Scientists solve long-standing ecological riddle

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Plot richness
Plot biomass

The fundamental mechanisms underlying global productivity-diversity patterns have been debated by ecologists for decades. Methodological advances are now permitting a glimpse at the processes that lie behind surface patterns. Credit: U.S. Geological Survey

Researchers have found clear evidence that communities rich in species are substantially healthier and more productive than those depleted of species, once complicating factors are removed.

An international group of scientists, including University of Washington ecologist Jonathan Bakker, has solved this long-standing ecological riddle using new scientific techniques for analyzing complex data to answer the question: How do we know that conserving biodiversity is actually important in the real world?

"This study shows that you cannot have sustainable, productive ecosystems without maintaining biodiversity in the landscape," said Jim Grace, a U.S. Geological Survey research ecologist and lead author of a new paper published online Jan. 13 in *Nature*.

Biodiversity has been hypothesized to be of critical importance for the stability of natural ecosystems and their abilities to provide positive benefits such as oxygen production, soil genesis, and water detoxification to plant and animal communities, as well as to human society.

Many of the efforts of conservation agencies around the world are driven by the assumption that this hypothesis is true. While theoretical studies have supported this claim, scientists have struggled for the last half-century to clearly isolate such an effect in the real world.

The scientists used data collected for this research by a global consortium, the Nutrient Network, from more than 1,000 grassland plots spanning five continents. Using recent advances in analytical methods, the group was able to isolate the biodiversity effect from the effects of other processes, including processes that can reduce diversity.

"It's a unique opportunity to have data that have been consistently collected from grasslands all around the globe," said Bakker, an associate professor in the UW's School of Environmental and Forest Sciences. "We're trying to come up with more robust ecological conclusions in terms of identifying processes that are truly global, or understanding when and where processes are important."

Three of the 39 grassland sites analyzed for this paper are in Washington state and were sampled by Bakker and colleagues in 2007. They were studied to provide baseline information for a long-term experiment that began in 2008. Bakker continues to visit one of the sites several times a year for this experiment, which examines the effects of herbivory and fertilization on grassland plant communities. These experiments have been the basis for other recent papers published by the network's scientists.

The three sites in Washington are within the Glacier Heritage prairie preserve near Olympia, at American Camp on San Juan Island, and at the Pacific Rim Institute for Environmental Stewardship on Whidbey Island.

The Nutrient Network now includes sites on every continent except Antarctica.

More information: James B. Grace et al. Integrative modelling reveals mechanisms linking productivity and plant species richness, *Nature* (2016). DOI: 10.1038/nature16524

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