New research will boost grasp of North American carbon cycle

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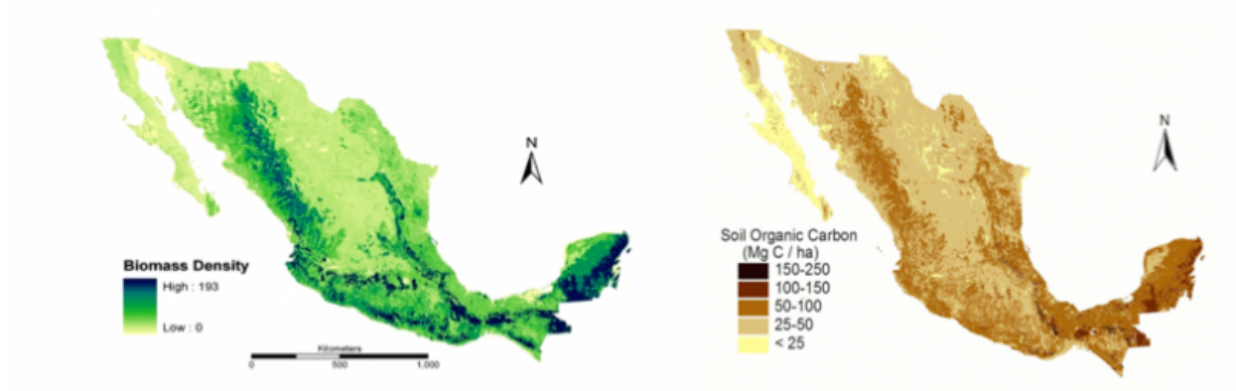

Above-ground biomass density (Mg C/ha) and soil organic carbon (Mg C/ha). Data was derived from information of >22,000 plots collected by the National Forest and Soil Inventory during the year 2007. Credit: University of Kansas

For centuries, people have transformed and splintered landscapes and ecosystems in North America. This radical altering of nature makes it tough for scientists to analyze the continent's life-sustaining carbon cycle—the biological, geological and chemical routes the element carbon takes to shift among earth, water and atmosphere.

"The carbon cycle is our understanding of where all the carbon on the planet is and where it is going," said Nate Brunsell, professor of geography at the University of Kansas. "This is important as the change

in carbon in the atmosphere is one of the major reasons for anthropogenic climate change, or 'global warming.' With the buildup of carbon dioxide in the atmosphere, we're impacting a lot of different aspects of the climate of Earth. This can alter the weather but also has the potential to alter where plants and animals can live."

Now, with a new grant from the Department of Agriculture, Brunsell and colleagues Rodrigo Vargas of the University of Delaware and Daniel Hayes of the Oak Ridge National Laboratory are undertaking an investigation to reduce uncertainty in carbon cycle science in the U.S. and Mexico.

"Our research is trying to understand how different regions of the U.S. and Mexico vary in terms of their carbon and water," Brunsell said. "Right now, we don't have a good handle on how all of these diverse regions will respond to climate change, and we're hoping through this study to be able to better understand how things are and how they are likely to change in the future."

The researchers will harmonize data about key components of the carbon cycle in Mexico, make the information dovetail with similar data for the U.S., and tie information on both nations to terrestrial and atmospheric models and remote sensing from satellites to see more accurately where information gaps still exist.

"We're missing a lot of information about Mexico," Brunsell said. "This represents a wide range of biomes, and each of these may behave quite differently to climate change. Also, if we're able to understand and model the carbon and water cycles across the diverse regions of Mexico, that will give us more confidence that our models can handle future changes in Mexico as well as here in the U.S."

The KU researcher said that changes in local levels of land cover,

agriculture and urbanization in Mexico and the U.S. are important to detail and tie to larger trends in greenhouse gas emissions around the world. "Understanding the interaction of local land use patterns in conjunction with global and regional climate change is a big part of this research," he said.

Indeed, the researchers say datasets on soil carbon, forests and evapotranspiration (the transfer of water to the air from soil, plants and bodies of water) have been largely unavailable across Mexico for synthesis with U.S. data. But they plan to acquire this information and combine it with data from new technology now available in Mexico.

"A lot of the data we're focusing on include forest inventory data as well as advanced meteorological towers that can directly measure the carbon and water cycles," Brunsell said. "Having a coordinated effort to examine these data across the continent is essential for understanding the impacts of climate change on local communities."

The KU investigator is building on his research interest in understanding water cycling and how climate change will change evaporation and rainfall patterns, and affect water resources in arid environments.

"My training is as a biometeorologist, which means that I look at the interactions between the life on earth and weather and climate," Brunsell said. "You can't get very far looking at water without understanding carbon cycling, particularly in plants. This is a research strength at KU, and there are quite a few of us looking at climate impacts on both water and carbon."

Provided by University of Kansas

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