Philippine coastal zone research reveals tropical cyclone disruption of nutrient cycling

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Cycas nitida trees preferentially occupy gorgeous coastal habitats in the eastern Visayan Islands of the Philippines. This spatial distribution places them at risk of severe damage by tropical cyclones. Credit: Thomas Marler

Living on beachfront property on a tropical island is an idyllic life goal for many people. Those people may be envious of a number of native

Philippine plant species that restrict their population distribution to coastal zones. But that idyllic life comes with a price, as revealed in an article that appears in issue 2 of the 2015 volume of the *Journal of Geography & Natural Disasters*.

"Island nations in the western Pacific region are subjected to more tropical cyclones than anywhere else worldwide," said Thomas Marler, ecologist with the University of Guam. "And the greatest destructive forces of tropical cyclones occurs on coastal zone habitats."

Working out of the Western Pacific Tropical Research Center, Marler teamed up with Ulysses Ferreras, a biologist with the Philippine Native Plants Conservation Society. The research partnership attempted to more fully understand the destructive forces of the typhoon by looking at the influence on chemical cycling among the interacting biological and geological systems. Their research focused on several islands in the eastern Visayan region of the Philippines where the typhoon first made landfall on 8 November 2013.

"We had conducted a lot of field work in these habitats during the years prior to the tropical cyclone," said Marler, "so we were able to return to those same habitats in attempts to understand the damage." The study included several habitats that contained different soil traits but supported a common plant species, *Cycas nitida*.

The publication illuminates several ways in which a tropical cyclone disrupts nutrient flow through the ecosystem. For example, defoliation of green leaves may be one of the most common responses of forests to tropical cyclone damage. Because these leaves were unable to proceed through the normal aging process before being dislodged from the trees, nutritional status of the plants temporarily decreases and forest floor nutritional deposits temporarily increase. Additionally, many plant leaves were partially desiccated by cyclone-force winds, but not fully killed. In

response, nutrients were locked up in the damaged portions of these leaves forcing them to stay suspended in tree canopies for extended periods of time instead of falling with customary litterfall to enter the soil nutrient cycling process.

Tropical cyclones are called typhoons in the western Pacific and hurricanes in the Atlantic basin. They are an example of what ecologists consider infrequent, large-scale disturbances. The ecosystem responses to the damage may be altered for many years following the disturbance event that may last only a few hours. This case study provides a relevant example of these phenomena from the heavily impacted but seldom studied Philippine islands.

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