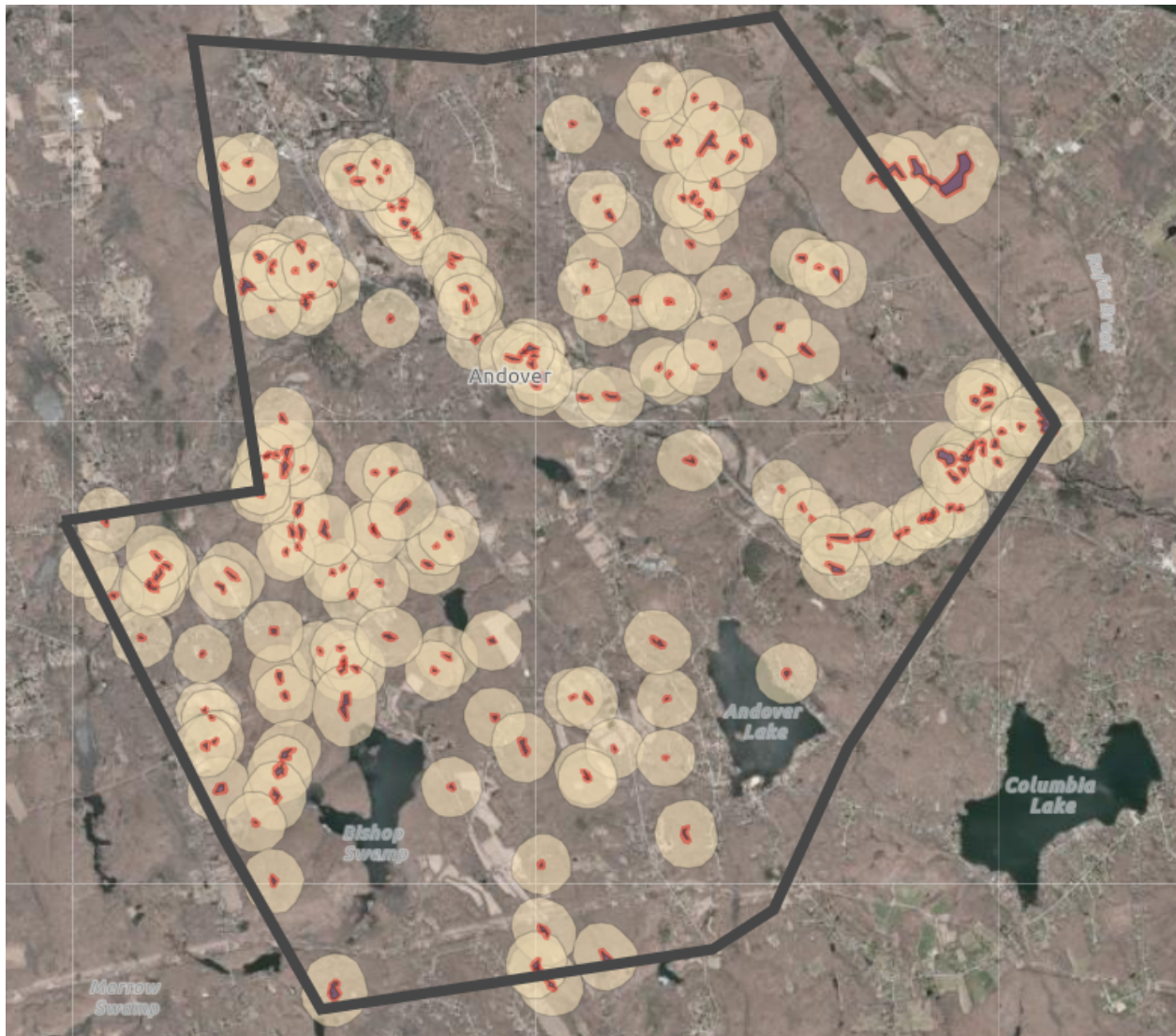


# Mapping Vernal Pools in Andover: Final Report

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**Figure 1.** Map of Andover, CT, on ArcGIS online showing potential vernal pool depressions (blue), envelopes (red), and critical terrestrial habitat (yellow).

