

# Indigenous Environmental Network Native Energy & Climate Stop GE Trees on Native Lands Campaign saveourroots.org

Genetically Engineered (GE) Trees are not "green" nor a sustainable solution to ever-growing demands for energy and an out of control consumption-based market.







Genetically engineered organisms, to date, have been reported as having highly undesirable outcomes that have resulted in devastating consequences to include greater, not less chemical use, for controlling or eliminating damaging insects and competing and invasive plants. Crop yields have also been greatly exaggerated in an attempt to convince a generally unaware populace. <sup>[1]</sup>

> "...a defined, discrete or simple pathway from gene to trait probably never exists. Most gene function is mediated murkily through highly complex biochemical and other networks that depend on many conditional factors, such as the presence of other genes and their variants, on the environment, on the age of the organism, on chance, and so forth."<sup>[2]</sup>

GE trees pose a very real and significant threat to our natural forests and all Life on Mother Earth. The propagation of these foreign organisms violates Indigenous peoples' fundamental rights to live in harmony with nature and to practice our cultural and spiritual beliefs in recognition of the Natural Laws of Creation. The propagation and use of GE trees as a natural resource and commodity for increased pulp and energy production will compromise and destroy the delicate regenerative biodiversity and life-cycles of Mother Earth .

#### The growing of GE trees is a risk towards:

- depletion of precious ground water reserves;
- increased use of deadly herbicides and pesticides;
- increased releases of greenhouse gas emissions and microscopic pollutants when used in biomass incinerators; and
- are a false solution towards mitigating climate change.

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## Introduction

This collection of information, infographics, articles, and references should be in no way considered comprehensive. It was compiled to provide a clear and concise primer on the clearly undesirable, unpredictable and devastating consequences if GE trees are allowed to become industrialized for energy (biomass feedstock / liquid biofuels) and increased use in consumer pulp and lumber markets.

GE trees, although not well defined, in the text of government policy statements, acts of Congress, and directives as key elements of the United States plans on reducing green house gas (GHG) emissions. The Clean Power Plan relies heavily on the possibility of using both GE trees and woody biomass harvested from national forests, tribal trust land, and privately owned forest lands for energy production and carbon offsets and trading.

Links are provided to scientific reports, articles, and summaries within the References and Resources—Page 8.

More in depth information that includes; links to citizen-led organizations who are part of the International Campaign to Stop GE trees; ways in which to stay up to date with the latest information; and contact information can be found here: saveourroots.org

## GE Trees Research, Development and Market Players: Government — Biotech Industry — Academia

## Government Agencies Involved in funding and research:

- US Departments of Energy
- US Dept. of Interior
- US Dept. of Agriculture
- US Dept. of Transportation
- US Dept. of Energy,
- Joint Genome Institute
- USDA Agriculture and Food Research Initiative
- US Forest Service

#### Biotech, Energy, & Lumber Corporations - USA:

- Arborgen
- Duke Energy
- Edenspace Systems Corporation
- FuturaGene
- International Paper Company
- MeadWestVaco
- Monsanto Fund
- Okanagan Specialty Fruits
- Rubicon Ltd.
- Southern Garden Citrus
- U.S. Sugar Corporation
- Weyerhauser

### GE trees are part of the commodification of nature and a component of carbon trading / carbon offsets and further displace Indigenous and front-line and traditional communities worldwide

#### Government and Corporate Funded U.S. Academic Institutions

- Carnegie Institution for Science Stanford
- University of California Berkeley
- University of California Davis
- University of California Riverside
- University of California Los Angeles
- University of Wisconsin Madison
- University of British Columbia Vancouver
- Texas A&M University
- Illinois State University
- Michigan State University East Lansing
- University of Toledo
- University of New Hampshire Durham
- Cornell University Ithaca
- Dartmouth College Hanover, New Hampshire
- West Virginia University Morgantown
- University of Tennessee Knoxville
- North Carolina State University Raleigh
- Georgia Institue of Technology Atlanta
- University of Georgia Athens
- University of North Texas
- Clemson South Carolina
- Mississippi State
- Oregon State
- Pennsylvania State
- Purdue
- Washington State
- State University of New York College of Environmental Science and Forestry
- Virginia Tech
- Hawaii Manoa



We face unprecedented social and ecological crises across the planet, including crises in water, food, biodiversity, climate, and human rights. The development of genetically engineered (GE) trees is another step in the wrong direction. We do not need false solutions that create more problems; we need real, just solutions that address the intertwined root causes of the multiple crises we face.

Forests are interwoven with human evolution. Yet they are complex, diverse and interactive systems that we barely understand. Forests are far more than just trees; they regulate and stabilize water flow and weather patterns, enrich soils, prevent erosion and sequester carbon. They provide food, medicine, shelter, fuel, livelihoods, recreation and sanctuary for diverse peoples around the world. Forests have made life on Earth possible.

