Introduction to the Genetically Engineered American chestnut

Genetic engineering is being used to develop GE (genetically modified or GM) trees, with the intention of making it easier and cheaper to grow trees to produce wood, fiber, fuel, and other products. For example, experiments are underway to genetically engineer trees to grow faster, be resistant to insects and diseases, tolerate herbicide sprayings, and have altered wood composition.

US researchers are requesting approval to **plant a GE disease-resistant American chestnut tree in the wild**. They are proposing to use this GE tree to replace or "restore" the American chestnut species that has been widely decimated by a blight disease (*Cryphonectria parasitica*). But the promise of "restoring" the American chestnut via **genetic engineering comes with great risks**, and could threaten the decades-long efforts of chestnut conservationists in Canada and the US who are working to recover the wild American chestnut by supporting the reproduction of existing trees that exhibit higher blight tolerance and breeding trees using non-GE methods.

What is the "Darling 58"?

Researchers at the State University of New York College of Environmental Science and Forestry (SUNY-ESF) have genetically engineered an American chestnut tree to be blight-tolerant, and are asking the US government to approve it for unrestricted planting in the wild. They call it the "Darling 58." They purport that the Darling 58 tree will be able to spread blight-tolerance to subsequent generations by cross-pollinating with wild American chestnuts.

The American chestnut is an endangered species but researchers argue that releasing this GE tree will "restore" it to the forests of Canada and the Eastern US. If approved, this genetically engineered tree would be the first-ever GE plant released with the **purpose of spreading freely through wild ecosystems**. Its release would be a large-scale experiment, and there will be little or no potential to track or reverse its spread.

How has the Darling 58 been engineered?

Genetic engineering directly changes the genetic makeup (DNA) of an organism, bypassing normal plant or animal reproduction to create new characteristics. Genetic engineering includes techniques that make changes to DNA by inserting genetic material from the same, similar, or totally unrelated organisms, or, with genome editing, by introducing genetic material that acts as an "editor" to change DNA.

The Darling 58 has been genetically engineered to tolerate the blight that decimated American chestnut tree populations. It is a transgenic tree, meaning that it was genetically engineered by inserting genetic material from other species into the tree's DNA. The package of DNA inserted into the American chestnut contains genetic material from five species: wheat, a plant related to mustard, two different bacteria, and a plant virus.

This GE tree threatens chestnut conservation work in Canada

The Canadian Chestnut Council (CCC) has a mission to preserve and restore the wild American chestnut (*Cantanea dentata*). With a Stewardship Agreement under Ontario's Endangered Species Act (2007), they have been working to identify and breed healthy American chestnuts for more than 20 years.

The historic range of the American chestnut covers most of the eastern United States and parts of southern Ontario. Recent DNA analysis shows that the population of American chestnut found in Ontario is unique from neighboring regions in the US. Many individual trees within this population exhibit high genetic fitness (i.e. they can reproduce successfully) and a high tolerance to chestnut blight. The CCC's blight resistance breeding program draws on the strengths of this population.

If the Darling 58 is brought across the border or spreads into Canada over time, it would seriously threaten their blight resistance breeding program and the future of this unique Northwest population of American chestnuts.

The risks

Forest ecosystems are highly complex and poorly understood. Assessing how the release of a GE tree will affect other trees, understory plants, insects, soils, fungi, wildlife, and human communities over time, would require a far better understanding of forest ecology than we currently have. Recent advances have revealed highly intricate interdependencies, feedback loops and communication networks between and among forest species. This incredible complexity increases the unknowns and uncertainties of introducing GE trees.

There is also no way to guarantee that a genetically engineered tree will function as planned in the wild. In the case of the GE American chestnut, there is a danger that the blight could adapt and continue killing the trees. There is no evidence that this GE tree will be able to grow to maturity in the wild, or that its GE blight tolerant trait will remain stable in the long term.

The Precautionary Principle demands that, given our lack of understanding and the vast uncertainty, we must take action to avoid risk. The future of forests is at stake.

Resisting the drive to "replace nature"

The promise of technological fixes to get us out of the biodiversity and climate crises is compelling. However, each new genetically engineered "solution" could create serious new problems. Instead, we need to address the root causes of environmental destruction and re-examine the way we structure our economies and societies. One thing is certain – healthy, thriving forest ecosystems are the backbone of the future we are building. We need to protect forests from unnecessary risks.

Current status

The US government is close to approving the release of the GE American chestnut into the wild. However, thousands of concerned individuals and organizations, including the Canadian Chestnut Council, submitted comments to the US government opposing the release of this GE tree.

The US researchers say they will seek approval from the Canadian government but the status of this request is unknown.

Get involved

There is a growing movement of people in Canada and around the world rising up to protect forest ecosystems and the endangered American chestnut from the risks of GE trees.

Do you have a relationship with the American chestnut you would like to share?

Do you want to know how you can protect remaining wild trees?

- Host an event
- Invite a speaker
- Be in touch

Contact us to get more information or to get involved.
trees@cban.ca

For more information and updates:

www.cban.ca/trees

The Canadian Biotechnology Action Network (CBAN) brings together 15 groups to research, monitor and raise awareness about issues relating to genetic engineering in food and farming. CBAN members include farmer associations, environmental and social justice organizations, and regional coalitions of grassroots groups. CBAN is a project of MakeWay's shared platform.

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