



AMERICAN CHESTNUT RESTORATION

"They also grew behind my house, and one large tree, which almost overshadowed it, was, when in flower, a bouquet which scented the whole neighborhood, but the squirrels and the jays got the most of its fruit; the last coming in flocks early in the morning and picking the nuts out of the burs before they fell. I relinquished these trees to them and visited the more distant woods composed wholly of chestnut. These nuts, as far as they were, were a good substitute for bread."

– Henry David Thoreau, Walden, (1854)

Grand Dame of the Woods

"Under the spreading chestnut tree the village smithy stands." For us twentieth century dwellers Longfellow's 19th century poem would be foreign both to blacksmith's haunts and chestnut trees. Ranging from Maine to Georgia and across from southern Ontario to Louisiana, at one time about a quarter of the forest cover on the Appalachian range (some say far higher estimates) was the American Chestnut, *Castanea dentata*, a member of the beech family (Fagaceae) that includes beeches, oaks, and Allegheny chinkapins (*Castanea pumila*). With straight timber-type branch-free boles for up to 50 feet, Chestnuts can grow to a hundred and twenty or more feet high with spreading, rounded crowns. The glossy, dark green, prominently veined leaves are 5" to 8" long, 2" wide, canoe-shaped (oblong lanceolate) with a short stem and coarse, bristly teeth on the margins, hence the name, *dentata*. The leaves are sharply tapered at both the base and at the tip. In the spring flowering season (May – July, depending on latitude and elevation) fragrant flowers in slender, erect, unisexual or bisexual catkins (aments) appear after the leaves. The staminate catkins are long and drooping, while the bisexual catkins are shorter with pistillate flowers at the base. In its heyday – in Thoreau's "boundless chestnut woods" -- when the blooming American Chestnut produced "long, creamy flowers, the mountains looked as if their crests were once more covered with snow." The autumn leaves turn a pure gold with velvet-lined prickly burs that yield 3 smooth brown nuts, and the trees generally bear fruit after the seventh year. This tree has been a key component of the eastern forest ecosystem with specimens reported to be 80 to 120 feet high and averaged 3 to 6 feet in diameter with some very old survivors reported to be 13 feet in diameter. Before the blight Chestnut trees had been found sometimes in virtually pure stands of 100 acres or more, and these areas attracted the siting of Cherokee villages in the Southern Appalachians where the largest and most magnificent of the trees were found. But the chestnut could also flourish in a mixed forest with various species of ash, birch, black locust, hickory, maple, oak, and yellow poplar depending on the lay of the land, soil depth, and elevation. They can grow successfully on mountain ridges, in coves, on hills and slopes, and prefer well-drained, deep, moist, and sandy loams.



Versatility

The large highly prized American Chestnut furnished far more than shade and wildlife cover. It was also:

- * A supplier of strong, straight-grained, decay-resistant construction material (cabin logs, posts, poles, split-rail fencing, railroad ties, mine props, wood framing, paneling, turning stock, cabinetry, furniture – including cradles and caskets – and even musical instruments) as well as fuel wood. The wood is softer and easier to work than oak, is easy to split, and doesn't warp or shrink;
- * A source of tannic acid for leather tanning. Some major timber companies in the Southern Appalachians even became subsidiaries of leather companies in order to ensure continued supplies of tannin;
- * Mast for major wildlife populations – black bear, white tailed deer, wild turkey, squirrel, bluejays, grouse, and, historically, Eastern Woods Bison, and Eastern Elk. Farmers also allowed their livestock to graze in chestnut stands, especially cattle and swine;
- * A major part of rural economies – chestnuts were gathered and eaten by Native Americans, and settlers hauled them by the wagon-load to railways where boxcar loads were shipped off to towns and cities to provide a sweet and nutritious treat, fresh, baked, roasted, or as stuffing for turkey and goose suppers. "Chestnuts roasting on an open fire..." created warmth wherever holiday cheer could be found whether in homesteading households or family-oriented neighborhoods.