• Industrial Tree Plantations: Plantations are not forests. Monoculture tree plantations consist of vast expanses of trees, all the same age and all of a single species, often alien to the region. They do not support biodiversity and local communities cannot use them. Plantations displace native forests and ecosystems and they displace Indigenous Peoples and local communities. They contaminate air, water and soil from the toxic agrochemicals used on them; and they poison people living nearby. The argument of GE tree proponents that the use of GE trees would protect forests by growing more wood on less land is a false argument. GE trees would lead to expansion of plantations because gains in productivity would make them more profitable. They would thus worsen the documented social and ecological impacts of industrial tree plantations.

Bioenergy, Synthetic Biology and the Bioeconomy: GE trees are a critical part of the ongoing, dangerous push to promote bioenergy and the bioeconomy. Poplars and pines are being genetically engineered to facilitate the production of jet fuel and chemicals compounds. Oil palms are being genetically engineered to increase biodiesel production. GE eucalyptus and pine trees are being engineered to feed pulp mills and to supply the rapidly increasing demand for wood pellets to co-fire in coal power plants.

The monopolization of land and water to grow GE tree plantations to replace a small percentage of fossil fuels will come at high costs, including worsening human rights abuses, accelerating the loss of terrestrial biodiversity, and intensifying the global water, food and climate crises. <sup>[4]</sup>

## **BIOTECH GREENWASH: GE TREES**



1.6 billion people depend on forests for shelter, food, water, and other essential daily needs

70% of all new drugs introduced in the past 25 years have derived from forest plants, animals, and microbial material

A true forest is a wonderful, magnificent wild of the known and unknown that cannot be cultivated and cannot be replaced.

Learn More: saveourroots.org

Indigenous Environmental Network - PO Box 485 - Bemidji, MN 56619

• Invasive Alien Species: Not only *can* genetically engineered trees spread into natural forests, it is virtually impossible to prevent them from doing so. Often GE trees are developed from non-native, invasive species or engineered with traits that give them advantages over their wild relatives, making them likely to become invasive and displace native biodiversity. Unpredictable changes – common to genetic engineering – may equally contribute to new or increased invasiveness.

• **Contamination and Unknowable Risks:** Trees can live for centuries and have evolved to spread their seeds and pollen over great distances. This means that genetic contamination of forests by GE trees, would be virtually guaranteed. The impacts of that would be highly unpredictable because:

- 1. Tree genomes are complex, given their long lifespan, their role in complex ecosystems and their geographic distribution.
- 2. The inserted gene sequences and the genetic engineering processes themselves result in mutations and unpredictable changes within the genome of the GE tree.
- 3. This in turn brings unpredictable changes to the behavior of the tree's genes and its responsiveness to external factors, thus potentially altering how it reacts to cold, drought, storms, diseases, pests etc., or how it interacts with or impacts on other organisms.
- 4. Furthermore, due to the complexity of interactions within forest ecosystems, it is next to impossible to accurately assess the impacts of GE trees on forests, or even to know what questions to ask. For these reasons, any outdoor planting of GE trees, including field trials, threatens to contaminate native forests with unpredictable and irreversible impacts.

• **System Change:** As with many other socially and ecologically destructive projects, national policies and international trade regimes largely promote the development and deployment of industrial tree plantations and GE trees for the short-term economic benefit of a few transnational corporations to the long-term detriment of many. [4]

#### Genetically Engineering / modifying plants is not conventional plant breeding.

Traditional plant breeding is the exchange of genes between two plants to produce offspring that have desired traits. This is done by transferring the male (pollen) of one plant to the female organ of another. This cross breeding, however, is limited to exchanges between the same or very closely related species. Genetic engineering differs from conventional plant breeding. In conventional plant breeding half of the genes of an individual come from each parent, whereas in genetic engineering one or a few specially selected genes are added to the plant genome.

Moreover, conventional plant breeding can only combine closely related plants. - Thank the powers that be... do we want or need a green bean flavored watermelon? Or would we like a cat/dog, perhaps. Natural Law, Mother Earth are constantly adapting to both internal and external stressors.

Genetic engineering of plants usually makes use of a type of bacteria which has the natural ability to transfer DNA to some plants.

When the bacterium infects the plant, it penetrates the plants cells and transfers its modified DNA to the plant.

