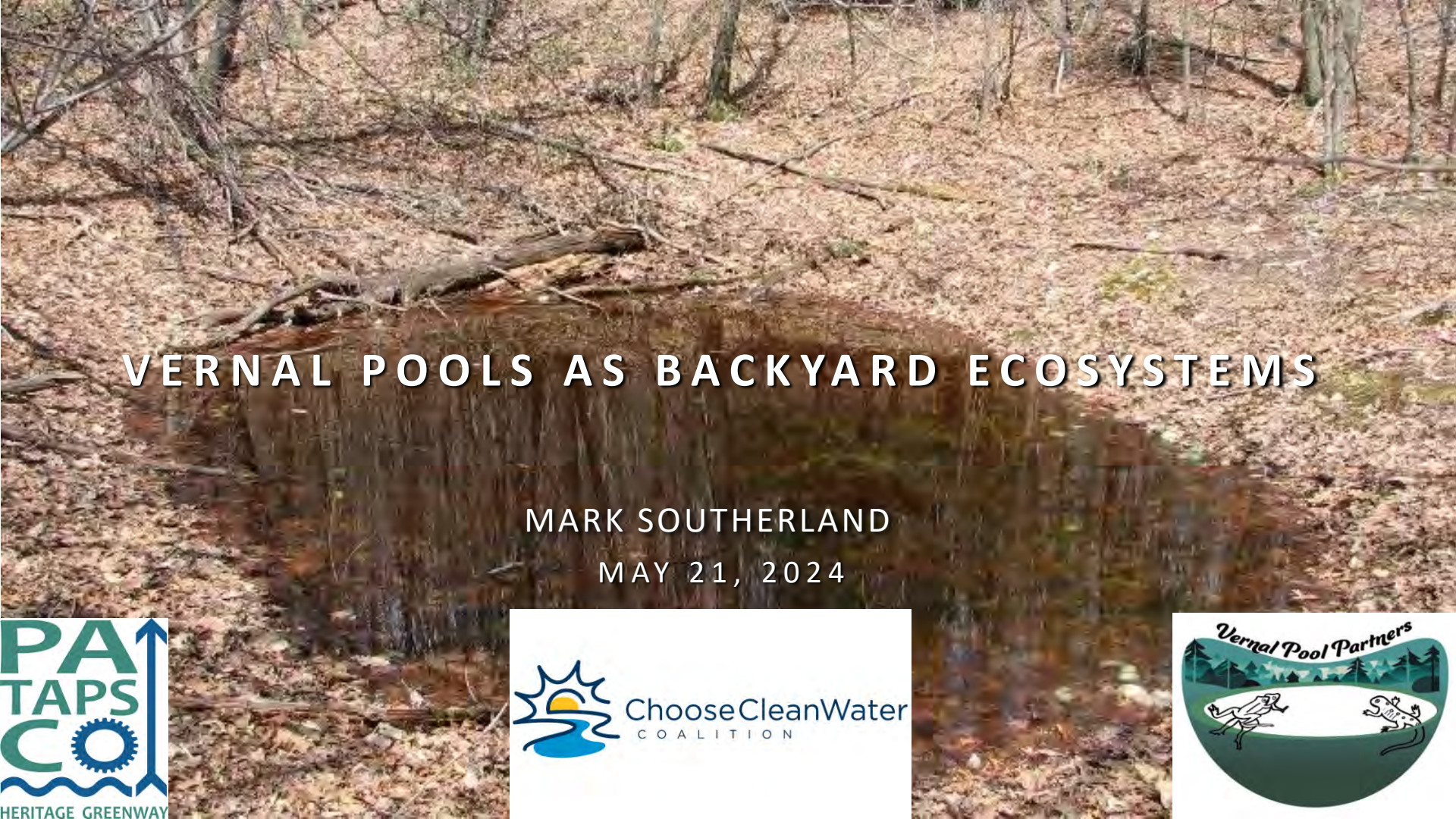


VERNAL POOLS AS BACKYARD ECOSYSTEMS

MARK SOUTHERLAND

MAY 21, 2024

PA TAPS CO HERITAGE GREENWAY

ChooseCleanWater COALITION

Vernal Pool Partners

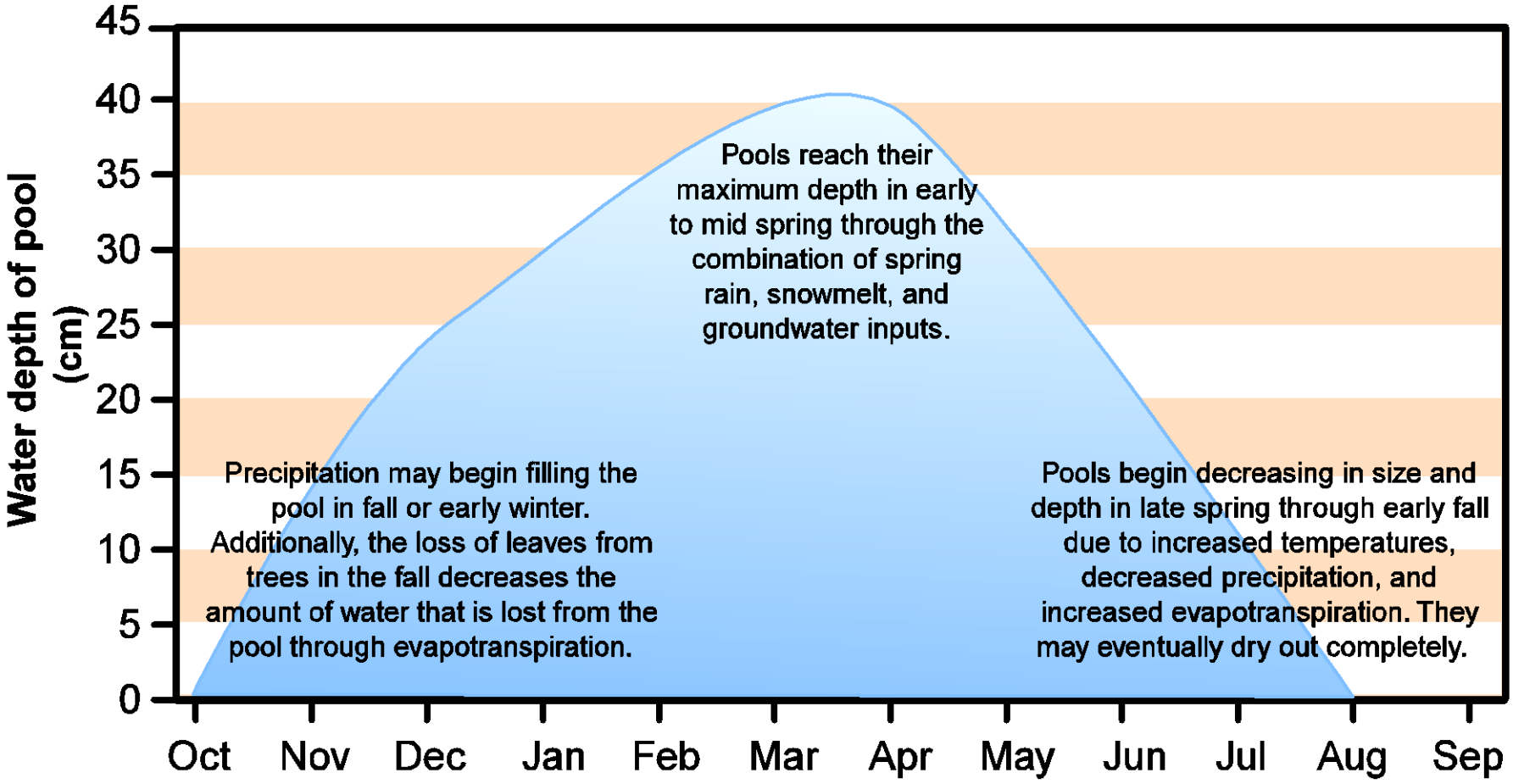
BY ANY OTHER NAME

- Vernal ponds
- Temporary ponds
- Ephemeral ponds
- Spring ponds
- **Seasonal pools**
- Semi-permanent pools
- Woodland pools
- Geographically isolated wetlands





La Aguada
Seasonal
Water Pools


Water depth of pool (cm)
45
40
35
30
25
20
15
10
5
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Pools reach their maximum depth in early to mid spring through the combination of spring rain, snowmelt, and groundwater inputs.
Precipitation may begin filling the pool in fall or early winter. Additionally, the loss of leaves from trees in the fall decreases the amount of water that is lost from the pool through evapotranspiration.
Pools begin decreasing in size and depth in late spring through early fall due to increased temperatures, decreased precipitation, and increased evapotranspiration. They may eventually dry out completely.

DISTINCT BIOTA

No permanent fish populations

- Support animals that breed without fish (i.e., with vulnerable eggs or larvae)

Animals adapted to vernal pool drying

- Animals that leave on drying or with eggs/cysts that resist drying (cryptobiosis)

Plants are usually typical wetland species

- but some rare (e.g., swamp pink and Virginia sneezeweed)

DISTINCT BIOTA

Invertebrates

- Fairy shrimp, clam shrimp, seed shrimp
- Cladocerans, isopods, amphipods, copepods
- Caddisfly, midge, and mosquito larvae, beetles
- Snails, clams, mites, planaria, leeches, worms

