolated. But as modes of transportation improved, people began to trade with other continents more often.

Though the North American chestnuts had been isolated, they weren't the only chestnut trees in the world. There were also European chestnut trees and Asian chestnut trees. Though these trees are all part of the same species, their genes are quite different. This is because they evolved in different habitats, interacting with different species. Even trees within the same habitat have genes that are a tiny bit different.

Over time, a process called natural selection occurred. In each habitat, trees faced changes in their environment. The trees that were able to adapt to these changes and survive had different genes from the trees that died off. Over thousands of years, this made the species noticeably different. Asian chestnuts co-evolved with a fungus called *Cryphonectria parasitica*. Both Japanese and Chinese chestnut trees are usually able to resist the fungus and are not killed by the infection. But the American chestnut trees had not been previously exposed to this fungus and were especially vulnerable. It is thought that the fungus, commonly known as the chestnut blight, was accidentally brought to the United States around 1900. In 1904, the first American chestnut tree sick with the blight was spotted in the Bronx, a borough of New York City.

The fungus enters the tree through cuts and grows beneath the bark, eventually killing the tree. The first symptom of the fungus is a small orange-brown area on the tree bark which then spreads and grows. These spots, called cankers, split the bark of the tree and gradually kill it.

Before the American chestnut disappeared, it made up 25% of all of the hardwood forests in the Appalachians, the main mountain range in the Eastern United States. The disappearance of the chestnut tree had several negative consequences for the people in this region. Previously, their houses had been built out of chestnut wood. They had relied on the trees for nuts. They had sold the lumber from the trees to make money to support themselves and their families.

Pockets of the American chestnut still survive in the Northwestern United States, where the climate is too cold for the fungus to survive. On the East Coast, chestnut trees still sprout, but they typically die while they are still very young and before they have a chance to produce nuts.

The last large group of surviving chestnut trees is in West Salem, Wisconsin. About 2,500 trees exist there, the descendants of trees planted generations ago by a settler named Martin Hicks. For most of the twentieth century, these trees escaped the blight. But in 1987, scientists found the fungus among them, as well.

Scientists are now working hard to save the American chestnut, but it is a long and arduous process. Surviving chestnut trees are rare and must be protected from exposure to the fungus. In 2008, government officials in Ohio announced they had found an adult chestnut tree in a marsh. Though the officials had known about the tree for seven years, they waited to announce

its existence because they wanted to protect it. The exact location of the tree remains a secret for its own protection from the fungus.

Scientists are trying different approaches to save the American chestnut. Researchers at the American Chestnut Foundation, an organization in western North Carolina, have been cross-breeding the American chestnut with the Chinese chestnut. The goal is to create a tree that has all the characteristics of the American chestnut, but keeps the Chinese chestnut tree's resistance to the blight. Because the Chinese chestnut co-evolved with the fungus, it is not killed by the fungus.

Other scientists are attempting to modify the American chestnut genes to make them resistant to the fungus. Researchers at the State University of New York College of Environmental Science and Forestry have inserted genes from wheat into the American chestnut genes. These genes help (the gene) create an enzyme (a complex protein) that kills the fungus. However, genetic modification is highly controversial. Trees that have been genetically modified need approval from the government before they can be planted in the wild. The scientists doing genetic modification defend their work. They point out that there are around 45,000 genes in the chestnut tree, and the researchers are adding one-to-three additional genes.

But whether the genetically modified trees can be grown in the wild comes down to whether government regulators think those added genes are dangerous. Right now, these trees are only permitted to be planted in specific areas where there is no danger of spreading pollen to other, non-genetically modified trees. From 2006 to 2012, the researchers planted hundreds of genetically modified chestnut trees in Syracuse. They also planted over 150 trees in other New York locations. Each tree begins as a group of cells grown in a Petri dish. It takes two years before those cells are large enough to have a seedling that can be planted in the ground.

Ultimately, these researchers want to repopulate the hardwood forests of the Eastern United States with the American chestnut tree. Chestnuts aren't the only trees from ancient American forests that have nearly disappeared. Elms have fallen prey to Dutch elm disease, a fungus that devastated native elms in both Europe and America (in spite of the fungus's name, it actually originated in Asia, not the Netherlands). The disease was introduced to the United States from Europe in 1930. The disease spread unusually rapidly due to the European elm bark beetle, which spreads the fungus as it feeds on the twigs and bark of elm trees. The white pine tree, native to northeastern United States, was attacked by another fungus called "blister rust." The first sighting of blister rust occurred in New York in 1906, just two years after the first documentation of the chestnut blight.

Collaborations between scientists, government and preservationists may be able to save all of these trees and bring back healthy American forests.

Name: _____ Date: _____

1. What has caused the widespread decline of the American chestnut tree?
 - A global warming
 - B changes in farming habits
 - C a fungus
 - D scientists

2. The passage explains the problem of the declining American chestnut tree population. What step towards finding a solution is discussed?
 - A importing and planting chestnut trees from Europe
 - B moving the remaining American chestnut trees to West Salem, Wisconsin
 - C conducting scientific research into ways to strengthen and protect the trees
 - D building fences around the last remaining chestnut trees

3. Americans are trying hard to save the chestnut tree. What evidence from the text best supports this conclusion?
 - A American chestnut trees have been afflicted since the early 1900s.
 - B The government is tightly regulating genetically modified trees.
 - C People in the Eastern United States used the trees for building houses.
 - D Both scientists and the government are researching ways to protect the tree.

4. Why is it important to save American chestnut trees?
 - A They provide valuable food and building material.
 - B They are a national symbol.
 - C They are the only chestnut trees in the world.
 - D They have soft, flexible wood.

5. What is this passage mainly about?
 - A the various uses of the American chestnut
 - B why so many American chestnut trees have disappeared, and how they can be saved
 - C fungi in Europe and the United States
 - D the dangers of genetically modified trees

6. When describing the American chestnut tree, the author writes: "throughout the season the leaves change color from green to orange, yellow and red, making the mountains look as though they are on fire..."

Why does the author state that the mountains "look as though they are on fire"?

- A To emphasize that chestnut trees are more commonly found on mountains
- B To make the reader think about the effect of forest fires on trees
- C To clarify for readers who aren't familiar with the colors orange, yellow and red
- D To help the reader create a vivid visual image of the tree's leaves

7. Choose the answer that best completes the sentence below.

_____ the American chestnut is close to extinct, collaboration between scientists, preservationists, and the government could be able to successfully save the tree.

- A Even though
- B For example
- C Thus
- D Most importantly

8. Why is the American chestnut susceptible to fungus while the Asian chestnut is not, and how are scientists using this fact to help them create a solution to the problem?

9. Describe some of challenges associated with saving the American chestnut tree using specific examples from the text.

10. Explain whether one should be optimistic or pessimistic about the possibility of saving the American chestnut tree. Use specific evidence from the text to support your argument.
