White-tailed Deer Alter Diversity of Songbirds And Their Habitat in Northwestern Pennsylvania

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White-tailed Deer were nearly extirpated from Pennsylvania at the turn of the century. Since then, protection, reintroduction, and habitat improvement resulted in the deer population increasing from presettlement densities of 10 to 15 deer per square mile to more than 50 deer per square mile in the four-county area that surrounds the Allegheny National Forest (Fig. 1). As a result, deer populations have significantly altered the vegetation of Allegheny hardwood forests for nearly 80 years (Hough 1965; Whitney 1984; Tilghman 1989). Currently, average population density across the Allegheny Plateau is 30 deer per square mile.

Changes in understory forest vegetation have demonstrated effects on local songbird populations (MacArthur and MacArthur 1961; Hooper et al. 1973; McShea and Rappole 1992). However, studies linking the impact of deer density on vegetation to effects on birds have not been conducted in Pennsylvania or elsewhere.

DEER IMPACTS ON UNDERSTORY VEGETATION

In 1980, the Northeastern Forest Experiment Station's Forestry Sciences Laboratory at Warren, Pennsylvania, initiated a 10-year study of the impacts of varying deer densities on forest regeneration and understory vegetation. Scientists simulated four deer densities (10, 20, 38, and 64 deer per square mile) within each of four study areas in northwestern Pennsylvania. These densities represent the range of actual deer densities across the landscape between 1900 and 1980.

Within each study area, timber harvests were conducted that represented standard silvicultural practices throughout the Allegheny Region. Ten percent of each area was harvested to remove all trees except seedlings (clearcut), 30 percent was thinned, and the remainder was left uncut.

Deer densities greater than 20 deer per square mile have significant impacts on forest vegetation in thinned and clearcut stands. Species richness and abundance of commercial tree seedlings decreased with increasing deer density. Seedling and sapling height also decreased with increasing density (Figure 2). While percent ground cover of herbaceous species was not affected, there were significant changes in species composition, including decreases in species richness and abundance of wildflowers, and increases in grasses and New York and hay-scented fern.

EFFECTS OF CHANGES IN UNDERSTORY VEGETATION ON SONGBIRD HABITAT

Because of growing concern for a variety of forest resources other than commercial regeneration, we expanded the study to consider impacts of browsing by White-tailed Deer on songbird habitat and populations in 1991. We conducted point counts of birds five times at each site from 15 May to 31 July, categorizing birds as ground nesting (within 1.5 feet of the ground), intermediate canopy nesting (ICN, between 1.5 and 25 feet), and upper canopy nesting (above 25 feet). Point counts were designed to sample birds within clearcut, thinned, and uncut areas as a whole, representing songbird communities within managed forests.

Densities of White-tailed Deer greater than 20 deer per square mile significantly reduced ICN species richness and abundance as a result of decreased height of nesting habitat. We noted a 30 percent decrease in species richness and a 37 percent decrease in abundance of ICN songbirds between 10 and 64 deer per square mile (Figure 3).

Eastern Wood-Pewee, Indigo Bunting, Least Flycatcher, Yellow-billed Cuckoo, and Cerulean Warbler were absent at densities greater than 20 deer per square mile. Eastern Phoebe and American Robin were absent at densities greater than 38 deer per square mile.

We noted no significant effects of browsing by White-tailed Deer on ground nesting songbirds, probably because the absolute amount of ground cover remained constant even though composition of ground vegetation varied at different deer densities. We assumed that upper canopy nesting songbirds would be largely unaffected by deer browsing in the forest understory. Generally, their abundance and species richness did not change with different deer densities. The Cerulean Warbler, which we hypothesize feeds in the intermediate canopy level, was one exception, disappearing at densities greater than 20 deer per square mile.

We recommend managing White-tailed Deer toward densities of 20 deer per square mile. Achieving and maintaining deer populations at this level should promote diverse and abundant tree, shrub, and herbaceous vegetation, which in turn provides abundant habitat for songbirds of all kinds. ICN songbirds in particular would benefit from lower deer densities across Pennsylvania.

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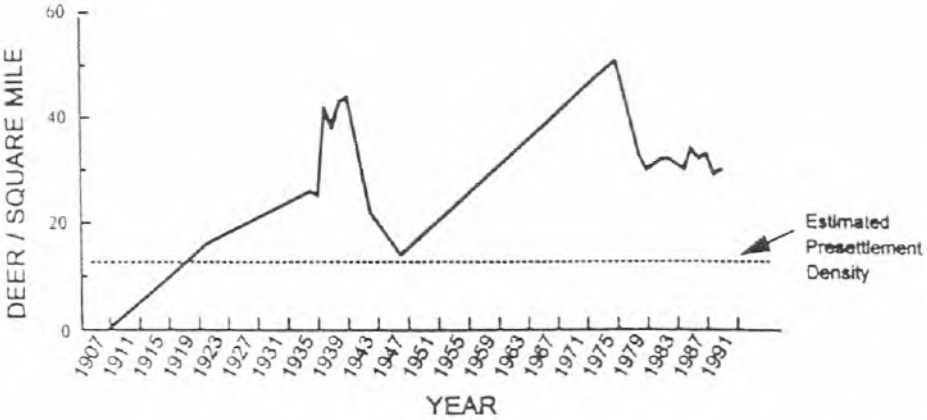
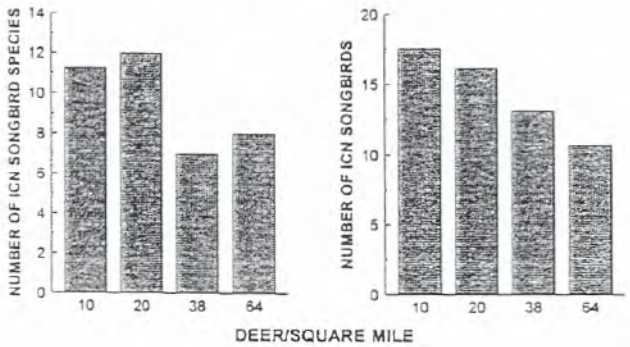


Figure 1. Deer population trends in Pennsylvania (Elk, Forest, McKean, and Warren Counties) 1907-91.



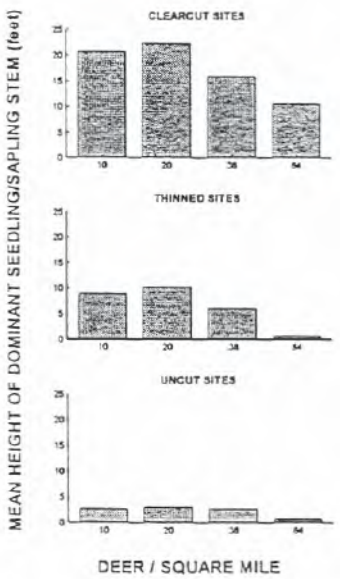


Figure 2. Deer per square mile vs. mean height of dominant stem.