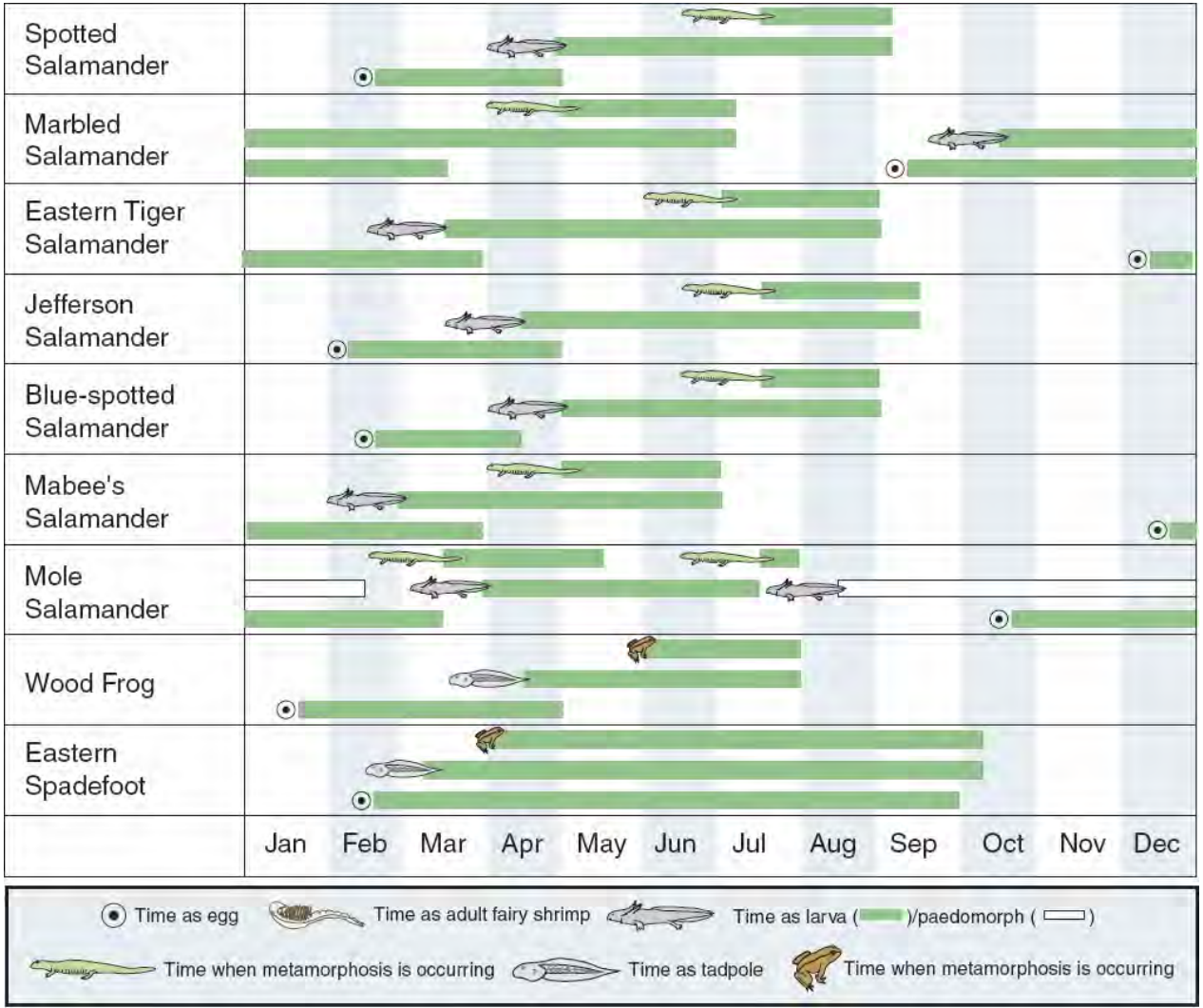
Amphibians

- Breeding habitat for mole salamanders, wood frogs, and eastern spadefoots

Facultative Vertebrates

- Spotted turtle

WHY SHOULD WE CARE?



WOODLAND CONTEXT

3 Life Zones

- Vernal pool depression
  - Maximum standing water
- Vernal pool envelope
  - 100 foot radius
  - Local effects on water quality
  - Where marbled salamanders lay in fall
  - High density of juveniles
- Vernal pool terrestrial habitat
  - 1000 foot radius
  - 95% of populations of vernal pool breeding amphibians
  - Watershed effects on water quality

WHY SHOULD WE CARE?

Ecological Services for Species

- Important breeding habitat for amphibians
- Support of aquatic and terrestrial food webs
- Stepping stones within the landscape

Ecological Services for People

- Pollution removal
- Groundwater replenishment
- Natural mosquito control
- Connection to nature

OUR QUALITY OF LIFE

- Vernal pools can bring new richness to your life and increase the appreciation of the natural world
- “True backyard ecosystems”
- “Singing forests are healthy forests”
- Pollution and groundwater benefits
- Ethics

WHAT CAN YOU DO?

