Discoveries

TED LEVIN

Well-fed Plant Cuts Back on Meat

Assessing the health of ecosystems can be a difficult, expensive, and time-consuming task. Subtle changes in plant growth due to small variations in nutrient availability might require years of expensive and complicated testing to identify. Fortunately, researchers from the University of Vermont and Harvard University's Harvard Forest may have discovered an elegant, cheap, and timely solution to measuring one nutrient vital to ecosystems: nitrogen. Their magic litmus test? The northern pitcher plant (*Sarracenia purpurea*), a bug-eating carnivorous plant only slightly less popular as a horror-flick icon than the familiar Venus flytrap.

Nicholas Gotelli, a biologist at UVM, and his colleague, Aaron Ellison, an ecologist at the Harvard Forest, were able to show that the shape and growth pattern of the pitcher plant – a familiar bog-dwelling flowering plant with tubular leaves – were directly related to the amount of nitrogen that plant received. This study, announced by UVM and published in the April 2, 2002, issue of the *Proceedings of the National Academy of Sciences*, was conducted in 26 bogs throughout Connecticut, Massachusetts, and Vermont.

When Ellison and Gotelli added a nitrogen solution to the pitcher leaves, several changes began to take place. The plants began to produce flattened leaves called phyllodia and the pitchers, or tube-shaped insect-catching leaves, began to shrink. Within 8 to 12 weeks, the plants shifted to a more vegetarian diet, obtaining nitrogen from the artificially enriched rainwater absorbed by the pitchers and the roots.

In most places, nitrogen found in the soil and water is sufficient to make the enzymes required for photosynthesis and growth. In a nitrogen-deficient bog, however, pitcher plants and others must resort to insect carnivory to obtain all of the nitrogen they need to photosynthesize – but at a cost. Many extra resources are required for the plant to produce and maintain the insect-catching pitcher structures.

In the case of the pitcher plant, the cost of making the pitchers is outweighed by the benefit – staying alive. When adequate nitrogen is available, however, the plant no longer needs to expend excess energy creating large pitchers to snare insects; it can obtain all the nitrogen and other nutrients it needs from rainwater.

The most useful aspect of this study may be the potential for using pitcher plants as natural and simple indicators of ecosystem health. Pitcher plants are abundant and easily identifiable, and Ellison and Gotelli have shown that over a three-month period – one northern New England summer – the effects of increased nitrogen levels in bog ecosystems become obvious. With simple equipment and training, almost anybody can be enlisted to keep an eye on pitcher plant growth habits (and maybe see a few ants or flies get nabbed), while contributing to this new and important research.

"Discoveries" is a regular column in Northern Woodlands. *We welcome submissions from members of the research community. Articles should be written for a general audience, should be 200-500 words long, and should report on research, either completed or ongoing, that will stand up to peer review.*