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UGA forest genetics researcher leads effort to sequence and catalog conifer genes for future biofuels research

Athens, Ga. – Jeffrey Dean, professor of forest biotechnology in the University of Georgia Warnell School of Forestry and Natural Resources, is spearheading a project at the U.S. Department of Energy's Joint Genome Institute (JGI) that will greatly expand the gene catalog for pines and initiate the first gene discovery efforts in five other conifer families.

The project will be a significant piece of the JGI's Community Sequencing Program, which focuses state-of-the-art genome analysis resources on biological organisms that have implications for helping wean the nation's dependence on fossil fuel, according to the JGI press release announcing research proposals selected in this year's competition.

"The wood from conifers will almost certainly be an important component of this nation's biomass energy strategy," Dean said, "but despite extensive commercial plantations they remain essentially an undomesticated species. Information from this project will greatly enhance the ability of our tree improvement programs to develop pines tailored to suit the needs of the future bioenergy industry."

The goal of Dean's research is to produce a comprehensive catalog of all the genes expressed as conifers grow, develop and respond to their environments. By comparing genes expressed by different conifer species in similar tissues under similar conditions, scientists will be able to more quickly identify the key genes controlling tree growth and development. Such studies will also improve our understanding of the formation of biomass components such as lignin that impede production of biofuels from lignocellulosic materials, including wood.

"Although the JGI recently produced a complete genome sequence for poplar, the first woody perennial plant species so characterized, that information has certain limitations for comparison to conifer species, which diverged from poplars and other flowering plants while dinosaurs still dominated the Earth," Dean said. "Complete sequencing of a conifer genome is still a ways off since their genomes are typically enormous, but a complete catalog of expressed conifer genes would still be a watershed for our ability to study, predict and understand how conifer genetics have contributed to the survival of these magnificent trees through hundreds of millions of years."

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While final details on specific species and numbers of sequences are still being worked out, Dean, the lead investigator, and his four co-investigators David Neale (University of California, Davis), Glenn Howe (Oregon State University), Kathleen Jermstad (USDA Forest Service) and Deborah Rogers (Center for Natural Lands Management), will focus much of their initial efforts on loblolly pine, a conifer native to the southeastern United States and a species that by itself is responsible for approximately 16 percent of the world's annual timber harvest.

“Loblolly pine is a primary target for this research project because of its current commercial importance in the southeastern United States, as well as its potential for providing biomass to future biofuels markets,” Dean said.

Other targeted species for the project include coast redwood, one the fastest growing conifers, and *Wollemia nobilis*, a species related to the Norfolk Island pine that was thought extinct until a small grove was discovered in Australia in 1994. More than fifty research laboratories from around the world have pledged their support for this project. They, along with many others, will benefit from immediate access to all gene sequences from the project, all of which will be available online as they are produced at JGI.

The UGA Warnell School of Forestry and Natural Resources provides students with five degree path programs in forestry and natural resource science and management, including the forestry, fisheries and aquaculture, natural resources recreation and tourism, water and soil resources, and wildlife management and ecology majors. With more than fifty faculty and 23,000 acres of teaching lands, the Warnell School is the southeast's oldest, and one of the most respected forestry and natural resource education providers in the United States. The school also houses one of the largest study abroad programs in the nation covering all seven continents to provide global learning opportunities for its students. For more information, see the Warnell School website at www.warnell.uga.edu.

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