Nitrogen availability alters the expression of carnivory in the northern pitcher plant, *Sarracenia purpurea*

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Atmospheric transport and deposition of nutrients, especially nitrogen, is a global environmental problem with well-documented consequences for ecosystem dynamics. However, monitoring nitrogen deposition is relatively expensive, monitoring stations are widely spaced, and estimates and predicted impacts of nitrogen deposition are currently derived from spatial modeling and interpolation of limited data. Ombrotrophic (''rain-fed'') bogs are nutrient-poor ecosystems that are especially sensitive to increasing nutrient input, and carnivorous plants, which are characteristic of these widespread ecosystem types, may be especially sensitive indicators of N deposition. Botanical carnivory is thought to have evolved in nutrient-poor and well-lit habitats such as bogs because the marginal benefits accruing from carnivory exceed the marginal photosynthetic costs associated with the maintenance of carnivorous organs. However, the production of carnivorous organs can be a phenotypically plastic trait. The northern pitcher plant, *Sarracenia purpurea,* produces leaves specialized for prey capture and nutrient uptake (pitchers) and leaves that are more efficient at photosynthesis (phyllodia). We hypothesized that relative allocation to these two types of leaves reflects ambient nitrogen availability. We manipulated nutrient availability to plants with leaf enrichment and whole-plot fertilization experiments. Increased nitrogen, but not phosphorus, reduced production of pitchers relative to phyllodia; this result provided empirical support for the cost–benefit model of the evolution of botanical carnivory. Because this phenotypic shift in leaf production occurs in ecological time, our results suggest that *S. purpurea* could be a reliable and inexpensive biological indicator of nitrogen deposition rates. This suggestion is supported by field observations across a geographic gradient of nitrogen deposition.

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Direct Effects of N Additions on Morphology of *S. purpurea*.

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