



AMERICAN CHESTNUT TREE 4H PROGRAM

INTRODUCTION

This booklet is about the American chestnut tree. It was developed by the Virginia Chapter of the American Chestnut Foundation for middle school 4H young people.

The first chapter describes the tree and explains how it was used by our ancestors. It also explain why you do not see many of these wonderful trees anymore.

The second chapter is a story about a family that lived in the Blue Ridge Mountains of Virginia in the 1930s. The dying American chestnut trees had a big impact on Americans, especially those living in the Appalachians.

The third chapter describes a game. It is a board game called the “Chestnut Survival Game”.

The fourth chapter contains instructions for growing chestnuts. Your group will start with chestnuts, store them over the winter and plant them in pots in the spring. Within two months you will have seedlings.

The final chapter has frequently asked questions and answers.

This project would not have been possible without the financial support of the Virginia Chapter of the American Chestnut Foundation Board of Directors, our Chapter President Cathy Mayes who edited this brochure and writer of children’s books Helen Williamson.

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VA Chapter of The American Chestnut Foundation

First Edition

CHAPTER I

DESCRIPTION

You may have never seen this tree because most died many years ago---victims of an imported fungus also called “the blight”.

The American chestnut tree was often described as the perfect tree. At one time there were over four billion American chestnut trees in the eastern United States. The trees grew straight to over 100 feet and provided clear lumber. Other uses:

Split rail fences---chestnut logs are easy to split.

Logs for homes and barns---chestnut wood resists rot.

Railroad ties (sleepers)---chestnut wood is a hardwood.

Leather tanning---chestnut bark was used to make tannic acid.

Food for humans---sweet tasting chestnuts were enjoyed by all.

Food for animals---Every fall, chestnut trees produced more nuts than animals could eat. This got them through the winter.

Unfortunately, sometime before 1904 a fungus was accidentally imported from Japan or China. The fungus spread by spores which traveled with the wind. When the spores managed to get under the bark of the tree, a canker would grow in the cambium. This would choke off all nutrients and water from the roots to the leaves. When this happened, the branch or tree died.

Scientists first discovered the blight in 1904 in New York City. Since the American chestnut tree had no resistance to the fungus, more trees died. The fungus spread over the years and by 1950, the American chestnut tree was rare.

Unlike some other trees, the American chestnut trees were extremely valuable. Scientists and governments tried many methods to stop the spread of this fungus---all unsuccessful.

Finally, scientists decided to try to create a blight resistant American chestnut tree. The Chinese chestnut tree is blight resistant and is closely related to the American chestnut tree. However, the Chinese chestnut tree grows to 40-60 feet tall whereas the American chestnut tree is much taller. Since the early 1980s, The American Chestnut Foundation has been cross breeding American chestnut trees with Chinese chestnut trees (to pick up blight resistant genes). The resulting hybrids are then back crossed with American chestnut trees to ensure American chestnut characteristics are preserved. This cross breeding and back cross breeding has been done many times since the early 1980s. The American Chestnut Foundation now has advanced hybrids. These hybrids will hopefully be as blight resistant as the Chinese chestnut tree but have American chestnut tree characteristics.

CHAPTER II

CHARLIE

By Helen Williamson

Charlie scuffed his feet through the leaves that pooled beneath his favorite chestnut tree. It was late September in the year 1932, and Charlie had just turned twelve. Charlie and his sister, Hattie, who was ten, had come to harvest the nuts that were a cash crop for their family of seven, who lived in a two-room log cabin in the Blue Ridge Mountains of Virginia.

Hattie was anxious to gather the delicious, brown, glossy nuts and bring them to the store to sell. She had grown a lot in the past year and was looking forward to buying a new dress with the chestnut money. And her younger brother, Thaddeus, really needed a new pair of shoes.

But, as Hattie looked under the tree she saw, with dismay, that this year there were very few nuts lying on the ground, bursting out of their spiky burs. Just last year the nuts were so numerous that the family had filled sack after sack with them. This year she would be lucky to fill even one sack to take to market.

Looking up, she saw that several large branches of the tree were dead, their leaves hanging brown and withered.

"It's true, then," she said to Charlie with tears in her eyes. "The trees are dying."

"Yes, chestnut trees are dying all over the mountains," Charlie replied sadly.

"But why? Why are they dying?" demanded Hattie.

"Father says they have a blight that came from China. That's what is causing them to die."

"A blight--what does that mean? Hattie asked.

Charlie drew a deep breath. How was he to explain what was happening. How to explain something that no one really seemed to understand yet.

"A blight is a disease that makes chestnut trees sick," he explained "It's sort of like you getting the measles and then passing the germs on to some of the family. Then our family passes the germs to our neighbors and so on."

Hattie looked confused. "But we don't all become sick," she said. "And why aren't the oaks, and dogwoods, and other trees dying as well?" she demanded. "Why is it just the chestnut trees that are dying?"

"Chestnut trees have no immunity to this blight. They have no way to fight the disease that came from China," explained Charlie. "So they sicken and eventually die. Other trees are immune, that is, it doesn't affect them as much."