No one cares about what they don't understand

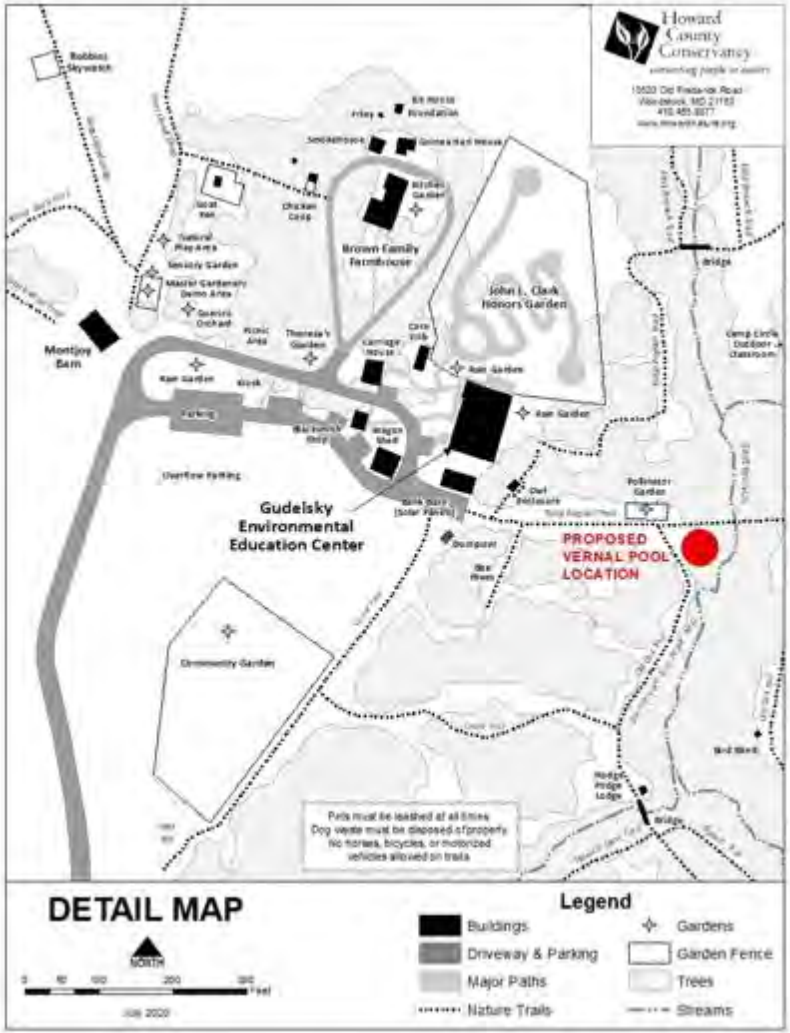
- The more we know, the more we care

Vernal pools exist in woods near you

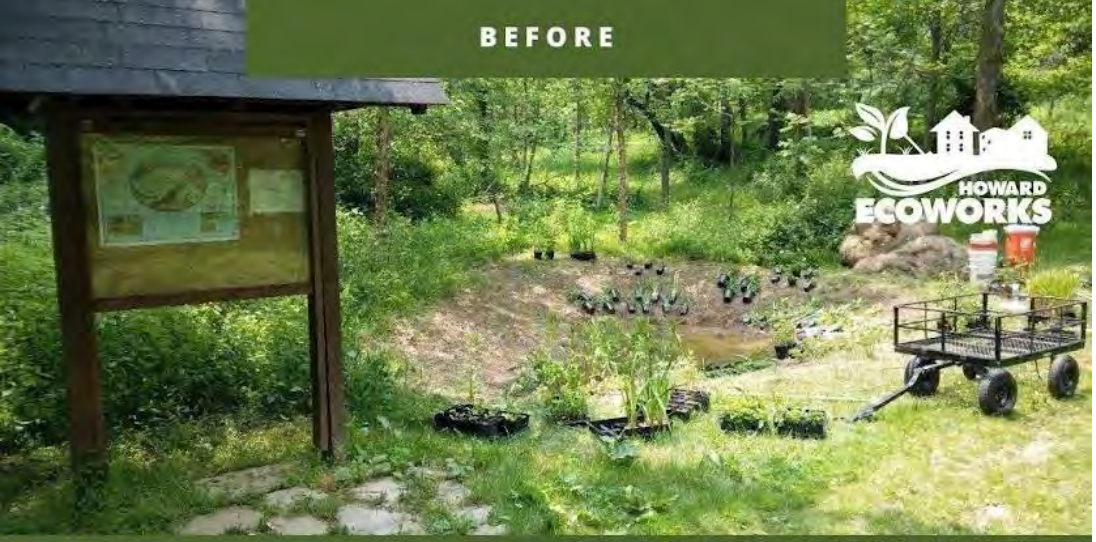
- Get out and enjoy them

Do your part to protect vernal pools

- Create pools to replace lost biodiversity
- Contribute to inventories
- Support preservation through legislation


Howard County Conservancy
Robbins Wayside
Montjoy Barn
Brown Family Farmhouse
John L. Clark Honors Garden
Gudelsky Environmental Education Center
PROPOSED VERNAL POOL LOCATION
Community Garden
Pets must be leashed at all times
Dog waste must be disposed of properly
No horses, bicycles, or motorized vehicles allowed on trails
DETAIL MAP
NORTH
July 2020
Legend
Buildings
Driveway & Parking
Major Paths
Nature Trails
Gardens
Garden Fence
Trees
Streams


John L. Clark Honors Garden
Gudelsky Environmental Education Center
PROPOSED VERNAL POOL LOCATION
VERNAL POOL LOCATION MAP
NORTH
July 2020



Abbreviation	Common Name	Scientific Name
Asin	Swamp Milkweed	Asclepias incarnata
Caam	Creek Sedge	Carex amphibola
Coco	Mistflower	Eupatorium coelestinum
Irve	Blue Flag	Iris versicolor
Loca	Cardinal Flower	Lobelia cardinalis
Losi	Great Blue Lobelia	Lobelia siphilitica
Paau	Golden Ragwort	Packera aurea (Senecio aureus)
Aiau	Golden Alexander	Zizia aurea

COMMUNITY INVOLVEMENT

Vernal Pool Guided Hikes

- PHG Led Hikes
- Vernal Pool Identifiers

Vernal Pool Inventory

- Data Gathering
- New Education Ideas

PA TAPS CO
HERITAGE GREENWAY

PA TAPS CO
HERITAGE GREENWAY

WHAT DO LOOK FOR ON A HIKE

- Isolated pools of water
  - Most commonly found in depressions in otherwise flat areas
  - “Pit and mound” topography
- Indicator or obligate species!
  - Wood frog or egg mass
  - Marbled salamander or egg mass
  - Spotted salamander or egg mass
- Even if you are not 100% sure still record the pool and submit to the inventory.

