

Biotechnology Holds Promise for Protecting Forest Health, But Investments in Research Are Needed, Along With Public Dialogue

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WASHINGTON – Biotechnology has the potential to be a part of the solution in protecting forest trees against destructive pest and disease outbreaks which are predicted to increase because of climate change and expanded global trade and travel but considerable investment is needed to further basic understanding of tree genetics, the

effectiveness of biotechnology in mitigating forest threats, and impacts on ecosystems, says a new report from the National Academies of Sciences, Engineering, and Medicine, *Forest Health and Biotechnology: Possibilities and Considerations*. The report also stresses the need for developing respectful, deliberative, transparent, and inclusive processes to engage people on the issue both to increase public understanding of threats to forest health, and to



understand public views on biotechnology and other interventions in order to inform decision making. While outbreaks of native pests are common in forests and can help renew ecosystems, serious disruptions can occur when an invasive pest is introduced or when native pests expand their range or become more virulent, the report notes. When massive forest die-offs happen, they threaten both the survival of tree species and the benefits forests provide to humans, such as water filtration, erosion prevention, and livelihoods. “Global commerce has hastened the introduction of non-native tree pests and diseases, and those native to the country are becoming more virulent due to external factors such as climate change,” said Susan Offutt, chair of the committee that wrote the report, senior consultant to the Global Strategy to Improve Agricultural and Rural Statistics at the U.N. Food and Agriculture Organization, and former chief economist at the U.S. Government Accountability Office. “A healthy forest sustains ecosystems over time and space, and provides value to humans. The loss of a tree species can have cascading harmful effects on the forest ecosystem and on the benefits it provides to human populations.” “Global commerce has hastened the introduction of non-native tree pests and diseases, and those native to the country are becoming more virulent due to external factors such as climate change.” Threats to forests can be handled using a range of strategies through prevention of the arrival of invasive species, site

management practices, biological control agents, genetic resistance naturally present in the species, or biotechnological modifications to confer resistance. So far, biotechnology has only been used to address forest health in two tree species—American chestnut and hybrid poplars—and these trees are still in field trials. Biotechnology has the potential to help mitigate threats to North American forests by introducing pest-resistant traits, the report says, but research is needed to help meet challenges presented by this approach. The necessary genetic changes to achieve resistance are often not easy to identify and are challenging to implement. Furthermore, the effectiveness of biotechnology at mitigating forest threats needs to be assessed on many fronts. In addition to evaluating how effectively the resistance trait protects a tree species, the modified tree needs to be tested for viability in the diversity of environments in which it will live and for its effects on other species in the environment. Social impacts should form a key part of the integrated assessment of impacts, and the perspectives of those likely to be affected should be taken into account, the report emphasizes. Surveys, focus groups, town hall meetings, and other methods should contribute to decision making that respects diverse perspectives, values, and sources of knowledge. Furthermore, an additional framework is needed to account for forests' intrinsic value—that is, the value they have for their own sake. If a decision is made to go ahead with planting a biotech tree in the forest, a full monitoring and assessment plan should be developed so that ample learning takes place from these initial efforts, the report says. Because of uncertainties in predictions about the impacts of biotech trees in unmanaged environments, iterative decision making is needed; assessments should be continually modified with improvements in knowledge gained through on-the-ground experience with biotech tree development. The U.S.'s current regulatory framework for biotech plants also applies to biotech forest trees and does not impose any different requirements for trees than for other plants, the report notes. That framework encapsulates very few elements of the report's comprehensive definition of forest health. Regulatory agencies should explore ways to incorporate into their regulatory oversight responsibilities the ability to assess the impact on ecosystem services (the benefits provided by forests) of both biotech and non-biotech products developed for improving forest health. Biotechnology is one of many approaches to addressing forest health, the report cautions, and it should not be pursued to the exclusion of other practices for managing forest health, including prevention of the arrival of invasive species and site management practices. The study by the Committee on the Potential for Biotechnology to Address Forest Health was sponsored by the U.S. Department of Agriculture, the U.S. Environmental Protection Agency, and the U.S. Endowment for Forestry and Communities. The National Academies of Sciences, Engineering, and Medicine are private, nonprofit institutions that provide independent, objective analysis and advice to the nation to solve complex problems and inform public policy decisions related to science, technology, and medicine. The National Academies operate under an 1863 congressional charter to the National Academy of Sciences, signed by President Lincoln.

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