Decimation

In 1904 a fungus disease, *Cryphonectria* (formerly *Endothia*) *parasitica*, believed imported on Asian Chestnuts in the 1880s reaching the Botanical Gardens in New York City, was reported to have started the slow killing process that primarily hit the American Chestnut but also affected the chinkapins. It was not limited to the point of entry but spread rapidly throughout the natural habitat east of the Mississippi through wind-borne, water- and insect-transmitted spores. The fungus enters the trees through wounds and grows in and under the bark and chokes off the flow of nutrients and water in the cambium layer, effectively girdling and killing the tree. All of the tree's growth above these cankers would die, but the root system was not affected, so sprouts would continue to grow up 20-30 feet tall before the fungus again did its damaging work. A few saplings flower and form seed and in rare cases survivors have been found. Trees would die with a few years of the first infestation. Spores were formed that could cause additional infestation within months of initial infection. It averaged travelling about 20-50 miles of infestation per year and took about five decades to decimate the entire natural American Chestnut range.

White Ghosts of the Appalachians

Older folks still recall the period of massive chestnut kills in the late 1920s. The dead and dying trees would stand grey white in the pale moonlight, resulting in the creation of a massive depressive condition for residents in blighted regions. The hills of their youth were dying before their eyes and much of this occurred during the Great Depression – over 85% of the chestnuts were dead in the Great Smoky Mountain National Park by 1938. The tough wood remained sound for years and even today over a half century after the die-back we still find a host of chestnut stumps in the woods. As a testimony to their rot-resistance, chestnut logs were able to be salvaged from the blighted forests for up to ten years after the trees were stricken. A small borer would attack these standing dead trees chewing a web-work of pin-sized tunnels and created the wood known and prized today as the "wormy chestnut."

Blight-Resistant Strains

Early efforts to develop a blight-resistant strain of pure American Chestnut did not meet with success and trials were all but abandoned by the mid-twentieth century. Some plant pathologists still consider the quest far from complete. However, two researchers, MacDonald and Fulbright, have discovered a phenomenon from Italy known as hypovirulence or a weaker form of chestnut blight fungus which consists of a virus which could be transmitted to virulent strains under certain conditions and allow the trees to survive. This approach is continuing at the Connecticut Agricultural Experiment Station in New Haven, Connecticut and with the American Chestnut Foundation and the American Chestnut Cooperators' Foundation. A second approach is to backcross American and Chinese Chestnut hybrids to American rather than to Chinese Chestnuts. The American Chestnut Foundation was founded basically to breed for resistant chestnuts using this method to try and develop a forest form tree with blight resistance. A third method is to obtain resistant chestnuts by transferring to them resistant genes. This is in the beginning stage but may prove successful in the long run. See Louis Shain, "The Impact of Chestnut Blight on Appalachian Forests," Natural Resources Newsletter, pp. 19-22.

Recent research

In Minnesota researchers have developed crosses of American Chestnut trees that have survived in the upper Midwest with Chinese Chestnut trees, hoping to preserve the good qualities of both species and the latter's fungus resistance. In that part of the country and also in California and selected other alcoves some of the American Chestnuts escaped the blight and by combining the two varieties researchers hope to produce viable, reproductive trees through the maturing young trees. After several crossings and backcrossing the blight-resistant strain should be able to grow unprotected. The project is a long-term one because it takes 60 to 80 years before the tree actually matures.

The American Chestnut Foundation

A number of non-profit organizations exist that are seeking to reestablish the American Chestnut in one or other manner. The largest is the American Chestnut Foundation which was founded in 1983 with 2,200 members and with offices in Bennington, Vermont and state chapters in Connecticut, New York, Illinois, Indiana and Pennsylvania. The ACF maintains the Wagner Research Farm and Glenn C. Price Research Farm in Meadowview, Virginia, where a breeding program is underway to develop a blight-resistant strain of the American Chestnut.