PA TAPS CO
HERITAGE GREENWAY

VERNAL POOL INVENTORY

- Pilot year began in March 2021
- What do we ask of Community Scientists?

1. Go out on your own time to walk the watershed
2. Look for vernal pools
3. Collect required (and optional) data
4. Submit data directly on your smartphone into our Google Form or take notes and submit when you get home

PATAPSCO HERITAGE GREENWAY

HB729 VERNAL POOL WETLANDS PROTECTION ACT OF 2024

- Act would designate vernal pools as named wetlands in MDE regulations
- Act would protect vernal pools supporting amphibian species, including a 100-foot buffer needed to support full life cycle
- Act would require MDE to prepare a plan for providing the public with location of vernal pools and other wetlands

https://mgaleg.maryland.gov/mgawebsite/Legislation/Details/hb0729

SPONSOR DELEGATE TERRI HILL
HB729 IN ENVIRONMENT AND TRANSPORTATION COMMITTEE

HB729 FAILED TO PASS

- MDE objected to bill through amendment cycles, although supporting the concept of protecting vernal pools
- MDE agreed to step one of definition
- Delegate Dan Stein (Speaker Pro Tem) promised to include the following statement in Joint Chairman's Report

JOINT CHAIRMAN'S REPORT

"The committees are interested in how the state defines vernal pool. The committees are aware that the Maryland Department of the Environment has a definition in its regulations (26.23.01.01.B.87) but that other agencies may define vernal pools differently. Therefore, the committees request that the Maryland Department of the Environment confer with the Maryland Department of Natural Resources and other stakeholders to submit a report with a definition of vernal pool that could be used across state government to clarify the criteria for seasonal pools that should have protective status. The report is requested by December 1, 2024."

LOOK FOR
VERNAL POOL WETLANDS PROTECTION ACT OF 2025

Act would protect vernal pools in MDE regulations using the definition developed by MDE, DNR, and stakeholders by Dec 2024

Join Vernal Pool Partners:
mark@vernalpoolpartners.org

SOURCES

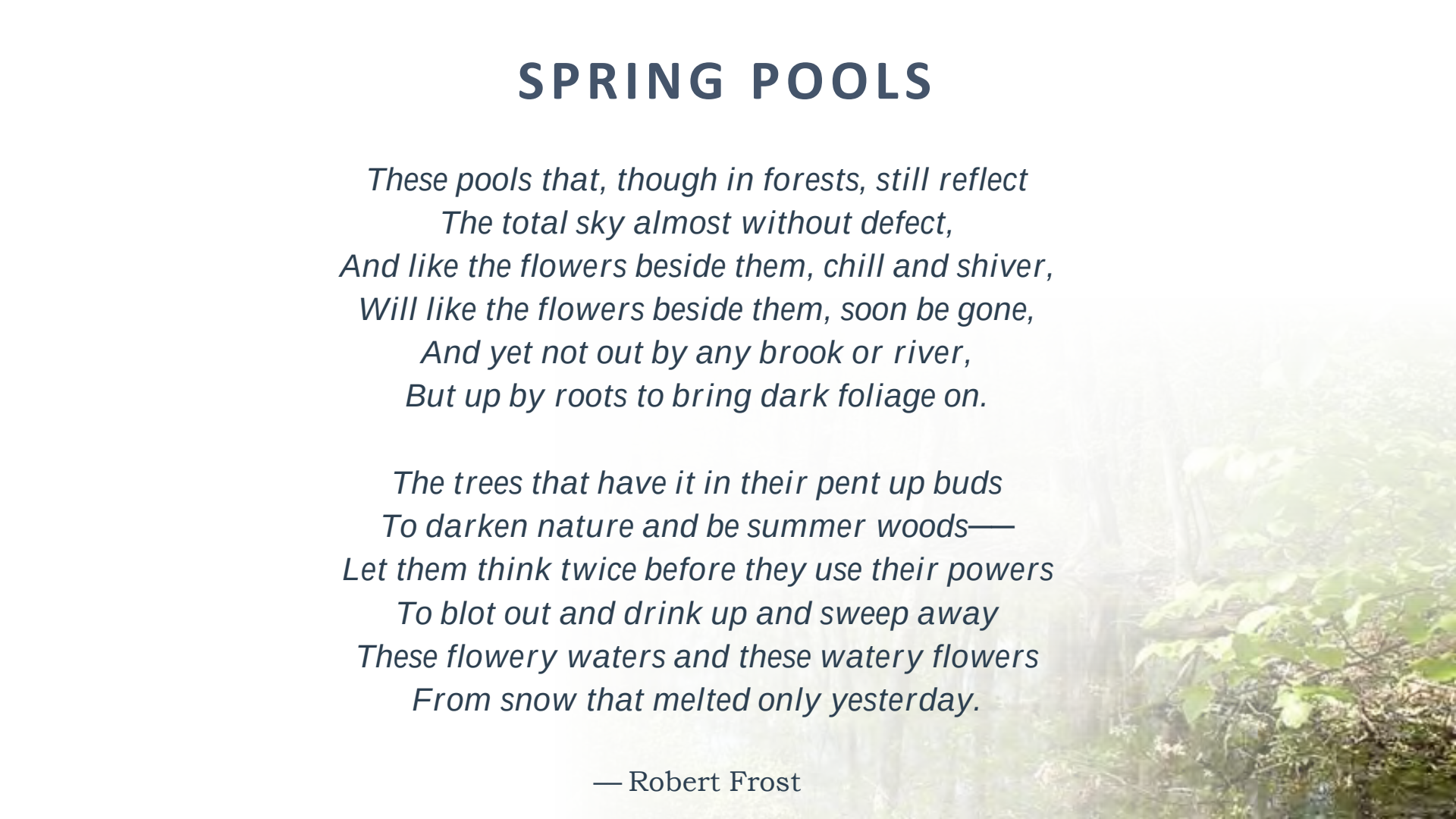
- **Lesley Brown and Robin Jung, *An Introduction to Mid-Atlantic vernal Pools,* EPA, 2005**
- Elizabeth Colburn, *Vernal Pools: Natural History and Conservation*, 2004
- *Maine's Citizen's Guide to Locating and Documenting Vernal Pools*, 2003
- Thomas Biebighauser, *A Guide to Creating Vernal Ponds*, 2003
- Henry Wilbur, Complex life cycles, *Annual Review of Ecology and Systematics* 11:67-93, 1980
- Parmelee, J. R., M. G. Knutson, and J. E. Lyon. 2002. A field guide to amphibian larvae and eggs of Minnesota, Wisconsin, and Iowa. U.S. Geological Survey, Biological Resources Division, Information and Technology Report USGS/BRD/ITR-2002-0004, Washington, D.C. iv + 38 pp.

