Model forecasts long-term impacts of forest land-use decisions

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The drive to develop crops for use as biofuel, continues to raise questions about additional uses of forest land. A cutting edge computer model developed at North Carolina State University offers detailed insight to predict the environmental impact – along with understanding forest ecosystem response to global climate change.

"We think the model will help policy makers and forest managers make informed decisions to maintain forest productivity while minimizing the environmental impact of managed forest plantations," says Dr. Shiying Tian, a Postdoctoral Researcher at NC State, and lead author of a paper on the model, just released in the *Journal Of Environmental Quality*. "It also will help us understand how these forest systems will respond if we see changes in temperature or precipitation related to climate change," says Dr. Mohamed Youssef, Assistant Professor of Biological and Agricultural Engineering at NC State, and co-author.

NC State previously developed models accounting for the hydrology, carbon and nitrogen cycles in agricultural land with high water table soils. The new model, DRAINMOD-FOREST, extends the applicability to forest land by accounting for plant growth in the forest ecosystem. The model addresses how trees and other forest vegetation affect – and are affected by – the water, carbon, and nitrogen cycles. DRAINMOD-FOREST looks specifically at forests in areas with a high water table – such as coastal regions.

The new model is timely, due to a number of emerging uses for forest

land. One example, the national interest in identifying new means of growing biofuels crops, like switchgrass, by planting it in the space between trees in commercial forests. DRAINMOD-FOREST will help determine whether such an "inter-crop" method is viable and sustainable. Would it hinder tree growth? What would the environmental consequences be? "We could also use the model to determine the viability and environmental impact of introducing new commercial tree species," Tian says.

"This is a whole system model," says Youssef. "We look at the hydrology, or water cycle, of the system. We look at the nitrogen and carbon cycles. And we look at plant growth in the forest system. This is the most thorough model yet for forest ecosystems in the coastal regions of the south and southeast U.S."

More information: View the abstract here.

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