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## Studying Woody Biomass for Energy Across the U.S.

*SRS scientists contribute to special journal issue on bioenergy*

by Sarah Farmer, SRS Science Communications

Posted on **June 23, 2016** by [Zoe Hoyle](#)



Non-traditional equipment is tested for harvesting small trees as an energy crop. The red attachment is a shear felling head, and allows the skidsteer to accumulate several small stems at a time. Photo by Dana Mitchell, U.S. Forest Service.

Woody biomass includes stems, small branches, treetops, needles, leaves, and sometimes the roots of trees and shrubs. These materials are byproducts of forest management activities such as thinning, but they can also be a valuable source of bioenergy.

Five U.S. Forest Service Southern Research Station (SRS) scientists – **John Stanturf**, **Emile Gardiner**, **Leslie Groom**, **Dana Mitchell** and **James Perdue** – recently contributed to four review articles that were part of a special issue of the journal *BioEnergy Research*. SRS researchers collaborated on the journal articles with scientists and engineers from a number of universities and other agencies, including the Forest Service Northern Research Station, Pacific Northwest Research Station, and Forest Products Laboratory, as well as the USDA Agricultural Research Service and Natural Resources Conservation Service.

The articles cover all aspects of the bioenergy supply chain – from cultivation in fields or forests, to harvest, to conversion into a final product. Since 2009, Forest Service scientists and engineers have contributed to more than 60 peer-reviewed journal articles about forest operations – a branch of industrial engineering that includes designing, implementing, or improving technologies in the forest sector – and logistics, which includes the harvest, handling, processing, transportation, and storage of woody biomass.

“In practice, operations and logistics blend science, engineering, and management functions to efficiently and effectively meet the needs of customers and society,” says Mitchell, a coauthor of one of the papers. “Forests provide products like biomass, and also help clean the water and air, offer food and shelter to wildlife, and provide opportunities for recreation and other benefits.”

In addition, some tree species, or genotypes within a species, have extra abilities and can help remove chloride, selenium, heavy metals, and other pollutants from former landfill sites, old mine tailings, and other contaminated areas. The process is called [phytoremediation](#), and poplars, willows, and their



10 August 2016



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hybrids are especially effective. These species are also used across the globe to generate bioenergy, and are promising candidates for U.S. bioenergy operations.

Even when grown as bioenergy crops, trees provide valuable ecosystem services. Fast-growing trees such as eucalyptus, pine, and poplar can be grown in plantations and harvested after less than 20 years. “These short-rotation woody crops could be an integral component of regional and national energy portfolios,” says Stanturf, a coauthor of one of the papers. “While they’re growing, they can store carbon, clean the air and water, and improve the soil.”

The renewed interest in biofuels provides an opportunity to use small-diameter trees, which grow thickly in many forests and can represent a fire hazard. In some forests, harvesting small trees to create biofuels will support forest restoration and fire prevention. Currently, forest management contracts to mitigate fire risk cost the Forest Service – and by default, the taxpayer – \$500 to \$1500 per acre.

Although the ultimate goal is that woody biomass removal is valuable enough to pay for itself, partial success will still extend the fire-risk mitigation budget and allow for more acres to receive need treatments. Forest Service scientists continue to develop new strategies for providing the country with sustainable and cost-effective strategies for growing, harvesting, and using forest biomass.

Read **Ecosystem services of woody crop production systems.**

Read **Environmental technologies of woody crop production systems.**

Read **Forest operations and woody biomass logistics to improve efficiency, value, and sustainability.**

Read **A survey of bioenergy research in Forest Service Research and Development.**

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