SPRING POOLS

These pools that, though in forests, still reflect
The total sky almost without defect,
And like the flowers beside them, chill and shiver,
Will like the flowers beside them, soon be gone,
And yet not out by any brook or river,
But up by roots to bring dark foliage on.

The trees that have it in their pent up buds
To darken nature and be summer woods——
Let them think twice before they use their powers
To blot out and drink up and sweep away
These flowery waters and these watery flowers
From snow that melted only yesterday.

— Robert Frost



JUST OUTSIDE IN YOUR BACKYARD

Vernal Pool Conservation In the Anacostia River Watershed

Jorge Bogantes Montero, Anacostia Watershed Society

ANACOSTIA WATERSHED SOCIETY

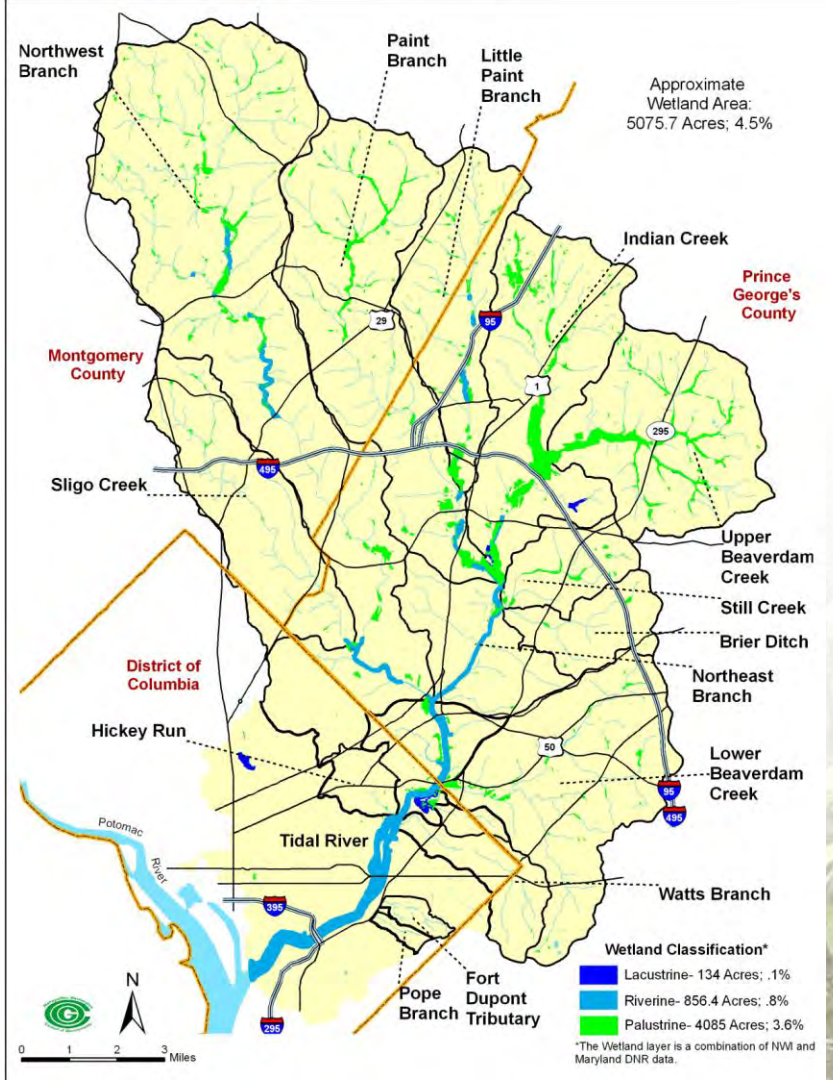
Watershed Facts:

- 176 sq. mi.
- Population of over 1 million
- Imperviousness: 23%
- Forest cover: 30%

ANACOSTIA WATERSHED SOCIETY

WETLANDS IN THE ANACOSTIA RIVER WATERSHED

- Vernal pools mostly in and around palustrine wetland areas
- Distribution of vernal pools unknown
- Vernal pool listing in the AWRP/ site with potential of creation of enhancement



Threats

Habitat Destruction

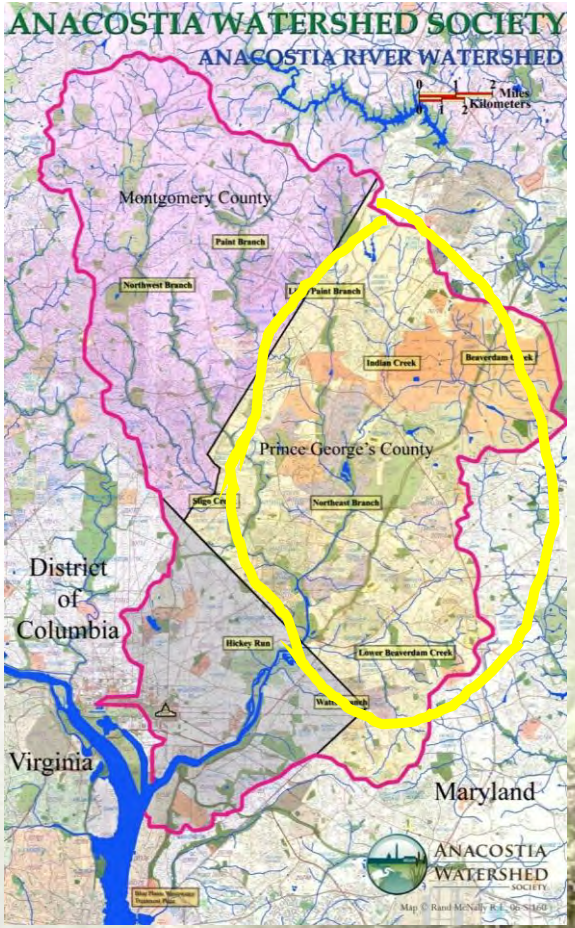
Pollution

Climate Change

ANACOSTIA WATERSHED SOCIETY'S VERNAL POOL INVENTORY

Goals:

- Inventory/mapping of vernal pools of conservation importance in the Anacostia River watershed, focusing on lands owned by the Maryland-National Capital Park and Planning Commission (M-NCPPC) in Prince George's County.
- With the help of trained community scientists, focus on monitoring vernal pools with obligate species.
- Identify conservation and restoration needs that may arise.
- Educate the public about these fragile ecosystems.

