



Negative Effects of White-tailed Deer on Native Wildflowers at Indiana Dunes National Lakeshore (INDU)

In North America, the distribution and abundance of native plant populations, particularly native forest understory wildflowers, are changing in response to changes in several environmental factors.



Figure 1. White tailed deer

Abundant white tailed deer, *Odocoileus virginianus* (Fig 1), are suspected to be important drivers of this change in eastern North

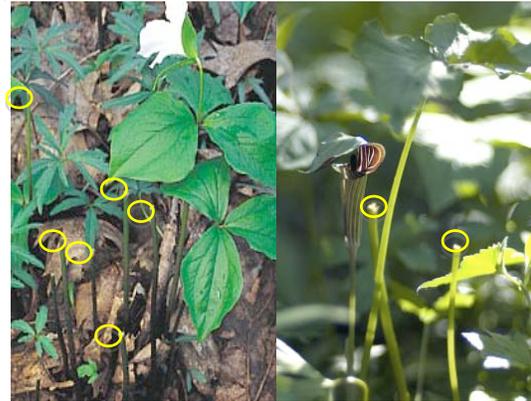
American forests¹. To isolate the effects of deer from other sources of change within plant communities, it is important to conduct experiments that can separate deer impacts from other environmental factors.

Professor Susan Kalisz (University of Pittsburgh) and her students collected data on the abundance, individual size and flowering status of wildflowers growing in INDU's long-term deer experimental plots



Figure 2. Professor Susan Kalisz (right), INDU wildlife biologist Randy Knutson and U Pittsburgh student researchers Justin Aaron and Cory Kohn (left) at an INDU deer exclusion plot. Not pictured Andrew Berson, student researcher.

(Fig 2) in which deer are excluded from entering plots by fences (Deer Exclusion) are paired with plots that allow deer free access (Deer Access). In all plots, the researchers collected data on focal forest understory wildflowers that deer prefer as food termed palatable, and wildflowers that deer avoid eating, termed unpalatable (Fig 3).



Figures 3A and B. 3A. White trillium (focal palatable species) decapitated by white-tailed deer browsing. 3B. Focal unpalatable Jack-in-the-pulpit co-occurs with trillium but is not eaten by deer. (Photos by C. Heckel). Yellow circles show eaten trillium stems in both.

The researchers compared the data for palatable and unpalatable focal native plants to determine the extent to which deer affect the performance of these wildflowers. Their research investigated three key questions: (1) Do deer cause declines in abundance of palatable wildflowers and increase abundance of unpalatable wildflowers? (2) Do deer cause either group to have lowered flowering or seed production? (3) Are individual plants smaller where deer have access relative to the exclusion plots?

Summary of Methods and Results: The abundance, individual size and stage of eight

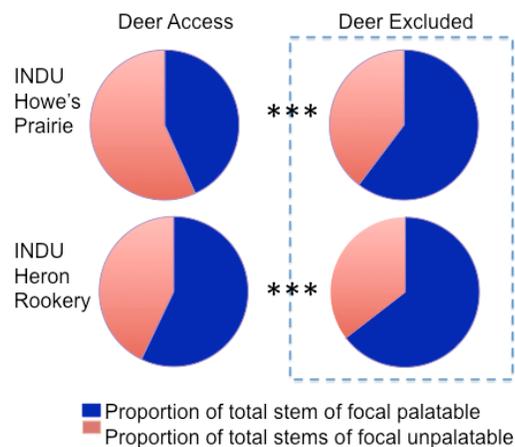


Figure 4. Deer depress the abundance of palatable focal species and increase the abundance of unpalatable species. Significantly fewer palatable individuals (blue) are found in the deer access plots relative to the deer exclusion plots. (***) indicates p value < 0.001 in a G-test).

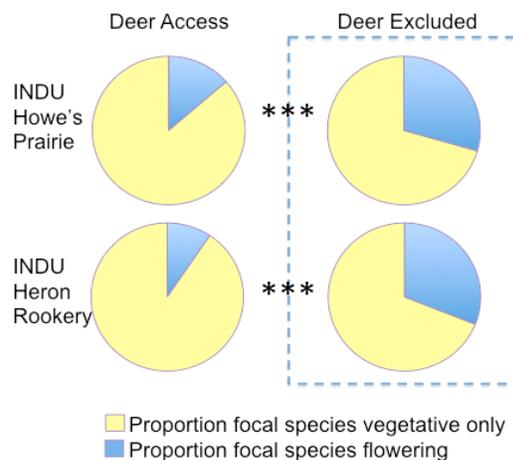


Figure 5. Deer depresses the frequency of flowering individual across all focal species. Significantly fewer reproductive individuals (blue) are found in the deer access plots relative to the deer exclusion plots. (***) indicates p value < 0.001 in a G-test).

focal species were quantified in the Deer Exclusion and Deer Access Plots. These species included palatable *Trillium grandiflorum* (white trillium), *T. erectum* (wakerobin), *T. cernuum* (nodding trillium), *Polygonatum biflorum* (Solomon's seal), and *Maianthemum racemosum* (false Solomon's seal), and two species highly unpalatable to deer, *Arisaema triphyllum* (Jack-in-the-pulpit) and *Podophyllum peltatum* (Mayapple). Kalisz and her team found that across all focal species, the proportion of palatable individuals is significantly lower in deer access vs. the deer exclusion plots (Fig 4) but the reverse was true for unpalatable species. They saw a significant and consistent decline in numbers for the focal species that flowered in the Deer Access Plots at INDU (Fig 5). These results are driven by the palatable focal species that were significantly smaller and flowered less in the Deer Access plots (data not shown).

Management Implications: These data implicate deer in the decline in the understory wildflower abundance and population structure in INDU. These results are consistent with findings from Pennsylvania and Virginia that Kalisz's lab

studied²⁻⁴ and studies from the Great Smoky Mountain National Park⁵⁻⁶ that demonstrate declines in abundance^{2,5,6} or changes in the population structure^{2,3} of native palatable and unpalatable⁴ wildflowers under high deer pressure.

Message:

Native plant populations of the understory herbs constantly grazed by abundant deer are unable to regenerate, become less viable, and can decline to extinction. This can result in the loss of biodiversity in our forests. The research findings suggest a need to decrease the deer herd size at INDU to sustain regeneration of native plants in the understory of forested habitats.

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