Suddenly Hattie began to cry. She couldn't imagine the mountains without the towering chestnut trees. Couldn't imagine springtime without seeing their white blossoms stretching high above all the other trees, and looking as if their tops were tipped with snow. It seemed impossible that these trees could all die. There were so many of them scattered throughout the mountains, dwarfing the other trees in the forests with their height and the breadth of their trunks.

Charlie put his arm around his sister. He, too, found it hard to imagine what life would be like if the trees all died. There were so many ways that the mountain families made use of the tree. He wondered how they would survive without them. Wood from the chestnut tree was highly prized and used for multiple purposes. His family's two-roomed log cabin was built with large chestnut logs. And,

the split -rail fences, that he and his older brothers had helped their father build to keep their animals out of their garden, were all made from chestnut wood as well. Telegraph poles, railway sleepers and barns all used the lumber. Even his grandfather's dulcimer was made from wood from a chestnut tree, and it played the sweetest music.

Charlie's thoughts were interrupted by Hattie's voice. "What will happen to the animals?" she asked in a small voice. "They depend on the nuts for food as much as we do?" Charlie did not know.

Charlie bent down and picked a just- opened bur from the ground. He lifted the three nuts that were nestled tightly inside from their velvety casing, peeled one, popped it into his mouth, and handed one to Hattie. The third he dropped into his pocket to eat later.

CHAPTER III

CHESTNUT SURVIVAL GAME

Each game can be played by one, two or three players at one time.

First, each player selects a token (animal) and is given eight chestnuts. The tokens are placed on the blue line which reads “Plant your chestnuts”.

Players take turns rolling the die. A player places a die into the plastic cup and rolls it on to the board. The player then moves their token the same number of rows as shown on the die. This is similar to the game of “Monopoly”. If the token lands on “Squirrel eats 1 nut,” the player must give up one chestnut. If the token lands on “Weeds slow growth,” the player does not have to give up a chestnut as all their chestnuts would survive slow growth. When the token reaches the point where the winter is over, the game ends for that player. When all players are finished, the person with the most chestnuts wins.

Some players may not know terms such as “germinate,” “browse,” “girdle,” etc. Explanations are on the right side of the board.

CHAPTER IV

GROW A CHESTNUT SEEDLING

Seedlings are small trees which can be planted outdoors. Normally they are grown in pots indoors or in greenhouses. Pollinated chestnuts can be harvested in October. They are then kept in plastic zip bags in a refrigerator over the winter. This winterizes them and keeps them safe from being eaten by deer, raccoons, squirrels and other animals. In the spring roots will begin to grow. Once this happens, you can plant them in pots and watch them grow into small trees.

IN THE FALL:

You will need a gallon of peat moss, 2-3 cups of water, three plastic zip bags and at least 9 chestnuts and a toothpick. The American Chestnut Foundation has a limited number of American and hybrid chestnuts.

Mix 2-3 cups of water into a gallon of peat moss and mix. You want the peat moss to be slightly moist. Place 3-4 chestnuts into a plastic zip bag and add the peat moss. Seal up the zip bag. Use a toothpick to make small holes in the bag. Place the bags in a refrigerator and wait until March..

IN THE SPRING:

The chestnuts need about 2-3 months of cold temperature to germinate. About mid-March take the chestnuts out of the refrigerator. Keep them in the bags and place them outside but protected from deer, mice and other nut eating animals. As temperatures warm you will see tap roots.

Make your own potting mix. To do this mix equal parts of perlite, vermiculite and peat moss. If you have a pH meter, chestnuts like a pH of 4.5 to 6.5 (slightly acidic).

Chestnut trees have deep roots so a tall container is optimum. A one or two quart milk container with the bottom removed will work. A screen in the bottom will keep the potting mix in the container. Fill the container with your potting mix. With two fingers make a hole as deep as the tap root. Place the root in the hole and fill the hole with your mix. Make sure the flat side of the chestnut is parallel to the surface. Cover the chestnut with $\frac{1}{2}$ to 1 inch of potting mix. Add a LITTLE water. Chestnuts are drought resistant and require little water. The best way to kill your seedling is to over water it.

Most of the above information comes from “Growing Chestnut Trees from Seed” by Frederick V. Hebard and Philip A Rutter.

For more information on growing chestnuts from seeds, see:

<https://www.acf.org/ma-ri/the-project/quick-growing-guide/>

Click on the link “here” under “MORE PLANTING INFORMATION”

CHAPTER V

QUESTIONS

1. When and where was the blight found in the U.S.?

Officially, the blight was first noted in the summer of 1904 in the New York Zoological Park by Herman Merkel. This is now known as the Bronx Zoo.

2. What are the Latin names for the Chinese, American, Japanese and European chestnut trees?

Chinese---*Castanea mollissima*.

American---*Castanea dentata*

Japanese---*Castanea crenata*

European---*Castanea sativa*

3. What is the Latin name for the blight fungus?

Cryphonectria parasitica

4. How large were mature American chestnut trees?

Most grew to 50 to 75 feet tall. However, in 2015 a 115 foot American chestnut tree was found in Maine. The trunks of mature American chestnut trees could be anywhere from seven to 20 feet in diameter depending on how the tree grew.

