Vernal Pool Amphibian Breeding Ecology Monitoring from 1931 to Present: A Harmonized Historical and Ongoing Observational Ecology Dataset

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Introduction

- The presented dataset includes observations at 11 vernal pools on Mohonk Preserve lands that vary in size and are distributed across the landscape at a range of elevations (166 - 384 m).
- The goal of the project is to monitor the seasonality and reproductive ecology of amphibians and strives to provide a holistic environmental context for occurrence records
- This dataset is the longest and largest time-series of consistent herpetological sampling with paired water quality data and multiple replicate pools
- Incorporates records from Long Woodland Vernal Swamp from the years immediately preceding its drying
- Extends into the 1930s, allowing for investigations into the impacts of climate change, urbanization, and acid rain.

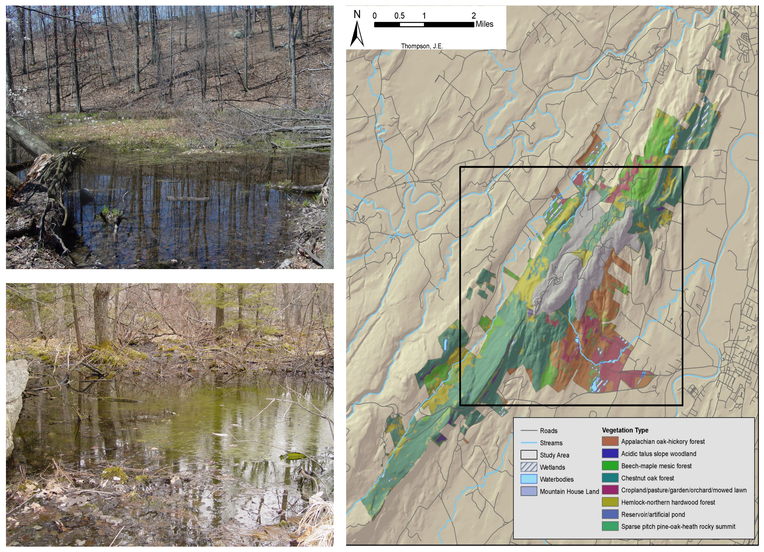


Figure 1. Representative photos of the sampled vernal pools, Canaan (top left) and Sleepy Hollow (bottom left). Map of the land cover across the preserve lands included in the described dataset. Exact locations of pools are obscured.

Sampling Description

- From 1931-1991, sampling at vernal pools varied from year to year. From 1991 on, each of the pools was observed 2x per year.
- Starting in 2016, a rigorous protocol was adopted from the USGS Amphibian Reproductive Monitoring Initiative with each of 10 pools monitored at leas 4x each spring.
- The study presently uses the Double-Observer Dependent method to measure occupancy and occurrences of species. Prior to 2017, water temperature was taken on site and water was collected so that pH could be measured in the laboratory.
- From 1931 – 2015, environmental data collection varied but often included weather conditions, water temperature, and pH.
- In 2017, the acquisition of the YSI Sonde probe allowed for the collection of pH, DO, nitrate and conductivity on site.

Data Rescue and Digitization

- The Vernal Pool Monitoring program began in 1931 with the observations of Daniel Smiley (1907 - 1989).
- He first began monitoring amphibians in 1930 and began regularly monitoring vernal pools in the 1950s.
- Most of his observations are recorded in a card filing system or one to two-page reports.
- DSRC archives includes 86 years of natural history observations, 123 years of daily weather data, 60,000 physical items, 9,000 photographs, and research library.
- Most of the digitization work, including scanning, transcribing, and formatting, was done by volunteer citizen scientists.
- This process is ongoing and additional data will be added over time.

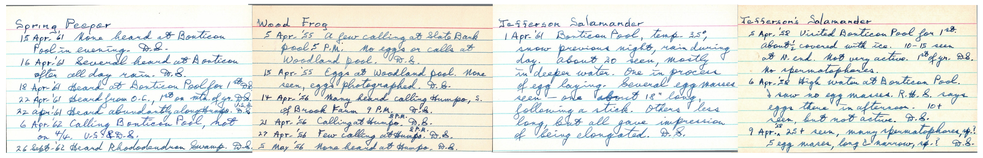


Figure 2. Representative occurrence records collected by D. Smiley and archived on notecard. These records have been digitized and the narrative data have been extracted to a standard format.

Temporal Coverage

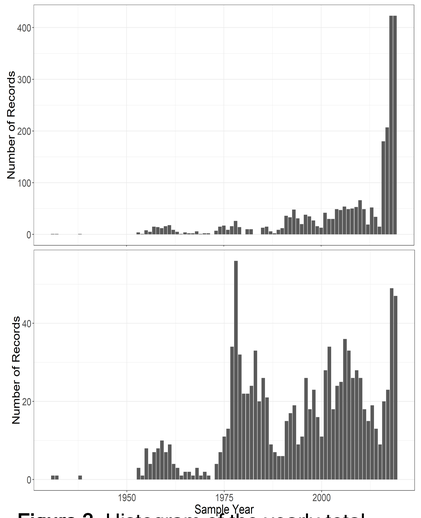


Figure 3. Histogram of the yearly total sampling records of occurrences collected across all pools and species (top). Histogram of the yearly total dates for water quality and weather data across all pools (bottom).

