

## SOIL AND PLANT SCIENCE DIVISION

# Technical Soil Services

## Special Projects Region

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## Soil and Plant Science Division (SPSD) Assists Lake Mattamuskeet National Wildlife Refuge (NWR) in Understanding Tundra Swan Mortalities in Hyde County, North Carolina

### Purpose

On December 6 and 7, 2023, the SPSP Special Projects Region (SPR) soil scientists Braden Fleming, Austin Price, and Reuben Wilson completed Technical Soil Services (TSS) at the Lake Mattamuskeet National Wildlife Refuge (NWR) in Hyde County, North Carolina (Figure 1). The TSS request was made by the Refuge after a swan mortality event occurred in the last migratory season. Lake Mattamuskeet is a vital stop along the Atlantic Flyway for migratory waterfowl including several species of duck, goose, and swan.

### Background

Lake Mattamuskeet is the largest natural lake in North Carolina, with over 40,000 acres of historically significant waterfowl habitat, fishing, recreational hunting, and birdwatching. It is managed by the Lake Mattamuskeet NWR, one of the NWRs in eastern North Carolina focused on providing habitat and forage for waterfowl migrating south along the federally recognized Atlantic Flyway.

In the fall of 2024, the Lake Mattamuskeet NWR contacted the Special Projects Region to request assistance in understanding potential causes for a swan mortality event that occurred at the refuge (Figure 2). Autopsies had shown swan fatalities due to lead toxicosis, a lethal ingestion of lead. The impoundment where the event occurred was historically used for waterfowl hunting as early as 1934, when it was acquired by the federal government. Lead shot was used by waterfowl hunters before the ammunition



was outlawed federally in 1991 because of concerns about negative impacts on waterfowl populations and the overall health of the environment.

A previous relationship was established in 2019 and 2022 while working on the Lake Mattamuskeet Coastal Zone Soil Survey (CZSS). The focus of this was to help with subaquatic vegetation restoration (SAV) in the lake and improve migratory waterfowl foraging habitat.

## Key Outcomes

The NWR selected three transects in the waterfowl impoundment where the mortality event occurred. Two transects in which the ditches were recently cleaned and potentially exposed relict lead shot, and one that was not ditched to be the control. Samples were collected at 40 spots along the first transect, 20 on the second (the control), and 24 along the third transect (Figure 3). Subsamples were taken at a depth of 0 to 15 centimeters and another from 15 to 30 cm. These depths were chosen because most waterfowl forage only to a depth of 15 cm, while swans are capable of foraging to a depth of 15 to 30 cm.

Each subsample was analyzed in triplicate with a pXRF to determine elemental analysis. The primary reading was focused on lead, while bismuth and iron were also reported. Bismuth, steel, and tungsten were used to replace lead shot after it was outlawed, so it was in the interest of the NWR and SPSD to see its concentration as well.

While on site, SPSD soil scientists also performed two confirmation pedons to see if a terrestrial update may need to be added to the Lake Mattamuskeet CZSS, but both pedons correlated to the mapped series of Engelhard (Coarse-silty, mixed, semiactive, nonacid thermic Humaqueptic Fluvaquents) (Image 1; Image 2).