5. Why not cultivate Chinese chestnut trees instead of trying to bring back American chestnut trees?

American chestnut trees have different characteristics than Chinese chestnut trees. American chestnut trees grow taller, produce better lumber and produce sweeter nuts.

6. What is phytophthora?

Phytophthora is another type of fungus. *Phytophthora cinnamomi* will kill American chestnut trees. It is also called “ink disease” because it causes the roots to turn black and slimy. There are many types of phytophthora. One type caused the Irish potato famine in the 1840s.

7. Why weren't chemicals effective in stopping the blight from spreading?

The blight fungus is spread by spores in the air. Chemicals would have had to be sprayed everywhere. This was not practical.

8. What is hypovirulence?

In 1965 a French scientist discovered a virus that made *Cryphonectria parasitica* (the blight fungus) less aggressive. Trees that have this virus are called “hypovirulent.” Applying this virus to trees has been difficult in America as the virus does not spread from tree to tree.

9. Soon after the discovery of the blight many American chestnut trees were cut down so that the fungus would die with it. Why didn't cutting down chestnut trees stop the blight?

The fungus which caused the blight can live in other plants. It is impractical to kill all plants that might host the blight fungus.

10. I saw a small chestnut tree out in the woods. Does this mean the chestnut tree is coming back?

You probably saw a “stump chestnut”. The blight fungus does not live in the ground. Stumps from chestnut trees which died long ago sometimes produce new sprouts. These may live for a few years. However, they will probably be killed by the blight.

11. Will a lone chestnut tree produce fertilized nuts?

No, chestnut trees will not pollinate their own nuts.

12. I saw a “Dunston” chestnut tree in a nursery. What is a “Dunston” chestnut tree?

This tree is part Chinese chestnut tree and part American chestnut tree. The Dunston nuts are large like Chinese chestnuts. It does not grow straight and tall like the pure American chestnut tree. But it produces a large nut and lots of them, so it is a popular variety for people who grow chestnuts for food.

13. What is the nutritional value of American chestnuts compared to other chestnuts?

Compared to Chinese, European, and Japanese chestnuts, American chestnuts have more fiber, protein and fat. However they have fewer carbohydrates. This is as a percentage of dry weight.

14. Do chinquapins get the blight?

Chinquapins which are closely related to chestnuts do get the blight.

15. Is chestnut wood rot resistant?

Yes it is very rot resistant. Some say it is as rot resistant as cedar.

16. Can genetic engineering be used to give American chestnut trees resistance to the blight?

Scientists have injected a gene from a wheat plant into the genome of the chestnut. This causes the American chestnut tree to produce an enzyme called oxalate oxidase (OxO) which breaks down oxalic acid. This acid is produced by the blight fungus. This makes the blight fungus less lethal.

17. Is the American chestnut tree shade tolerant?

Yes, It will grow well in shady areas. If it survives it will grow taller than other trees of the forest. It will then produce shade for less shade tolerant trees. For this reason it is called a dominant or keystone tree of the forest.

18. What kind of soil does the American chestnut tree thrive in?

It grows well in well drained, slightly acidic (pH 4.5 to 6.5) soil. It will not grow in swamps or very wet soil.

19. Is the American chestnut tree drought resistant?

Yes, the roots grow almost straight down and are able to tap into ground moisture during drought conditions. Also, for this reason, larger chestnut trees are difficult to transplant.

20. The American chestnut tree grows well on reclaimed surface mine land. Why is that?

If reclaimed surface mine land is not compacted, it will drain off excess water. American chestnut trees thrive in well-drained soil. Also, mine land is rocky and acidic. Many plants cannot tolerate these conditions. Chestnut trees help break up and sweeten the soil, helping other plants get established.

21. What is the blight fungus and how does it kill the American chestnut tree?

Spores produced by the fungus are usually blown by winds onto a crack in the bark of the chestnut tree. At this stage they are harmless. However, when they can get under the bark the fungus will grow. The fungus grows in the cambium which is just under the bark. The cambium contains the “arteries” of the tree. Once this happens the fungus produces a canker which chokes off water and nutrients from the ground to the tree branches.

22. What are some of the nicknames of the American chestnut tree?

“Mighty Giants”---because of the size of the tree

“The Perfect Tree”---because it produces food for humans and other animals, it is a hardwood, rot resistant and many other qualities.

“King of the Forest”---because if it lives it becomes a dominant tree of the forest.

“The Tree That Made America---because it was used for telegraph poles, railroad ties, log cabins, barns and many other uses.

23. Will the blight fungus make me sick?

No, it is not harmful to humans. The spores are in the air and people breathe them without effect. However, you should probably not eat it.

24. What do American chestnuts taste like?

American chestnuts have a sweet taste. Before the blight, children used them as snacks.

References:

Mighty Giants, An American Chestnut Anthology, The American Chestnut Foundation, 2007

American Chestnut, The Life, Death, and Rebirth of a Perfect Tree, Susan Freinkel, 2007

“The American Chestnut's Genetic Rebirth,” Dr. William Powell, Scientific American, March 2004