- The resulting dataset includes 2,480 occurrence sampling events and 1,089 unique water and weather sampling events across the 11 pools.
- The temporal extent of the dataset is from 1931-04-21 through 2019-05-01, including months from February - May.
- Collection of both species occurrences and water quality data was sporadic from 1931-1991, but pools were regularly sampled each spring starting in 1991.
- Long Woodland Swamp stopped holding water in 2017, so data collection commenced at Ski Loop Vernal Pool.
- Since 2017, additional water quality variables are collected using the YSI Sonde.

Taxonomic Coverage

- The described dataset includes 2,480 sampling and 151,701 individuals across all species, vernal pools, and sampling dates.
- All species included in the sampling are native to the region and are all classified as Least Concern by IUCN.

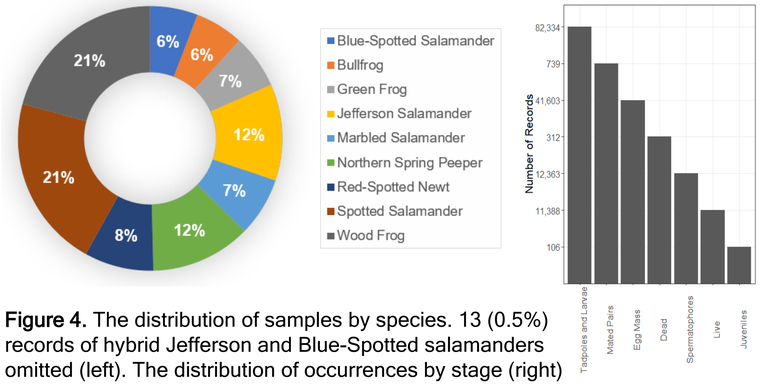
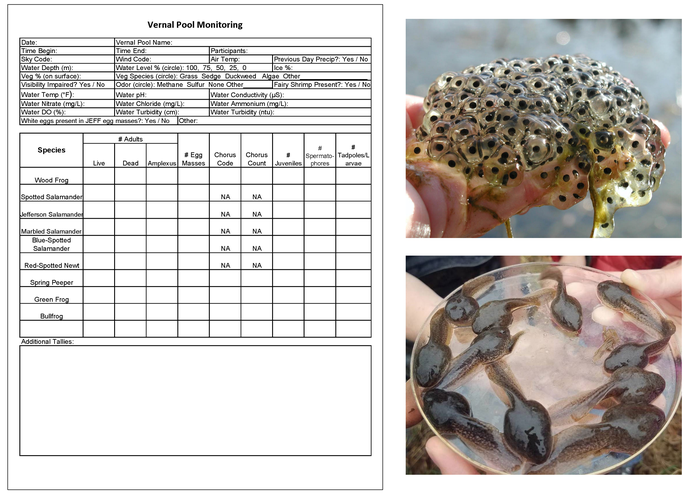


Figure 4. The distribution of samples by species. 13 (0.5%) records of hybrid Jefferson and Blue-Spotted salamanders omitted (left). The distribution of occurrences by stage (right)

Ongoing Monitoring and Maintenance

- The digitization of library historical records is ongoing, as is yearly sampling. These data will be added to the repository dataset as they become available.
- If any pools dries up, a new site will be added to maintain 10 pools monitored each year.



Vernal Pool Monitoring

Date:	Vernal Pool Name:		
Time Begin:	Time End:	Participants:	
Sky Code:	Wind Code:	Air Temp:	Previous Day Precip?: Yes / No
Water Depth (m):	Water Level % (circle): 100, 75, 50, 25, 0		Ice %:
Veg % (on surface):	Veg Species (circle): Grass Sedge Duckweed Algae Other		
Visibility Impaired? Yes / No	Odor (circle): Methane Sulfur None Other_____		Fairy Shrimp Present?: Yes / No
Water Temp (°F):	Water pH:		Water Conductivity (µS):
Water Nitrate (mg/L):	Water Chloride (mg/L):		Water Ammonium (mg/L):
Water DO (%):	Water Turbidity (cm):		Water Turbidity (ntu):
White eggs present in JEFF egg masses?: Yes / No	Other:		

Species	# Adults			# Egg Masses	Chorus Code	Chorus Count	# Juveniles	# Spermato-phores	# Tadpoles/Larvae
	Live	Dead	Amplexus						
Wood Frog									
Spotted Salamander					NA	NA			
Jefferson Salamander					NA	NA			
Marbled Salamander					NA	NA			
Blue-Spotted Salamander					NA	NA			
Red-Spotted Newt					NA	NA			
Spring Peeper									
Green Frog									
Bullfrog									

Additional Tallies:

Figure 5. The current form of the vernal pool monitoring data sheet (left). Wood frog egg masses (top right) and green frog tadpoles (bottom right).

Acknowledgements

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