The American Chestnut Cooperators' Foundation

The approach utilized by this group of researchers is the intercrossing of American Chestnuts with those trees which have shown some degree of native resistance to the blight. ACCF's two sites where the first all-American intercrosses have been planted are in Virginia Tech's Martin American Chestnut Planting in Giles County, Virginia, and in Beckley, West Virginia. They have identified previously clearcut forest sites to implement an integrated management plan which involves introducing improved American Chestnuts and hypovirulent strains of the blight fungus combined with managed cutting. ACCF sites are located in the Jefferson and George Washington National Forests in Virginia, the Monongehela National Forest in West Virginia, the Nantahala and Pisgah National Forests in North Carolina, and the Daniel Boone National Forest in Kentucky.

The American Chestnut Restoration Project

Paul Gallimore at the Long Branch Environmental Education Center in Leicester, North Carolina has launched a project to restore the American Chestnuts to the Southern Appalachian Mountains and to educate the public on its importance to the forests of this region. The CRP objective is to recapture a niche and provide food for wildlife as well as to create groves and integrated permacultural plantings for meeting human food needs. He regards the act of planting trees as an act of hope for the future, an act of caring for ecological restoration. He seeks to propagate this species using a backcross of the American chestnut for forest-form and quality of nuts with the Chinese chestnut (*Castanea mollissima*) for blight resistance. Seedlings are available for reforestation and edible landscaping. The headquarters at Long Branch is a large pre-World War I house made and furnished with local wormy American Chestnut wood.

The American Chestnut Regeneration Effort (ACRE)

This new group seeks to obtain a genetic strain that is fungus-resistant. The program has begun in 1997 and consists of building up remineralized soil with full spectrum trace element fertilizers from powdered rock as part of the plant health regimen. Surviving American chestnut rootstock sites are being selected for remineralization. As the sapling flowers and produce viable seed this will be distributed to other interested parties. A third phase consists of restoring the American chestnut to our culture, consciousness and communities through "real Earth healing" by offering prayers for divine guidance and assistance to protect, strengthen and revive the chestnut. People are being encouraged to plant chestnut saplings from seed of remineralized trees – individually and in groves.

What Can Be Done?

Remember the 3 "A"s from the basics of ecological literacy –

1) Awareness, 2) Action, and 3) Advocacy.

- 1) Know how critically important the effort to restore the American chestnut is, then
- 2) Act by planting chestnuts, and
- 3) Encourage National Forests, State Forests, private landowners, schools and other public or private institutions with land holdings to embark on major chestnut restoration efforts.

Here are a few tree planting tips to get you started:

Be sure to pick a site with well-drained soils – chestnuts don't like to keep their feet wet. If necessary, put in drainage systems to ensure that the trees will not be in standing water at any time of the year. Make sure that proximity to power lines won't present any problems, and that the trees are not within 20 feet of other buildings or trees.

Chestnuts will grow most vigorously with as much of full-sun as is possible on your site.

Dig at least a 2-bushel size hole for the root system, and use compost and/or peat moss to hold moisture. The chestnut taproot can grow from 15-50 feet deep, but the majority of the feeder roots are within a foot of the surface. Gently tamp the compost around the roots so that no air pockets remain. If you build up an earthen dam around the drip edge of the tree prior to watering it in, it will take full advantage of the watering. Grasses and weeds will compete aggressively for sunlight, nutrients, and water, so clean-cultivate for at least a 3 foot radius before planting. Continue to keep the area from the trunk to the drip edge free of grasses and weeds with cutting or mulching. Mulching with alfalfa hay (rain-spoiled hay is generally available in the spring and is a lot cheaper than first quality) will help to moderate soil temperatures, smother weeds and grasses, retain moisture in the soil, and provide

nitrogen – can't beat this combo! Tear the bale into 6 inch to 12" "books" and place around the tree in a 3 foot radius, but take care to keep the mulch from being up against the trunk to avoid rodent nesting and decomposition of the tree's bark! Wood chips, leaves, sawdust, cardboard, thick layers of old newspapers (without colored ink inserts) all make excellent mulch material. Due to their deep taproots, chestnuts are remarkably drought tolerant, but will grow with great vigor if they receive at least 1 inch of rainfall or supplemental watering per week until they are fully established. One soaking, heavy watering per week is best as periodic minimal watering will encourage shallow root development.

