

## Examining impacts of mercury contamination on birds in the Shenandoah River watershed.

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**1. Overview:** A 3-year study designed to detect and quantify effects of mercury contamination on the avifauna of the Shenandoah River. Belted Kingfisher and Tree Swallow have high potential for mercury (Hg) impact, so Year 1 focuses on reproductive success and Hg availability in these species. Bird diversity surveys will also be carried out, and Hg availability will be examined in 3 additional species. In Years 2-3, sample size increases for target species, and more species and their prey will be examined as necessary.

**2. Objective:** To compare the reproductive success and physiological condition of individual birds between mercury contaminated sites and uncontaminated sites in the same watershed. In addition we will compare the species richness of the avian communities to identify severely impacted populations. We will also provide a robust quantification of the current levels of mercury availability in the watershed's avifauna.

**3. Plan of work:** We will erect 200 swallow nesting boxes along the water's edge, evenly distributed across the contaminated and uncontaminated sites. Nests (n = 20 each from contaminated and uncontaminated sites) will be monitored to compare basic reproductive health parameters. Hg accumulation in adults and young will be measured in blood and feathers, as well as one egg per clutch. We will employ the ligature method, in which prey are harmlessly collected from the throats of nestlings, to determine the species and biomass of invertebrate prey. In Years 2-3, after the swallows have recruited to the boxes in large numbers, we may destructively sample 15 adults and 15 young to determine how egg, feather and blood Hg correlate with levels in kidney, brain, liver and breast muscle. We may also sample the prey base directly to assess mercury availability if these data are not available.

We will locate Belted Kingfisher nests at the contaminated and uncontaminated sites from a boat. The nesting cycle will be monitored using a burrow probe to examine nest contents by video. Nests will be entered from above by digging to allow direct sampling of blood from young and attending adults. Kingfisher hunting success and prey will be identified through a spotting scope, allowing us to pinpoint the size and numbers of fish fed to the young. Expected annual sample size of 5-10 nests per site will necessitate 2 years of study on kingfishers for a final sample size of 10-20 nests from each of contaminated and uncontaminated sites.

We will do preliminary screening of the entire avian community to identify major effects such as extirpation of entire populations from the contaminated study sites, or extreme reduction in density. This will be done with 30 point count surveys of breeding birds in Year 1.

Using mist nets we will sample blood and feathers from 10 each of 3 breeding migratory species that forage on insects near the water. We will also sample an egg from 5 nests of each of these species. This sampling will be repeated on uncontaminated sites for a total of 20 adult and 10 eggs of each species.