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THE GROWING THREAT

GENETICALLY ENGINEERED TREES
& THE FUTURE OF FORESTS

“We have no control over the movement of insects, birds and mammals, wind and rain that carry pollen and seeds. Genetically engineered trees, with the potential to transfer pollen for hundreds of miles carrying genes for traits including insect resistance, herbicide resistance, sterility and reduced lignin, thus have the potential to wreak ecological havoc throughout the world’s native forests.”

--Dr. David Suzuki, The Suzuki Foundation

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2012 - 375 GE pine trees were cut down by activists in New Zealand.

2013 - 1,200 women, part of Brazil's Landless Workers Movement (MST) occupied three eucalyptus plantations as part of an international 'Day of Women's Struggle' called by La Via Campesina

May, 2013 - During the International Tree Biotechnology Conference in Asheville, North Carolina, Global Justice Ecology Project, Katuah Earth First!, Croatan Earth First!, Everglades Earth First!, Dogwood Alliance and REAL Cooperative organized the largest ever public protests against the GE tree industry. During the week of actions, 5 people were arrested while disrupting various conference events.

September 26, 2013 - activists destroyed around 100 GE papaya trees in Hawaii.



To get involved, contact:
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**Sign the petition calling on the
USDA to ban GE trees:**
globaljusticeecology.org/petition.php

**Join the Campaign to STOP GE Trees
today to put an end to this global threat.**

The stakes are too high to allow ArborGen and their industry counterparts to run rampant across the globe, spreading GE trees and their catastrophic impacts. Its time to stand up to defend native forests and say NO to Frankenforests and genetic engineering.

INTRO

Genetically engineered (GE) trees pose an enormous risk to the world's forests. The spread of GE trees—for use in commercial plantations for timber, pulp and bioenergy—is quickly advancing, in the US and abroad. The next several years are critical in stopping the spread of GE trees, and avoiding catastrophic interferences with native forests, human and animal communities and the global climate.

Just as Monsanto, DuPont, Syngenta and other biotech companies have seized control of the world's agricultural system, a whole new suite of corporations with names like ArborGen and Futuragene want to take control over the world's forests.

Through genetic engineering to create “purpose-grown” trees, these companies aim to revolutionize industrial forestry. Under the new ‘Bioeconomy,’ plant-based feed stocks from GE eucalyptus, pine, poplar and other trees and agricultural crops are needed to replace fossil fuels and other petroleum-based materials. Unsustainable consumption patterns will go unchecked, while native forest biodiversity will be threatened and mega-timber and pulp corporations like International paper and Suzano will gain more control over global forestland.

In the US, GE cold-tolerant eucalyptus is poised to become the first commercialized GE tree. This would kick open the door to approval of GE trees that are in development like poplar and pine, and could set in motion a global trend. GE trees must be stopped dead in their tracks. Once Pandora's Box is opened, and GE trees begin to spread and contaminate native forests and trees, the future of global forests is in grave danger.



RISKS OF GE TREES

GE trees vastly differ from other transgenic, annual crops like corn and soybeans—and the risks, regulation and assessment needs are much greater than those of agricultural GMOs.¹

Trees are long living – Unlike annual crops, trees can live for decades to centuries in the wild, unsupported by human intervention. Their escape into the wild can be extremely difficult to eradicate.

Seed and Pollen Dispersal – Many species of trees—especially pines and poplars—can spread their seeds and pollen great distances. The risks of contamination are high, and spread of pollen and seed from plantations to forests is both inevitable and irreversible.

Widespread – Some species of trees are widespread throughout the world, or are capable of interbreeding with similar species in the same genus. The genus *Populus*, which contains 20-80 different species, is ubiquitous in North America and the northern hemisphere.² Contamination with non-GE, wild species could quickly become widespread over an enormous geographical area.

Human Health – The use of GE trees, especially in industrial plantations, is likely to increase the application of dangerous chemical fertilizers, herbicides and pesticides. Exposure to herbicides like Roundup increases risk of spontaneous abortions and certain cancers. A primary field of GE tree research is focused on engineering trees to produce the Bt toxin. Bt toxin can cause widespread sickness, and has potential to remain active and lethal up the food chain.³ Because pollen in pine and poplars can travel long distances, large areas could be affected with chemical contamination.

