Biotech chestnut tree poised to restore lost ecosystems and biodiversity — But it needs your help

Chestnuts roasting on an open fire kindle iconic imagery of the season. However, the American chestnut (*Castenea dentata*) that once produced them is all but absent from the Appalachian forests that it once dominated. An invading fungus in the early 20th century virtually eliminated the American chestnut from its native range, spanning from Georgia to Maine.

Forests east of the Mississippi River were once filled with old growth American Chestnut trees. Credit: Credit: KnowxTNToday

Over the last several decades, conservation-minded scientists developed a biotechnology-based solution that would return this tree to this critical ecosystem. Tested, validated and poised for deployment, the fate of this effort balances in the uncertain hands of regulators Your voice may be instrumental in their decision.

A USDA/APHIS public comment period is open only until December 27, 2022. Regulators place significant weight in sound scientific arguments. However, good evidence and reason are usually rare among the avalanche of boilerplate anti-GMO pseudoscience spam that pollutes the space of scientific discourse. Your words will stand out with exceptional impact.

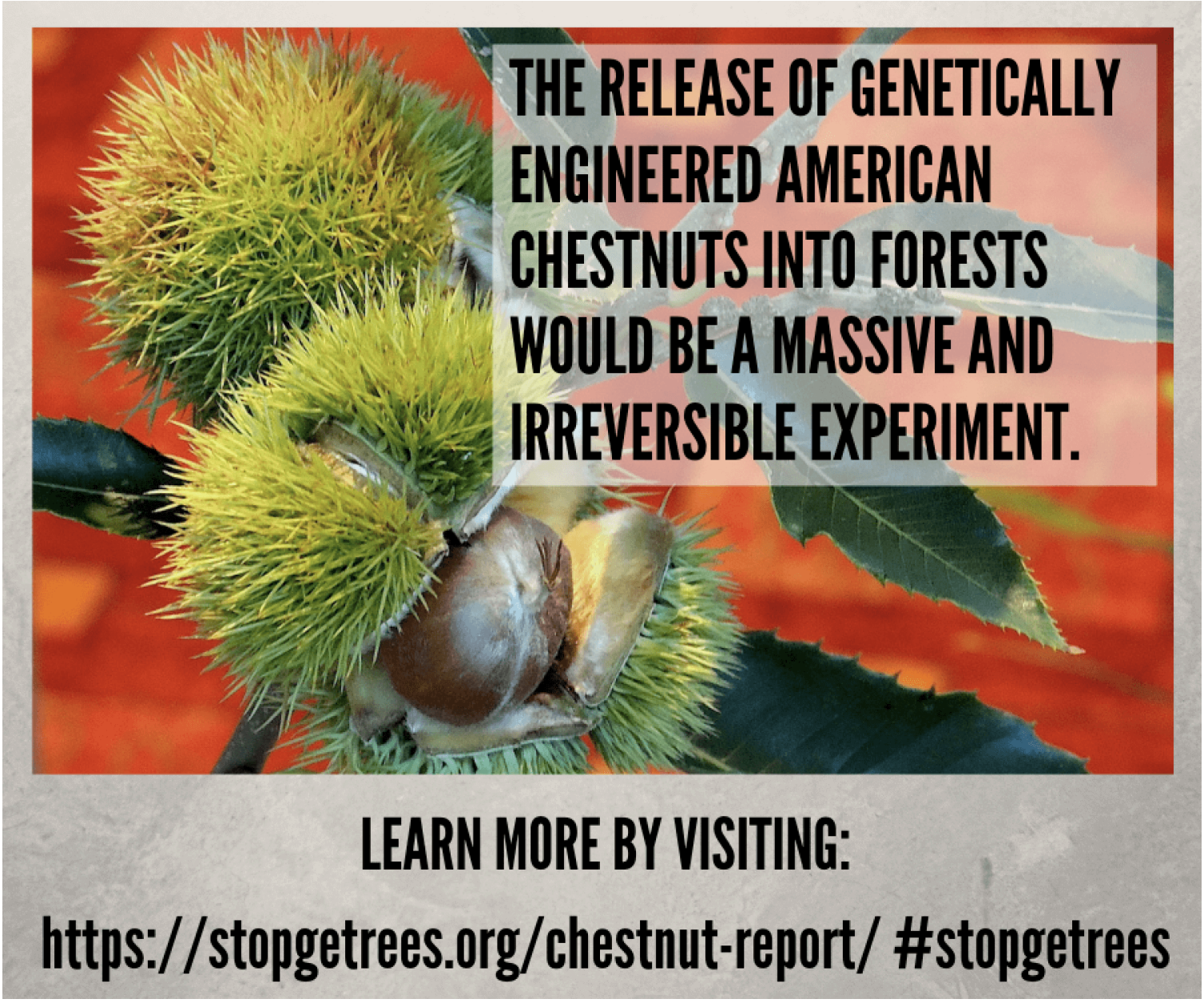
Follow the latest news and policy debates on sustainable agriculture, biomedicine, and other ‘disruptive’ innovations. Subscribe to our newsletter.
SIGN UP

Here’s what you need to know. Over the last twenty years, efforts at the nexus of conservation and biotechnology have genetically engineered (GE) the American chestnut to resist the fungus. The goal is to repatriate the forests and restore them to pre-1900s composition, adding back a key species that supported significant biological diversity. Scientists developed the GE trees at the State University of New York College of Environmental Science and Forestry Experiment Station in Syracuse, NY. After years of study, they are poised to be released.

The genetic tweak is the addition of a gene from wheat known as *oxalate oxidase*. The fungal pathogen generates oxalic acid to break the defenses of wild chestnut trees. The genetically engineered trees fight back by producing the added oxalate oxidase enzyme, a natural enzyme that breaks down oxalic acid. The tree doesn’t kill the pathogen, which remains part of the ecosystem, and because the solution removes the acid rather than attacking the pathogen, there is virtually no chance of the fungus becoming resistant. The added gene simply protects the GE tree against fungal invasion. It works beautifully in the lab and in field trials — the fungus and the tree living in perfect harmony.

Photo, taken in the mid-to late 19th century, shows how large and abundant the American chestnut was in the forests of the eastern United States. Credit: Forest History Society, Durham, NC

The critics' response has been typical, with claims that the development is too fast, too risky and "we just don't know" what might happen. Many suggest that breeding in resistance genes from the Chinese chestnut as an alternative, believing that introduction of thousands of genes from another part of the world is somehow less risk than maintaining the American chestnut's genetic integrity, except for addition of a single natural plant gene to solve one easy-to-solve problem.



But the GE trees have been extensively tested in the lab and controlled field trials. Scientists understand where the gene is inserted and observe no collateral effects. The trees have been carefully examined for unanticipated effects against fungal symbionts, insect herbivores, pollinating bees, and other animals that may consume the plant materials. The trees were shown to present no risk above traditionally bred trees,

a view shared by the USDA after extensive review.

A typical USDA/APHIS public comment period on a GE crop is usually splattered with the diversionary rhetoric of patents, Monsanto, profits, monocultures and health claims. The GE chestnut, developed by state university faculty, was developed to restore critical ecosystems, to enhance biodiversity, and fortify native forests against an invasive pathogen. No patents, no Monsanto, no profits, just GE trees crossing with wild relatives and new Chinese-American chestnut hybrids to expand the native genetics.

The GE chestnut represents a stellar application of biotechnology, and your note of support will help regulators justify their decision to allow widespread release.

Again, the public comment page is here. Even a sentence or two may have a profound positive impact.

Kevin M. Folta is a professor, keynote speaker and podcast host. Follow Professor Folta on Twitter @kevinfolta