The DNA may also be introduced by physical means. Carried on microscopic particles of tungsten or gold, the DNA is literally shot into the plant nucleus, using a 'gene gun'. Once the DNA reaches the cell nucleus, it inserts itself at random into one of the host chromosomes and can express the desired character. The genetically modified plant is then grown from the transformed cell. <sup>[5]</sup>

#### Myth 1: Current genome editing technologies are not error prone

BIO's exposition is belied by the evidence. If CRISPR were already precise, accurate and specific there would, for example, be no publications in prominent scientific journals titled "*Improving CRISPR-Cas nuclease specificity using truncated guide RNAs*". And these would not begin by describing how ordinary CRISPR "can induce mutations at sites that differ by as many as five nucleotides from the intended target", i.e. CRISPR may act at unknown sites in the genome where it is not wanted.

#### Myth 2: Precision equals control

The second key error of CRISPR boosters is to assume that, even if we had complete precision, this would allow control over the consequences for the resulting organism. Suppose, as a non-Chinese speaker, I were to precisely remove from a Chinese text one character, one line, or one page. I would have one hundred percent precision, but zero control over the change in meaning. Precision, therefore, is only as useful as the understanding that underlies it, and surely no DNA biologist would propose we understand DNA–or else why are we studying it?

#### Myth 3: DNA functions are modular and changes are predictable

The third error of CRISPR advocates is to imply that changes to gene functions can be presumed to be discrete and constrained. The concept of the precise editing of a genome leading to a precise biological outcome depends heavily on the conception that genes give rise to simple outputs. This is the genetic paradigm taught in schools. It is also the paradigm presented to the public and that even plays a large role in the thinking of molecular genetic researchers. However, a defined, discrete or simple pathway from gene to trait probably never exists. Most gene function is mediated murkily through highly complex biochemical and other networks that depend on many conditional factors, such as the presence of other genes and their variants, on the environment, on the age of the organism, on chance, and so forth. <sup>[2]</sup>

Note: CRISPR is short for <u>CRISPR/cas9</u>, which is short for Clustered Regularly-Interspaced Short Palindromic Repeats/ CRISPR associated protein 9; <u>Jinek et al., 2012</u>. It is a combination of a guide RNA and a protein that can cut DNA.

## **US Secret Approval of Genetically Engineered Tree**



wildlife, songbirds, and public health. And all this for short term commercial profit."

A secret letter from the USDA to GE tree company ArborGen, dated last August, was recently exposed by scientist Doug Gurian-Sherman of the Center for Food Safety.

In this letter, the USDA made the unprecedented decision to allow ArborGen to pursue unregulated commercial cultivation of a loblolly pine genetically engineered for altered wood composition. These trees could be planted anywhere in the US, without public knowledge or access to information about them.

Gurian-Sherman argues the USDA "is deliberately thumbing its nose at the public" with this decision, pointing out that this is probably the biggest environmental regulatory change in the US since the early 1990s. Loblolly pines are native across 14 states throughout the US Southeast, and are grown in plantations around the world. Their pollen is known to travel for hundreds of miles.

"If these GE loblolly pines are released on a large scale in the US, there will be no way to stop them from cross contaminating native loblolly pines," said biologist Dr. Rachel Smolker of Biofuelwatch. "This is deliberate, irreversible and completely irresponsible contamination of the environment with unknown and possibly devastating consequences. Forest ecosystems are barely understood, and the introduction of trees with genes for modified wood characteristics could have all manner of negative impacts on soils, fungi, insects,

Many are also worried about the international implications of this USDA decision. Winnie Overbeek, International Coordinator of the Uruguay-based World Rainforest Movement states, "We are greatly concerned that these unregulated GE pines could be shipped to Brazil or other countries without public, or maybe even government, knowledge, further promoting the expansion of industrial tree plantations in the Global South. This contributes to deforestation and affects indigenous and peasant communities worldwide who depend on forests for survival."

In 2013, when the USDA called for public comments on another ArborGen request to commercialize a GE Eucalyptus tree (a decision still pending), they received comments at the rate of 10,000 to one opposing the industry request. By simply refusing to regulate this new GE pine, the USDA has cut the public out of the process completely. In 2013, a conference on Tree Biotechnology in Asheville, NC was disrupted for its entire 5 days by anti-GE tree activists, and there were multiple arrests.

The Campaign to STOP GE Trees is an international alliance of organizations, of which the Indigenous Environmental Network is a member, mobilized to protect forests and biodiversity and to support communities threatened by the dangerous release of genetically engineered trees into the environment.

The preceding are excerpts from: Breaking: Outrage Over US Secret Approval of Genetically Engineered Trees: http://stopgetrees.org/breaking-outrage-us-secretapproval-genetically-engineered-trees-2/

### Short List of GE Tree Species Currently in Development and Under Review

#### POPLAR

Trees in the genus *Populus* are being genetically engineered with a variety of traits, including increased growth rates; lower levels of lignin to improve processing for paper, wood pellets, and biofuels; pest and herbicide resistance for more efficient plantation management; and other traits that are claimed as "confidential business information." These GE poplars are often closely related to wild species growing in native forests or in non-GE plantations, raising the specter of escape of seeds or pollen into the wild where poplar trees with GE traits could then become established. Around 30 different poplar species grow from subtropical Florida to sub-alpine zones in North America and Europe. Steve Strauss, a respected GE poplar researcher and a proponent of GE trees, acknowledges the risks involved, saying that "the scale of potential impact of transgenic poplars is large because of their extensive dispersal of pollen and seed."

