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What happened to The Majestic American chestnut Tree? This Magnificent Tree survived in its native habitat for thousands upon thousands of years, and right up almost until the time of my birth in 1944. The chestnut blight was accidentally introduced to North America around 1900, on imported Asian, Japanese or Chinese chestnut nursery stock. In 1905, American mycologist William Murrill isolated and described the fungus responsible (which he named Diaporthe parasitica), and demonstrated by inoculation into healthy plants that the fungus caused the disease. By 1940, most mature American chestnut trees had been wiped out by this devastating imported fungal blight.

The American chestnut, Castanea dentata, is a large, monoecious deciduous tree of the beech family native to eastern North America. The tree ranged from Maine and southern Ontario to Mississippi, and from the Atlantic coast, all through the Appalachian Mountains to the Ohio Valley. The Tree graced the Appalachian Mountains just as the magnificent Redwood adorns California.

Sadly, this once strong and powerful tree had already vanished leaving only the remnants of dead trees remaining in the forest by the time of my birth. Countless memories linger of those mountains where I spent my childhood days exploring the forest and valleys in the foothills of the Appalachian Mountains. Around the age of 10 is when I first becoming aware of this tragic event; my father gave accounts of how impressive and plentiful the massive American chestnut tree had been; He talked about the logging activities around the turn of the century and told me about this American chestnut trees that often grew straight and branch-free for 50 feet among some virgin trees that grew as much as 150 feet tall with trunk diameters up to 14 feet at chest high prior to the massive logging activities that took place at the turn of the century all along the Appalachian Mountain chain. One can only imagine to what extent this expansive and invasive logging activities contributed to the spread of the pathogenic fungal virus, referred to as chestnut blight.

He enlighten me with details as to how a blight inherent to the imported Asian tree had struck our native chestnut tree's immune system and wiped out the once mighty giant. He explains how our native chestnut tree had not developed any defenses against this foreign invader. The blight had suddenly and without warning or knowledge been introduction into the American chestnut trees ecosystem. My father enlightened me with the explanation for this calamity as he explained that in those thousands upon thousands

of years preceding the blight's arrival, an enormously complex set of relationships evolved which tied the chestnut to innumerable bird, mammal, and insect species and other organisms, as well as to rocks, water, soils and fires, but it’s ecological immunity was not prepared for the introduction of this foreign invader, Diaporthe parasitica, the chestnut blight.

Essentially, the American chestnut was tied to the very shape of the hills and mountains on which the trees were found. We spent a great deal of time in the forest in those subsequent years as he explained the history of co-evolution on the North American continent and how it is carried in the genetic material only of the American chestnut, not the Japanese or Chinese chestnut. Unlike the Chinese chestnut, over the course of their millennia of coexistence with the fungus the Chinese chestnut trees acquired the genetic material that confers resistance.

In addition to the American chestnut trees beauty and protection, the tree was also prized for lumber. The wood weighed less than oak and resisted rot similar to that of the giant redwoods of California. Its straight grain made it favorable for woodworking and all sorts of wood products…fine furniture, musical instruments, railroad ties, shingles, paneling, even telephone poles. Chestnut wood was used from cradle to coffin.

The root collar and root system of the chestnut tree have some resistance against the fungal infection. So a large number of small American chestnut trees still exist as shoots growing from existing root bases. However, these regrown shoots seldom reach the sexually reproductive stage before being killed by the fungus. So they only survive as living stumps, or "stools", with only a few growing enough shoots to produce seeds. This is just enough to preserve the genetic material used to engineer an American chestnut tree with the minimal necessary genes from any of the disease-immune Asiatic species to confer resistance to the disease. Efforts started in the 1930s and are still ongoing to repopulate the country with these trees, in Massachusetts and many other places in the United States.

The fungus is spread by wind-borne ascospores and, over a shorter distance, conidia distributed by rain-splash action. Infection is local in range, so some isolated American chestnuts survive where there is no other tree within 10 km. Also, there are at least two viral pathogens that weaken the fungus through a mechanism, termed hypo virulence that helps trees to survive. A small stand of surviving American chestnuts was found in F. D. Roosevelt State Park near Warm Springs, Georgia on April 22, 2006 by Nathan Klaus of the Georgia Department of Natural Resources.

The fungus enters through wounds and grows in and beneath the bark, killing the cambium all the way round the twig, branch or trunk. The first symptom of C. parasitica infection is a small orange-brown area on the tree bark. A sunken canker then forms as the mycelial fan spreads under the bark. As the hyphae spread, they produce several

toxic compounds, the most notable of which is oxalic acid. This acid lowers the pH of the infected tissue from around the normal 5.5 to approximately 2.8, which is toxic to plant cells. The canker girdles the tree, killing everything above it. Distinctive yellow tendrils (cirrhi) of conidia can be seen extruding stroma from the grana in wet weather.

Current efforts are under way by the Forest Health Initiative to use modern breeding techniques and genetic engineering to create resistant tree strains, with contributions from SUNY College of Environmental Science and Forestry, Penn State, UGA, and the US Forest Service. One of the most successful methods of breeding is to create a back cross of a resistant species (such as one from China or Japan) with the American chestnut. The two species are first bred to create a 50/50 hybrid. After the third back crosses of the trees the remaining genome is approximate 1/16 that of the resistant tree and 15/16 American.

The strategy is to select blight-resistance genes during the back crossing, while preserving the more wild-type traits of American chestnut as the dominant phenotype. Thus, the newly bred hybrid chestnut trees should reach the same heights as the original American chestnut.

Research is also being conducted at the State University of New York College of Environmental Science and Forestry, by using the bacterial vector, Agrobacterium tumefaciens, to insert resistance genes from the Asian chestnuts into American chestnut. The inserted genes are present only in the resistant strain, and not in the Native American chestnut, and are tested for their potential to produce blight-resistant trees. Currently, SUNY ESF has over 100 individual events being tested, with more than 400 slated to be in the field or in the lab for various assay tests in the next several years.

Regrettably I only have a picture in the reminiscences of my mind the memories of my youth so many years ago living in the hills of north east Georgia and of the accounts from my father concerning this magnificent tree. Although I will not live to see the reforestation of the virtually pure Native American chestnut tree, my grandchildren will and it is my hope that they will also remember and cherish the accounts past down from an era that was and is gone with the wind.