



## Deer Exclosure Research At Lacawac Sanctuary

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*The results described in this article were featured in two of Dr. Dave Byman's published articles: 1) Demographic Effects of White-tailed Deer (*Odocoileus virginianus*) Exclosures on White-footed mice (*Peromyscus lecopus*) published in the July 2013 issue of American Midland Naturalist and 2) The Effects of Deer Exclosures on Voles and Shrews in Two Forest Habitats published in 2011 in Northeastern Naturalist.*

Ever since top predators, such as wolves, were removed or hunted out of their native ranges, the white-tailed deer populations have grown so large that many other species are being impacted. Deer only consume certain species of young trees, which make up a significant portion of the understory here at Lacawac Sanctuary. These young trees provide shelter and food resources for many small woodland mammals. Previous research conducted on growing deer populations looked at how bird species were impacted by the lack of understory growth, however not much was known about how it impacts small mammals. Dr. Dave Byman of Penn State Worthington Scranton set out to study how a large deer population impacted the small mammal populations found in the forest at Lacawac Sanctuary.

Every week May through September of 1996 to 2005, Dr. Byman sampled mouse, vole, and shrew populations inside and outside Lacawac's deer exclosures. The exclosures prevented deer from entering the space, but allowed smaller species to travel freely. Byman began his study by placing baited traps for the small mammals inside and outside of the exclosures. Once captured, Byman safely measured, weighed and sexed the individuals while ear-tagging the white-footed mice and marking the shrews and voles. By marking the individuals Byman was able to construct an estimate of how many shrews, voles and mice were living in the exclosures compared to the surrounding forested area. For example, if the same few shrews were caught repeatedly, this would indicate that the

population of shrews in that area was small. If unmarked shrews frequently were caught, it would suggest that the shrew population was large. Various squirrel species, Woodland Jumping Mice and even a juvenile Virginia Opossum were also caught and safely released during this experiment.

At the end of the 10 year study, Byman saw clear trends in the populations. After review, some



*Dr. Dave Byman, assistant professor of biology at Penn State Worthington Scranton, actively conducts research in Lacawac's deer exclosures and is on Lacawac's Science Committee.*

species of vole and shrew were not found often enough to provide a solid collection of data, and consequently, were excluded from the study's results. Byman did find evidence that supported the hypothesis that the high deer populations at Lacawac Sanctuary had affected the shrew and vole species negatively. Specifically the Northern Red-backed Vole and Woodland Vole populations had a greater density of individuals inside the exclosures than outside. Meaning, that the lack of understory cover outside of the exclosures limited the available habitat for the shrews and voles. The lack of understory also

leaves the shrews and voles more vulnerable to predators, such as owls.

Next Byman collaborated with Shannon D. Harding and Francis W. Spear to answer if large deer populations were negatively impacting the white-footed mouse population at Lacawac Sanctuary. The team discovered that the exclosures, absent of deer, allowed the white-footed mouse population to sustain a larger population. The data showed that the mouse population had a higher density inside the exclosure than outside. The scientists also found that the population inside the exclosures had a greater proportion of large females than outside. It is possible that the higher quantity and quality of food resources inside the exclosures play a role in the larger individual size and population density. Byman is currently working on a 5 year project studying how habitat quality and food quantity inside and outside the exclosures impact the small mammal populations.