

Productivity increases with species diversity: 150 years later, research proves Darwin prediction

May 13 2013

Environments containing species that are distantly related to one another are more productive than those containing closely related species, according to new research from the University of Toronto Scarborough (UTSC).

The experimental result from Marc William Cadotte confirms a prediction made by [Charles Darwin](#) in *On the [Origin of Species](#)*, first published in 1859. Darwin had said that a plot of land growing distantly related grasses would be more productive than a plot with a single [species](#) of grass.

Since then, many experiments have shown that multi-species plots are more productive. Cadotte's experiment showed for the first time that species with the greatest evolutionary distance from one another have the greatest [productivity gains](#).

"If you have two species that can access different resources or do things in different ways, then having those two species together can enhance species function. What I've done is account for those differences by accounting for their [evolutionary history](#)," Cadotte says.

Cadotte grew 17 different plants in various combinations of one, two, or four species per plot. As in previous experiments, he found that multi-species plots produced more [plant material](#). But when he analyzed the

results he also found that combinations of plants that were distantly related to one another were more productive than combinations of plants that were closely related. So, for instance, a plot planted with goldenrod and the closely related black-eyed susan wasn't as productive as a plot with goldenrod and the more distantly related bluestem [grass](#).

What's going on isn't mysterious, Cadotte says. Distantly related plants are more likely to require different resources and to fill different environmental niches – one might need more nitrogen, the other more phosphorus; one might have shallow roots, the other deep roots. So rather than competing with one another they complement one another.

What's interesting about his result is that evolutionary distance is all you need to know to predict productivity. The result suggests that as plant species disappear the Earth will become less productive, and plants will draw even less carbon from the atmosphere, possibly increasing the rate of global warming.

On the other hand, the results could give a valuable tool to conservation efforts. Environmentalists trying to restore damaged habitats could use the information to help them pick which combinations of species to introduce.

This research is published in the upcoming edition of the *Proceedings of the National Academy of Sciences (PNAS)*.

More information: Experimental evidence that evolutionarily diverse assemblages result in higher productivity,
www.pnas.org/cgi/doi/10.1073/pnas.1301685110

Provided by University of Toronto

Citation: Productivity increases with species diversity: 150 years later, research proves Darwin prediction (2013, May 13) retrieved 23 June 2024 from <https://phys.org/news/2013-05-productivity-species-diversity-years-darwin.html>

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