#### EUCALYPTUS

Species of the Eucalyptus genus are the world's most widely planted hardwood trees due to their fast growth rate and wide adaptability to different environments. Eucalyptus species are currently used in the production of pulp for paper and various wood products. In Brazil, they serve as a charcoal supply to support the steel industry. As more countries promote the production of biofuels, eucalyptus plantations will likely be in greater demand for cellulosic

biofuel production. One Brazilian forest-asset company claims that the eucalyptus market has room to expand by 500 percent over the next 20 years.

#### American Chestnut

The reasons for concern about the GE chestnut are many, but one of the main problems is that the GE chestnut has been engineered with foreign DNA from wheat, a process which damages the genome and leads to numerous mutations. This means the engineered tree will likely have unanticipated and unpredictable consequences when released into a forest ecosystem. ...with GMO crops, these unanticipated consequences can be very damaging to biodiversity and wildlife, not to mention people. Just take a look at the iconic Monarch butterfly--it's population is crashing due to the chemicals applied in abundance to herbicide resistant GMO crops. These herbicides are killing off the main food of the butterflies.

#### Papaya, Apple, Citrus, Plum

The infographic at the right provides an overview of a genetically engineered citrus tree that is in development and is being considered for by government regulating agencies for field trials. The tree, if research goes forward will be classified as a Plant Incorporated Protectant (PIP). The developer will need both deregulation



from USDA and registration of the PIP from EPA to grow the organisms without constraints.

For more information on these and other tree species currently in different stages of development and in the permitting process go to: saveourroots.org

#### **References:**

[1]GMO Myths & Truths: http://www.nongmoproject.org/wp-content/uploads/2015/03/GMO-Myths-and-Truths-edition2.pdf

[2] God's Red Pencil? CRISPR and The Three Myths of Precise Genome Editing: http://www.independentsciencenews.org/ science-media/gods-red-pencil-crispr-and-the-three-myths-of-precise-genome-editing/

[3] Human Health Effects of Biomass Incinerators – Dirty Energy Comes From Smoke Stacks!

Rachel Smolker, Ph.D. Congressional Briefing—September 25, 2012: http://ienearth.org/docs/BioMass-Pollution-Narrative-Rachel -Smolker.pdf

[4] Asunción Declaration Rejects GE Trees: The Global Movement Grows: http://stopgetrees.org/asuncion-declaration-rejects-ge-trees/#more-2001

[5] Green Facts: http://www.greenfacts.org/en/gmo/2-genetically-modified-crops/2-genetic-engineering.htm#5

#### **Resources:**

**Center for Food Safety—Genetically Engineered Trees: The New Frontier of Biotechnology**: http://saveourroots/docs/genetically-engineered-trees-the-new-frontier-of-biotechnology

History of ArborGen; http://saveourroots.org/docs/History-of-ArborGen.pdf

ArborGen Original PR 1999: http://saveourroots.org/docs/Arborgen-original-PR-19991.pdf

GE Trees will Increase Deforestation: http://saveourroots.org/docs/GE-Trees-will-Increase-Deforestation.pdf

GE Trees and Certification: http://saveourroots.org/docs/GE-Trees-and-Certification.pdf

History of the Campaign to STOP GE Trees: http://docs/saveourroots.org/History-of-the-campaign-to-stop-GE-trees.pdf

UN Decision on GE Trees: http://saveourroots.org/docs/UN-decision-on-GE-Trees.pdf

The Indigenous Environmental Network is a founding member of the Campaign to Stop GE Trees. Brenda Jo (BJ) McManama is IEN's *SAVEourRoots, STOP GE Trees on Indigenous Lands* campaign organizer and a member of the steering committee of the international campaign. Interested parties may contact BJ by telephone: 828-777-4882 or by email: stopgetrees@ienearth.org.

The following websites are excellent sources for more information and for ways that individuals and organizations, both Indigenous and non-indigenous, can get involved: saveourroots.org, stopgetrees.org, biofuelwatch.org,

The steering committee meets monthly via Skype and members of the National/International campaign also meet once per month via conference call. Other meetings are held in different regions where need is greatest. The next meeting is being planned in the late fall of 2016 in the Asheville NC area. If interested in attending this or other meetings please contact BJ McManama for more information.