False Solution to Climate Change – Deforestation is a major driver of climate change. When natural, biodiverse forests and grasslands are cleared for plantations, their ability to sequester carbon is greatly reduced. Instead of focusing efforts to stop industrial forest plantations worldwide, GE tree companies want to establish even more plantations, often displacing native forests, Indigenous Peoples and small-scale farming communities. Plantations are not forests. Plantations of GE trees, or ‘Frankenforests’ are more like lifeless factories, laden with chemical fertilizers, pesticides and herbicides that pollute water and continue dependence on fossil fuels. Increasing interest in utilizing

government and industry, could spell disaster for southern forests and the global climate. More biofuels means more industrial plantations—likely of GE eucalyptus, poplar and pine—and more burning of polluting energy sources.

STANDING UP FOR BIODIVERSITY AND HUMAN COMMUNITIES: A HISTORY OF RESISTANCE TO THE GE TREE INDUSTRY

The GE tree industry and the spread of eucalyptus plantations has not developed without significant resistance. Since the late 1990s, the GE tree industry has been mired in controversy, from public protests to clandestine acts of eco-defense.

July, 1999 - Activists cut down 115 of 120 GE poplars in the UK, planted by pharmaceutical giant AstraZeneca.

2000 - A group claiming to be Oregon State University students and alum destroyed 1200 GE poplars in three test plots throughout Oregon. The test plots were overseen by OSU researcher and tree engineer Steve Strauss.

2006 - The Campaign to STOP GE Trees, Rising Tide and Katuah Earth First! organized protests and a boat action organized around the International Union of Forest Research Organizations “2006 Forest Plantations Meeting” in Charleston, South Carolina, US.

2006 - 2,000 women affiliated with La Via Campesina destroyed one million eucalyptus seedlings at an Aracruz pulp mill in Rio Grande do Sul, Brazil.

2008 - African nations and dozens of environmental organizations staged protests and strongly urged the UN Convention on Biological Diversity to suspend the release of GE trees into the environment.

2010 - Global Justice Ecology Project, Dogwood Alliance, Sierra Club, Center for Food Safety, International Center for Technology Assessment and Center for Biological Diversity sued the USDA over their approval of ArborGen’s large-scale test plots of GE eucalyptus trees.

And perhaps for the first time ever, GE chestnut would provide wildlife with a genetically modified food source.

GE TREES AND BIOMASS: THE GREEN ENERGY BOMB

The southeastern US is experiencing a boom in the bioenergy industry. New biofuels initiatives are funneling money into the industry¹⁶, and new biomass incinerators and wood pellet plants are being built across the region, and are using whole trees in their operations.¹⁷

ArborGen's GE trees are highly sought out by southern wood pellet and cellulosic biofuel producers. A new company called EcoGen hopes to establish vast plantations of eucalyptus across the south to fuel biomass incinerators, and already has pending deals with Progress Energy and Florida Power and Light.

Foreign-owned utilities like Drax and E. On are investing in wood pellet facilities in Georgia, Louisiana and Mississippi to feed European coal plants being converted to burn biomass.¹⁸ These plants can't currently utilize fast growing species like eucalyptus and pine. Instead, they rely on slower-growing hardwood forests. The clearing of these forests in the Southeast is opening native forestland for plantations of GE trees that can be utilized in purpose-built plants like those proposed by EcoGen.

ArborGen's cold-tolerant GE eucalyptus has been placed on a list of GE plants to be "fast-tracked" for approval by the USDA.¹⁹ ArborGen executives sit on the US DoE and USDA Biomass Research and Development Technical Advisory Committee²⁰ and the Southeast Partnership for Integrated Biomass Supply Systems.

ArborGen also has a partnership with GreenWood Resources to develop GE poplar for use in southeastern biofuel production.²¹ Steve Strauss, the leading GE tree researcher from OSU, has also received government money to develop GE poplars. The Biofuels Center of North Carolina is testing ArborGen's eucalyptus near the North Carolina-Virginia border.

The "green energy bomb," which is being aggressively pursued by

GE trees for biomass spells disaster for the climate. Burning trees to produce electricity can be worse for the climate than burning coal, in terms of short and medium-term greenhouse gas emissions.

ARBORGEN

GE tree research and development company ArborGen was founded in 2000 as a joint venture between International Paper, MeadWestvaco and New Zealand-based Fletcher Forests (now Rubicon). Monsanto was an initial partner⁴ but backed out before ArborGen was fully formed.

