Researchers study beetle-killed trees as a sustainable biofuel

November 7 2013

University of Wyoming Department of Botany and Program in Ecology doctoral degree student Paige Copenhaver of Ridgefield, Wash., measures recovery in a fire-damaged area in Yellowstone National Park. UW students will help assess the ecological impacts of a five-year project investigating the feasibility of converting beetle-killed forest biomass into high-grade gasoline. Credit: UW

Millions of acres of beetle-killed trees in the Rocky Mountains could possibly be developed into an innovative industry that uses existing technology to convert biomass into high-grade gasoline, according to University of Wyoming members of a multistate research consortium known as the Bioenergy Alliance Network of the Rockies (BANR). It will study the major challenges limiting the production of biofuel using insect-killed trees in the Rocky Mountains.

The U.S. Department of Agriculture's National Institute of Food and Agriculture has awarded BANR a five-year, $10 million grant through its Agriculture and Food Research Initiative funding opportunity. Led by scientists at Colorado State University, the project also includes researchers, extension specialists and educators at UW, University of Montana, Montana State University, the University of Idaho, U.S. Forest Service and Cool Planet Energy System.

"Infestations of pine and spruce bark beetles have impacted over 42 million acres of U.S. forests since 1996, and a changing climate threatens to expand the threat from bark beetle on our forest lands," says Agriculture Secretary Tom Vilsack. "As we take steps to fight the bark beetle, this innovative research will help take the biomass that results from bark beetle infestation and create clean, renewable energy that holds potential for job creation and promises a cleaner future for America."

The project includes a comprehensive assessment of not only the logistics of harvesting and processing the wood, but also considers the economic, environmental and social consequences of such development. The USDA also requires that the findings and recommendations be shared through educational and extension activities in affected communities, says Dan Tinker, UW Department of Botany associate professor and the task leader for the study's ecological assessment component. He says UW will receive nearly $1 million to fund its part of the study.

Other UW faculty members involved in the projects are Anthropology Professor Sarah Strauss, who leads an assessment of social science, health and safety issues, and monitors community input; UW Energy Extension Specialist Milt Geiger, who will develop resources to inform the public about the industry's economic and community impacts; and Science and Mathematics Teaching Center Coordinator Sylvia Parker, who is collaborating to develop education programs that will infuse bioenergy-related topics into elementary to college-level science courses, including online courses.

Exploring the use of beetle-killed wood as a bioenergy feedstock is in line with the USDA's strategy to develop and expand sustainable regional bioenergy systems, Tinker says. He says insect-killed wood offers numerous advantages, including abundant supply, with stocks of 100 tons per acre; use of such fuel does not compete with conventional food and fiber production nor does it require fertilizer or irrigation to produce, as do other biofuel sources; and the new industry could create new jobs.

However, there are some challenges that have been a barrier to widespread use. Beetle-killed wood typically is located far from urban industrial centers, often in relatively inaccessible areas with challenging topography, which increases harvest and transportation costs.

The process has to be profitable for it to become a sustainable industry, Tinker says. He notes that the industry partner, Cool Planet, already has the technology to accomplish that. It's a modular system in which they establish a conversion plant nearby to where the dead trees are harvested, rather than requiring expensive shipment to distant plants. The process reproduces high-octane gasoline, plus a byproduct called biochar, which can enhance soil structure and can be used in the soil to sequester carbon dioxide.

It has to be ecologically and socially sustainable as well.

"We set the bar high; the process has to result in a zero, or positive impact, on the ecosystem. We are looking at ecological impacts on the forests and the modular pyrolysis sites, on the hydrology, soils and ecosystem function," Tinker says. "Our task is to closely monitor that, identify any problems, and make an ecological assessment to ensure we are not seeing any negative impacts on the forest."

The research team will partner with federal and state agencies, as well as private and industrial forest landowners, to establish study sites that represent the range of forest types across the region.

Social sciences constitute a major component of the study, Strauss says.

"Transitioning to new energy resources is a human problem, constrained by both natural resource availability and technological capacity," she says. "From tourists around the nation, to state governments and resource managers, to the various small, rural communities affected by the development of this resource, there are many different stakeholders with interests in this project."

Working with researchers from Colorado and Idaho, Strauss will use a social-ecological systems approach—including tools ranging from ethnography and individual interviews to GIS, archival research and surveys—to understand the cultural, social, and economic values and concerns of the many groups involved.

"From the social science perspective, the project seeks to understand the varied perspectives and priorities shared or contested across these communities," Strauss says. "We will work with the education and outreach groups to facilitate communication and collaboration for the benefit of all."

Provided by University of Wyoming