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NORTH AMERICAN FOREST INSECT WORK CONFERENCE

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SESSION "Off-the-shelf kits for saving the world's forests. Available now!"

Wednesday, June 1, 1:30PM – 3PM

Off-the-shelf kits for saving the world's forests. Available now!

Moderators: Jiri Hulcr and Caroline Storer

Presenters and Abstracts

1. Caroline Storer

School of Forest Resources and Conservation at University of Florida

Can biotechnology save the world's forests?

Innovations in genetic engineering (GE) have already revolutionized human medicine and agriculture. However, its vast potential remains underused for forest health protection. For example, genetic engineering of trees is increasing our ability to respond to new pest outbreaks or bring threatened trees back from extinction. How can these methods be used, and should they? Here we will provide an approachable introduction to modern genetic engineering to facilitate a discussion of the technological, environmental, and societal benefits and trade-offs of adopting these new approaches for forest health protection.

2. Sally L. McCammon

United States Department of Agriculture, Animal and Plant Health Inspection Service, Biotechnology Regulatory Services

Regulation of Genetically Engineered Organisms

USDA-APHIS regulates genetically engineered (GE) organisms to protect plant health under the Plant Protection Act (2000). A GE organism is regulated by APHIS if it is developed with a plant pest and is to be imported, moved interstate or released into the environment (field tested). While most of the work of the agency deals with commodity crops, a number of tree species have been field tested including American chestnut, poplar, walnut, white spruce and apple with a range of genes for pest resistance, herbicide tolerance and product quality. In addition, field testing of two insects has been permitted; diamond back moth, a pest of crucifers, and pink bollworm, a major pest of cotton. Once data and information are accrued to demonstrate that no plant pest risk is presented by the GE organism, a developer/researcher may petition APHIS for a determination of non-regulated status. A plant pest risk

assessment is completed and is the basis for the decision on the petition. Apple and papaya varieties have completed this process and Eucalyptus is in process. In addition, the National Environmental Policy Act (NEPA) requires an environmental assessment be done in conjunction with certain federal actions. APHIS-BRS has a web page for first time users of its system to facilitate efficient interaction with the regulatory system https://www.aphis.usda.gov/aphis/ourfocus/biotechnology/sa_permits_notifications_and_petitions/sa_petitions/ct_new_users_petitions. If there are questions as to whether a particular GE organism is covered by APHIS-BRS regulations, an inquiry may be submitted to the agency requesting a determination as to whether the organism is regulated https://www.aphis.usda.gov/aphis/ourfocus/biotechnology/am-i-regulated.

3. Andrew Newhouse, Charles Maynard, and William Powell

State University of New York College of Environmental Science & Forestry, Syracuse, NY

Transgenic blight-resistant American chestnut trees demonstrate potential for restoring threatened species after invasions by exotic pathogens

Chestnut blight on American chestnut (Castanea dentata) is a classic example of how an introduced pathogen (Cryphonectria parasitica) can affect entire ecosystems by decimating native keystone forest species. The traditional means for introducing blight resistance to American chestnuts is through hybrid breeding with Asian species (which are naturally blight resistant, having evolved with the pathogen for millennia). Advances in biotechnology and 26 years of research have allowed us to produce a fully American chestnut tree with a high level of blight resistance. The transgene product that allows this blight resistance, oxalate oxidase, is naturally found in a variety of crops and native plants, so it shouldn't present any novel risks to food or the environment. Transgenic trees could potentially be used for restoration, and transgene inheritance by subsequent generations could facilitate the preservation of extant genotypes. Initiating a project like this requires considerable investments of time and resources, including extensive supporting research that can vary substantially between species and disease systems. Transgenic plants also require permits for field testing, and rigorous regulatory reviews before they can be distributed. But progress toward a blight-resistant transgenic American chestnut may be directly relevant to other threatened trees (such as the related Ozark chinquapin) or other diseases (such as Phytophthora root rot, which affects chestnuts and many other plants), and may indirectly facilitate development of other species for ecological restoration purposes. Long-lived native trees with safe, durable, heritable disease resistance are not quite on the shelf, but they are definitely on the horizon.

4. Alison E. Adams

School of Forest Resources and Conservation at University of Florida

Public trust in science and genetic modification technology

Public surveys and scholarly research have established that a significant portion of the American public distrusts science and that this portion is growing. The discourse surrounding *genetic modification (GM) technology* is currently one of the most heated debates in public, media, corporate, and government arenas. The erosion of trust in science in general, and in genetic technology specifically, has critical implications for support for scientific innovations that have the capacity to address current environmental problems. Some social science research is already being done to determine *who* is more likely to be distrustful of genetic engineering. Yet, little is known about *why* people are distrustful of scientific innovations such as GM technology. The motivations for distrust are important to discover as the relationship between science and the public depends on clear communication, understanding, and trust. Sociological research provides a theoretical framework for examining how people assess risks associated with GM technology. The "risk society thesis" posits that we now live in a society that is characterized by the omnipresence of low-probability, high-consequence risks, which are inherently linked to continual modernization and industrialization. The risk society thesis suggests that, given the increasingly technical nature of scientific innovation, the lay public is increasingly reliant on experts to assess and communicate the risks associated with innovation to non-experts. But, what are the social implications when public trust in scientific experts erodes? This presentation will explore the complex relationship between science, institutions, and the lay public, specifically focusing on the debate over GM technology.

5. Adam Costanza

Institute of Forest Biosciences

Biotech Vs Forest Pests – An Uneven Fight

The health of many forests around the world is declining because of pests. Whether pests are invasive, or native ones accelerated by climate change, many trees are losing the battle. Biotechnologies, including genetic modification (GM), are a powerful tool to fight back against forest pests. GM technologies can be used to accelerate development of disease and pest resilient trees, but by default, current regulatory policies treat GM trees as threats to the environment. GM regulations are based on risk assessments in north America. However, these assessments focus on the potential risks of using GM trees and largely disregard the consequences of not using them. While we have the technologies, and guidelines on how to use them responsibly via the Responsible Use Initiative, organizations trying to use advanced forest biotechnologies for social and environmental benefit are fighting with one hand tied behind their backs. Using actionable, risk based analysis appropriately matched to threats posed by forest pests can tip the scales in favor of healthier forests. Doing so will lower development hurdles and costs when using advanced GM technologies. More importantly, it will provide options to use GM trees for public benefit, especially if the technology addresses a critical need in certain situations.