## **Project Overview**

Vernal pools are ephemeral wetland habitat formed by the seasonal filling of landscape depressions. The cycle of filling and drying up that categorizes vernal pools prevents fish from being able to occupy the habitat, but this opens up a niche for species of amphibians and crustaceans that require water bodies for breeding but whose eggs face heavy predation by fish in uninterrupted water bodies. Vernal pools, therefore, are critical breeding habitat for many amphibians (such as the wood frog, spotted salamander, and marbled salamander in CT) and crustacean (ex. fairy shrimp), and many of these species have become obligate species of vernal pool habitat, meaning they can only breed in this type of wetland.

In the face of climate change, however, vernal pool habitat faces many threats due to the specificity of their water levels and temperature to their functioning as breeding habitat. Within the Northeast specifically there have been major shifts in the flooding and drought cycles from year to year due to climate change, which in turn can alter the water level of the pools. If a pool were to dry up before the organisms inhabiting the pool are able to successfully breed and develop, those juveniles would be at a very high risk of death and success of breeding in the habitat would be greatly reduced, if not entirely diminished. Conversely, flooding could alter the ephemeral nature of some pools and thus convert them to year-round features, which do not offer the same protections for breeding species. In addition, changing water temperatures can disrupt the match between the physiology of obligate vernal pool species and their environment. Current vernal pools are therefore at risk of losing their functionality in the face of climate change, which means the species depending on them for breeding may face challenges in persisting. It is thus important to preserve as much vernal pool habitat as possible so that the odds of losing all functional vernal pool habitat in the face of climate change is reduced.

For this project, we worked with herpetologist and Andover Conservation Commission member Hank Gruner and GIS expert Tao Wu to create a map of potential vernal pools in Andover, CT, and their critical zones for conservation consideration. This mapping was done primarily in ArcGIS online using satellite imagery, with Google Earth referencing for quality control and ArcPro imports and exports used for data calculation and processing (ex. calculation of buffer region geometry). Generation of this map was the first step of a two-phase plan proposed by the Andover Conservation Commission and Inland Wetlands and Watercourses Commission to conserve critical vernal pool habitat in Andover.

Our map will be used to guide field surveys for vernal pools taking place in Phase II (mapped pools have coordinates included in attribute tables), and the use of ArcGIS software for the map will enable addition of biological (field-generated) data to the attribute tables for each vernal pool so that spatial and biological data can be used in tandem to determine conservation value and conservation feasibility for confirmed vernal pools.

Our process for mapping was based on recommendations outlined in Dr. Aram Calhoun and Dr. Michael Klemens *Best Development Practices: Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States* guidebook. The zones shown in the map above include the vernal pool depression, envelope, and critical terrestrial habitat as outlined in the document. The pool depression represents the actual vernal pool, which is the land depression that seasonally fills with water and offers critical breeding habitat for amphibians and crustaceans. The envelope is a one-hundred foot buffer extending from the edge of the depression, and this zone serves as Spring habitat for amphibians using the pool for breeding and Fall habitat for newly-emerged juveniles. It is also critical in terms of acting as a water quality buffer for the vernal pool it encompasses. The critical terrestrial habitat

is a seven-hundred-fifty foot buffer from the depression edge which represents the habitat for vernal pool obligate species outside of the breeding season, and this zone is an effective representation of the distribution of the metapopulations that depend on vernal pool habitat.

The aforementioned areas are those which must be considered for conservation-based regulation once a vernal pool is confirmed as functional and chosen for conservation. Zone area and perimeter calculations were included in attribute tables for application in later field and conservation analyses.

By providing location, critical zones, and spatial calculations for potential vernal pools in Andover, our map serves as a crucial first-step in conservation of critical wetland habitat in Andover that will be used and built upon in all later steps of the process.

Link to Google Slides Presentation:

[https://docs.google.com/presentation/d/1InJrdFUydZPY15\\_MIFb6QOqq1gYc-ZVMkqPl5UTduxU/edit?usp=sharing](https://docs.google.com/presentation/d/1InJrdFUydZPY15_MIFb6QOqq1gYc-ZVMkqPl5UTduxU/edit?usp=sharing)

## References

Calhoun, A. J. K. and M. W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.