What else can the Reader Do?

- * Search for and document American Chestnut survivors.
- * Join one or other associations mentioned or start local chapters.
- * Obtain American Chestnut saplings and cultivate them. We at ASPI have two of these (they need to be planted in pairs) and one is about 20 feet tall and quite healthy. Remineralize the soil if possible.
- * Publicize the need to restore the American Chestnut to its domain and give talks and slide shows on this subject.
- * Offer prayers at old American Chestnut sites.

Why the Future Calls for Chestnut Restoration

"O chestnut-tree, great-rooted blossomer, Are you the leaf, the blossom, or the bole?"
– William Butler Yeats

We don't need to look too far to see the disastrous effects of environmental degradation:

- * Deforestation continues unabated at the loss of 11.3 million hectares per year.
- * Global warming with increasing carbon dioxide levels – for the second year in a row, a new record was set in 1996 with 6.25 billion tons of carbon emissions due to the burning of fossil fuels.
- * Topsoil loss of staggering proportions – over one-third of all US topsoil has eroded away since the European arrival, and erosion is considered to be worse now than the great Dust Bowl of the 1930s when an estimated 100 million acres were lost to agricultural production. If this wasn't sobering enough, remember that of the 4 billion tons per year of sedimentation in rivers, lakes, and reservoirs, 75% of this sedimentation is from agricultural lands.
- * The US food production system including crops and livestock uses 3 units of fossil-fuel energy to produce 1 unit of food energy. And considering the energy used to grow, store, process, package, transport, refrigerate, and cook all plant and animal food, an average of about 10 units of nonrenewable fossil-fuel energy are needed to put 1 unit of food energy on the table. Each bite of food in the US travels more than 1300 miles.
- * And world-wide, 77,200 square miles of agriculturally productive land per year is lost to desertification, with a crop value of over \$26 billion. What do all these alarming statistics point towards except for the need to develop a low-input sustainable agriculture (LISA) that will be based on perennials, especially chestnuts and other tree crops. Chestnuts and other perennials soak up carbon dioxide and yield oxygen, are able to avoid annual cultivation with its accompanying topsoil loss, are resistant to drought conditions brought on by climate change, provide food without reliance on agri-chemical fertilizers (which in turn will eliminate ground- and surface-water contamination with nitrates), require no pesticides, herbicides, or fungicides, and can be grown on marginal sites and steep slopes with

low-fertility soils. Land that is currently banked in Conservation Reserve Programs (CRP) could be utilized for chestnut production, and with their deep and extensive root systems, even highly erodible land would be protected and nourished.

J. Russell Smith, Professor Emeritus of Economic Geography at Columbia University prophesied correctly in his landmark book Tree Crops: A Perennial Agriculture when he labeled chestnuts as "the corn that grows on trees." While most nuts contain over 50% fat, chestnuts contain less than 5% fat, no cholesterol, and complex carbohydrates with a high quality (10-15% by dry weight) protein. In many ways, chestnuts are more similar to grains, and Frances Moore Lappé, in her Diet for a Small Planet found that chestnuts are a highly nutritional food with protein superior even to eggs and could be considered a more nutritious staple than even brown rice.

FOOD VALUES OF CHESTNUTS: (From USDA AG Handbook #8-12, 1994)

FORM	%WATER	%PROTEIN	%FAT	%CARBOHYDRATE	CAL./OZ.
Fresh raw	44	4	1	49	64
Dried	9	7	2	80	103
Boiled/ steamed	62	3	1	34	44
Roast	40	4	1	52	68

The bottom line is: Plant chestnuts for more oxygen and less carbon dioxide, to reverse environmental degradation, to promote ecological restoration, wildlife habitat, nutritious and healthful food, and a potential economic boost to rural communities by helping them to grow a truly sustainable agriculture.

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