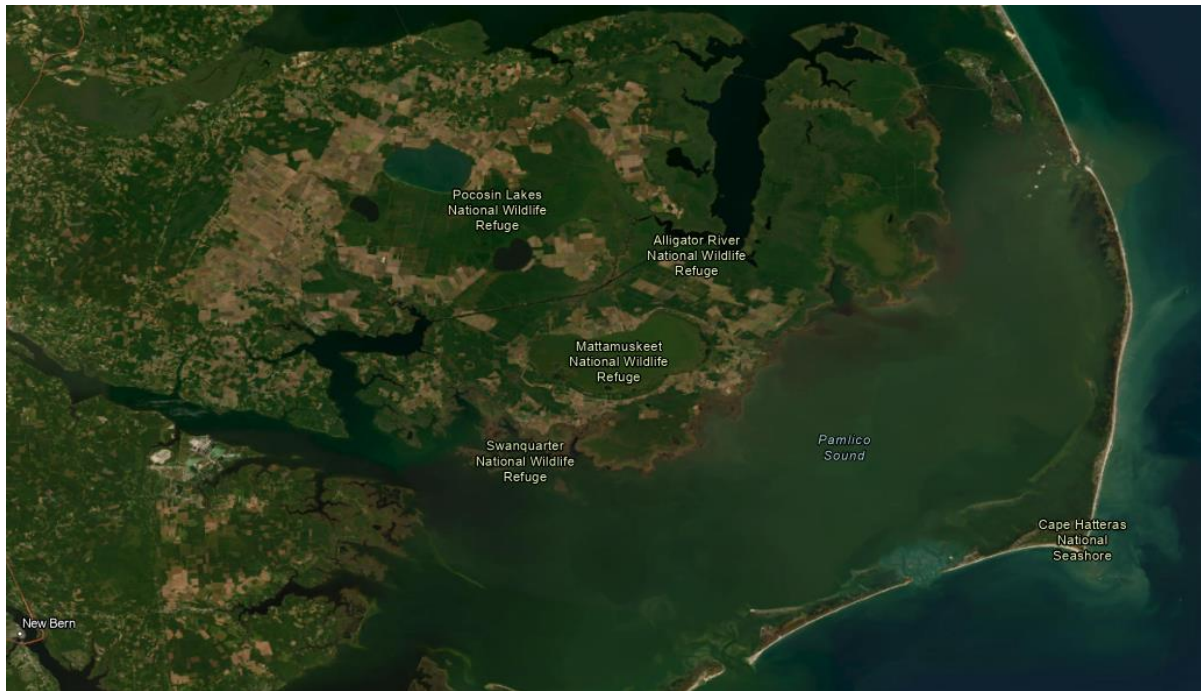


Figure 1.—An Earthstar Geographics image of Lake Mattamuskeet NWR.



Figure 2.—An Earthstar Geographics Image of Lake Mattamuskeet NWR and the Impoundment of interest in the south side of lake.



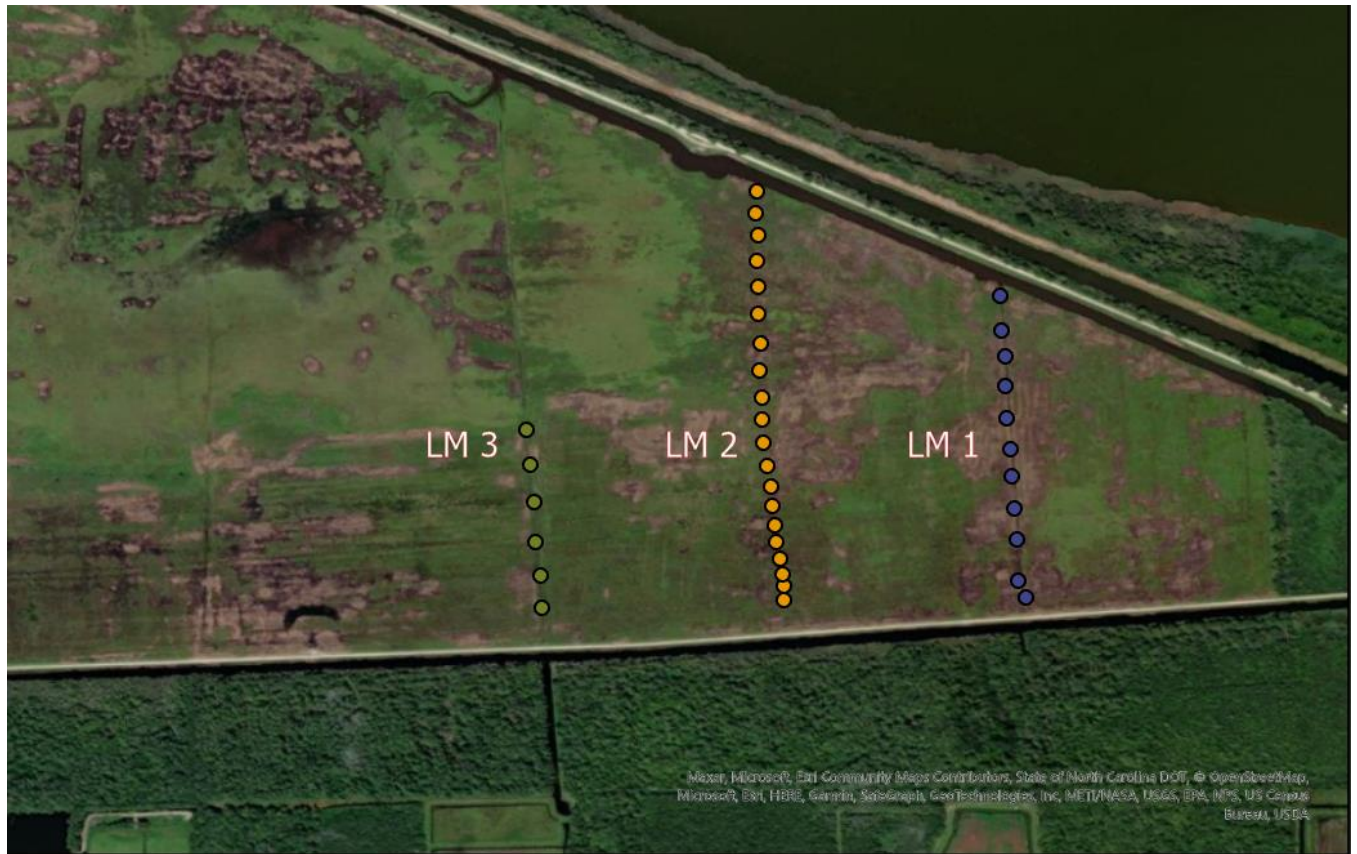


Figure 3.—An Earthstar Geographics image of the transects samples. LM 1 and LM 3 were recently cleaned ditches and LM 2 is a control where no ditching occurred.



Image 1.—Braden Fleming listens for a reaction to 30% hydrogen peroxide to indicate the presence of reduced sulfides during a confirmation description.





Image 2.—A landscape view of the impoundment and one of the recently cleaned ditches being sampled.