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# 'Family' matters when predicting ecosystems' reaction to global change, study finds

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This is a picture of the experimental setup in the greenhouse. Credit: Jennifer Schweitzer

Humans are rapidly changing the look and function of earth's ecosystems, from the increase of greenhouse gases to the unintentional and harmful spread of plants and animals to new environments. A major challenge for ecologists is to understand how and why communities respond to factors that underlie global change.

A University of Tennessee, Knoxville, study is finding some clues. It shows that just as our family histories dictate what we look like and how we act, plant evolutionary history shapes community responses to interacting agents of global change.

The research, published in the open-access journal *PLOS ONE*, may help predict what ecosystems will look like in the future and how they will work. To view the article, visit http://bit.ly/1AbFugC.

"The issues of global change have already begun to jeopardize the natural functioning of ecosystems and important services that we often take for granted like clean air, clean water, food and fiber production," said Rachel Wooliver, lead author and doctoral student in ecology and evolutionary biology. "Our study is the first to experimentally show that plant communities with different evolutionary backgrounds will respond differently to human-caused physical and biological changes."

In other words, regarding the future effects of global change on ecosystem services and processes humans rely upon, it's all in the family.

Wooliver and colleagues from UT, the University of Tasmania and Villanova University used eucalypt species native to Tasmania, Australia, to compare plant growth in cultures of all the same species to that of mixtures with native species with an introduced hardwood plantation species. They analyzed plant activity in an ambient environment versus one of increased levels of carbon dioxide and soil nitrogen.

"We found that only those communities composed of native species within one evolutionary lineage responded significantly to elevated carbon dioxide and nitrogen by taking carbon from the atmosphere and sequestering it into biomass," said co-author John Senior of the University of Tasmania. "Communities from another lineage, on the other hand, showed no response, which suggests that they will play a less crucial role in offsetting the rise of carbon dioxide and global warming."

This means that evolutionary history will shape which species will effectively sequester carbon and which won't.

Further, the presence of the nonnative species in these communities influenced productivity differently depending on the evolutionary background of the interacting native species. Thus, family trees can be used to predict how the spread of nonnative species by humans will shape the look and function of ecosystems as global change continues.

"Overall, this study provides new direction for global change scientists by highlighting that evolutionary history is key to understanding outcomes of plant function and diversity with rapid ecological change," said Wooliver.

The work is promising to researchers that are trying to figure out if species interactions change how ecosystems are responding to global change, as well as conservation biologists who aim to determine which species might be at higher risk for extinction in the future.

Provided by University of Tennessee at Knoxville

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