

a voice
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Celebrating natives
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The Grapevine

By Maryann Whitman

Plant Diversity and Ecosystem Functioning

In a study that mimicked the natural order of species loss in a grassland ecosystem, researchers found that declining biodiversity greatly reduced resistance to invasive species, and that the presence of even small numbers of rare species had profound functional effects. The results have important implications for understanding the biodiversity crisis.

Previous experiments relied on random species removal rather than realistic patterns of loss. When natural patterns and processes are replicated, a more realistic loss scenario is generated: entire groups of plants with unique functions disappeared faster than expected by chance, and invader resistance declined dramatically. The results suggest that biodiversity losses in natural systems can have far greater impacts than indicated by randomized-loss experiments.

The more plant diversity in the experimental plots, the less successful the invader (as measured by bio-mass produced). "Each species, no matter how few in number, potentially provides different services within the ecosystem," explained Erika S. Zavaleta, one of the researchers from the University of California, Santa Cruz. "Those extra species in our study are functionally unique. They are alive at different times of the year, and their roots are at different depths," she said. "It turns out that very rare things can matter a lot."

Other research has shown that more diverse communities use resources more efficiently, from water and nutrients to light, said Zavaleta. "By monopolizing resources, they're keeping invaders away," she added. "With fewer species, there are holes in the system and invaders can come in. Just a couple of members of certain species can help plug those holes. There may be only a few sprinkled around, but they can still be exerting a big effect on the way the system works."

Zavaleta likens the ecosystem benefits of retaining rare species to the role of a child plugging a dike with his thumb. "It's a small difference that can have huge consequences," she said. "Most ecologists would like to see natural systems able to do that – resist accidental invasion."

Something I Noticed

I have several large, unwieldy, exotic cactuses that my husband is very fond of; and as a result, I tend to them and take them outdoors to play during the summer. Each fall we carry them in and I inspect the pots for any hitchhikers (tree frogs), and remove any fertile fruit so that it doesn't fall and produce more large unwieldy cactuses. One of these cactuses is a night bloomer that produces gorgeous, softball-size, heavily perfumed blossoms that last for exactly one night. By morning the blossom is wilted, signifying that the appropriate pollinator had visited during the night. Or at least this has been the routine in the past.

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This year, once again I saw the blossoms, but they behaved differently. They lasted for more than one night. In the fall when the plants came in I found no fertile fruit on them.

The only thing that occurs to me as an answer to this mysterious situation is that the appropriate night-flying pollinators were missing this year.

I wonder how many of the native plants in the area also missed being visited by these same pollinators.

It May No Longer Be Safe to Plant a Tree

Volatile organic compounds (VOCs), in combination with nitrogen oxides, are responsible for ground level ozone and smog. Smog has both health and environmental impacts. While industry has dramatically cut its emissions of these pollutants, the journal, *Global Change Biology*, (vol. 10, p1737), reports that those cuts have been more than offset by the amount of VOCs churned out by trees.

Researchers at Princeton University used the U.S. Forest Service Industry Analysis, a database of 250,000 randomly sampled forest plots around the country, and the known VOC emission rate for each tree species for the study.

They calculated that vegetal sources of certain VOCs rose by 17% during the 1980s – equivalent to three times the industrial reductions. Farmland reverting to scrub, pine plantations, and the “invasive” sweet gum tree (*Liquidambar styraciflua*) were behind most of the increases in the United States.

The word “invasive” was used in the scientific report. American sweet gum is in fact native to the United States, from Connecticut south to Florida, and on into Central America. It has been planted for its valuable timber and for the styrax it produces, which is important to medicine and perfumery. It’s also a hardy ornamental shade tree, with brilliant autumn coloring, used for street and house plantings. I would have preferred they use a term like “successful self-seeding” instead of “invasive.”

Waipuna

The Bureau of Land Management in Oregon is testing a method of killing weeds that basically involves steam-killing them. Water at 200 degrees (boiling point of water is 212 degrees) is the key actor. A surfactant foam that is a biodegradable mixture of corn and coconut sugar extracts, is delivered by wand, with the water, and serves to trap the steam, maintaining a temperature sufficient to cause a cellular collapse of the treated above-ground vegetation. By the same method, the seed bank at the soil surface is depleted. Since it is not toxic, problems associated with wind blown chemicals and urban runoff are non-existent.

It has been found to be most effective on all seedlings, some forbs, and species of grasses like false-brome (*Brachypodium sylvaticum*), an invasive woodland grass rapidly expanding in the Pacific Northwest. It is less effective on woody species and species with extensive root systems.

A drawback for the home-owner/user is the cost of the machinery needed to deliver the very inexpensive foam.

Maryann is Editor of the Wild Ones Journal, and comes to the position with an extensive background in environmental matters of all kinds.