Many of ArborGen's executive staff have worked at Monsanto, including former CEO Barbara Wells and current CEO Andrew Baum.⁵ In presentations, ArborGen compares its business model to Monsanto's.⁶

Based in South Carolina, ArborGen also has operations in Brazil and New Zealand. While ArborGen currently sells several pine "varietals" (non-GE), they are testing GE eucalyptus, pine and poplars. ArborGen hopes to turn the US south into a factory for producing wood pellets and liquid biofuels from their GE eucalyptus and pine.

As recently as March of 2013, ArborGen has also been testing biotech hybrid loblolly x pitch pine. Loblolly pine is desired as a fuel source for diesel vehicles and the aviation industry.

GE EUCALYPTUS

ArborGen has petitioned the USDA for permission to sell its cold tolerant GE eucalyptus seedlings in the US.

ArborGen plans to sell half a billion GE eucalyptus trees annually for vast plantations across Texas, Florida, Georgia, Alabama, Louisiana, Mississippi and South Carolina.

GE eucalyptus tree plantations pose an unprecedented threat to U.S. forests.

Flammable –Eucalyptus trees pose a serious wildfire danger and California spends millions to eradicate them. In early 2009 in Australia, raging wildfires, exacerbated by a drought, moved through eucalyptus groves at over 100 kilometers per hour, devastating wildlife and killing

nearly 200 people. A drought in the Southern U.S. could result in similar devastating wildfires if eucalyptus plantations were developed there.

Water depleting – Large plantations of eucalyptus have depleted the availability of fresh water for communities, forests and other ecosystems. In the Lumaco District of Chile, for example, some Indigenous Mapuche communities are completely surrounded by eucalyptus plantations. While they previously had year-round access to fresh water, today they must truck water in because the eucalyptus plantations have depleted the local water supply. The USDA believes plantations in the southeast could use twice as much water as native forests and reduce stream flows by 20 percent more than pine plantations.⁷

Human health – Eucalyptus is also a known host for the deadly pathogenic fungus *Cryptococcus Gattii*, which has recently been found in the Pacific Northwest and can kill both humans and wildlife⁸. One case has occurred in North Carolina⁹.

Highly invasive – Eucalyptus trees are a documented invasive species in several states¹⁰. In California, eucalyptus trees were introduced from Australia in the mid-1800s. Today they have spread throughout the state. Plantations of eucalyptus have been described as “green deserts” because of their total lack of biological diversity.

Flammable kudzu – Because eucalyptus is invasive and flammable, it has been dubbed “flammable kudzu” by opponents.

GE LOBLOLLY PINE

In 2011, ArborGen partnered with the University of Florida to develop GE loblolly pine that would produce more terpenes for liquid biofuel production.¹¹ The research is funded by a \$6.3 million grant from the US Department of Energy.

Researchers at the University of Florida School of Forest Resources and Conservation hope to increase terpene production in ‘improved’ loblolly by five fold¹². They estimate that, over 10 years, a 25,000 acre plantation of ‘high terpene wood’ would yield 100 million gallons of terpene, to be used as a drop-in fuel for aviation and diesel engines. In 2012, US airlines consumed more than 16 billion gallons of aviation

fuel.¹³

Terpene is highly flammable. Plantations of high terpene loblolly pine, combined with drought, may produce ripe conditions for deadly, destructive firestorms in the southeast.

Because loblolly pine is native, contamination with native pine species is an enormous risk.

GE AMERICAN CHESTNUT

Once a dominant species in eastern forests, American chestnut was virtually wiped-out by a blight introduced when breeders began importing Japanese chestnut in the late 1800s.

Efforts have been underway for decades to bring back the American chestnut through backcross breeding programs that would produce a blight-resistant tree. As of one year ago, more than 100,000 of these trees were successfully growing across nineteen states.

In competition with this effort is a program out of SUNY Syracuse to create a genetically engineered American chestnut that is blight-resistant with the intention of releasing it into wild forests. In May of this year three USDA-approved outdoor field trials were planted in Georgia, New York and Virginia.

A gene found in wheat makes the trees resistant to oxidase, the toxin that ultimately kills chestnut¹⁴.

In addition to blight resistance, GE chestnut also exhibits resistance to the herbicide phosphinothricin, or glufosinate. While glufosinate is commonly used as a gene marker by geneticists, herbicide resistance could make chestnut a prime candidate for industrial monoculture plantations.

Research is also underway to use GE chestnut for biofuels. The SUNY program considers biofuels as an important potential new application of GE chestnut.¹⁵ Chestnuts were once an important food source for wildlife and humans. Plans to introduce GE chestnut across the eastern US could introduce yet another GE food source into the human diet.