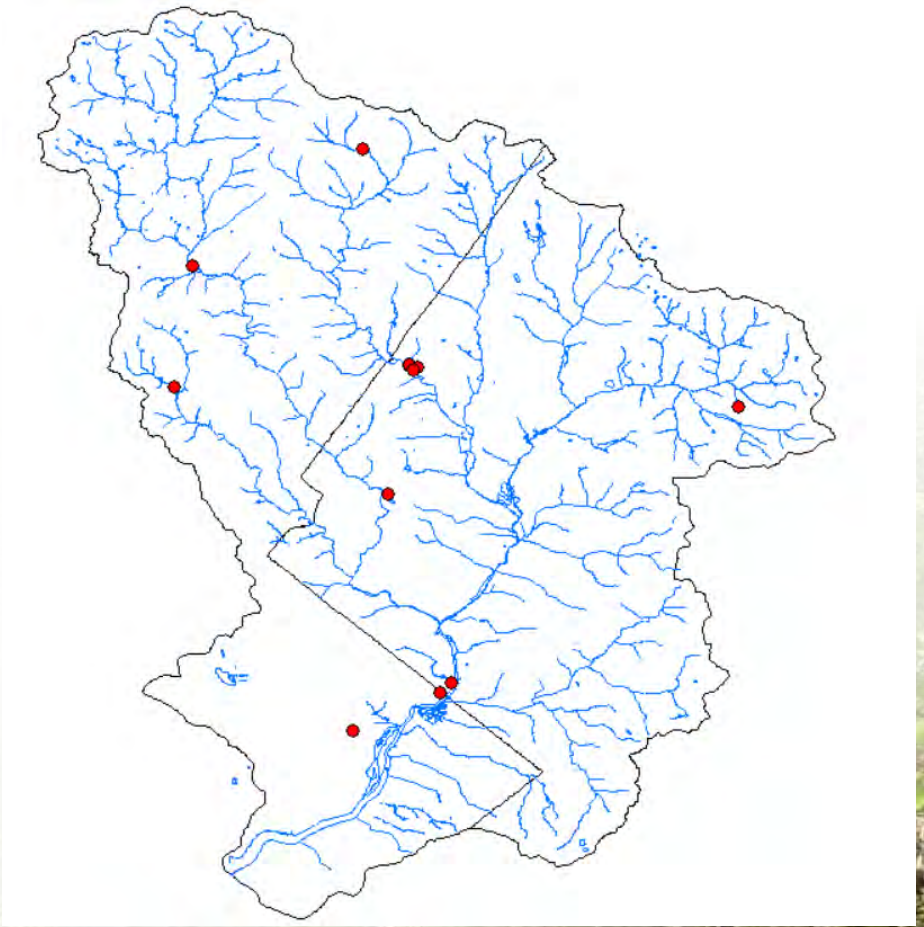


ANACOSTIA WATERSHED SOCIETY'S VERNAL POOL INVENTORY

- Inventory/mapping vernal pools of conservation since 2020
- Google Forms first, currently using Esri's Survey123 application
- NE Partners in Amphibian and Reptile Conservation (NEPARC) decontamination methods
- Master Naturalist cohorts are monitoring obligate species and hydroperiod at two sites

ANACOSTIA WATERSHED SOCIETY'S VERNAL POOL INVENTORY

- 1st site assessed 2 weeks before the pandemic…
- Unfunded (not a hands-on restoration project)/other priorities
- 9 sites in all jurisdictions with presence of obligate species
- Currently focusing on 2 sites on PG Parks properties for monitoring
- Scouting for new sites on PG Parks



OBLIGATE SPECIES OBSERVED

Wood Frog (*Lithobates sylvaticus*)

Spotted Salamander (*Ambystoma maculatum*)

Photo: Cliff Bloomfield

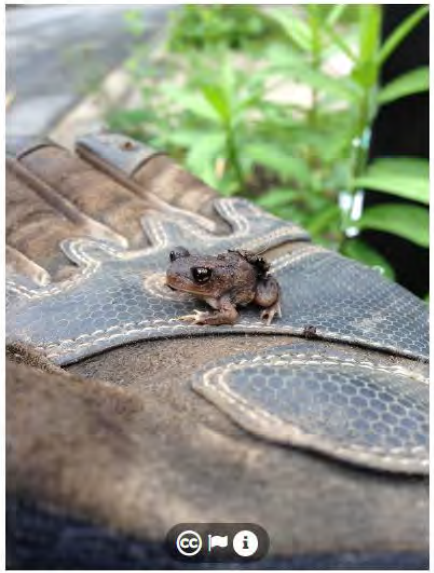
Marbled Salamander (*Ambystoma opacum*)

OBLIGATE SPECIES OBSERVED

Eastern Spadefoot (*Scaphiopus holbrookii*) Research Grade

Follow

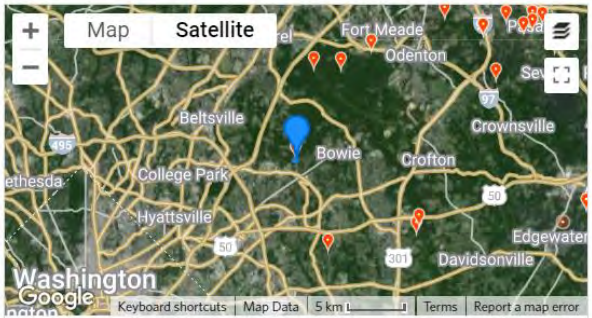
iNaturalist



hholbrook
28,258 observations

Observed:
May 30, 2016 · 8:43 AM EDT

Submitted:
Dec 20, 2017 · 1:00 PM EST



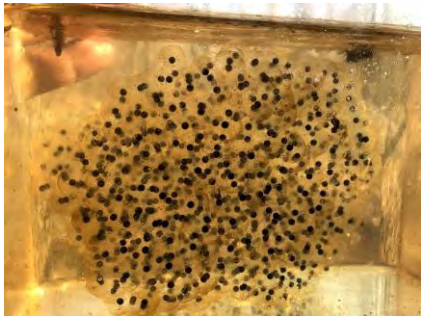
10608 Forestgate Pl, Glenn Dale,... Show

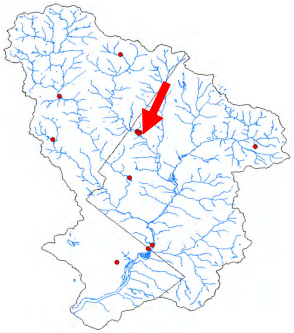
Details

Be the first to fave this observation!

PAINT BRANCH VERNAL POOLS

- 3 vernal pools, 2 of them seemingly man-made (a swale along a levee and an old farm pond?)
- Monitored since 2022 by master naturalists
- Presence of the 3 obligate species (but Marbled salamanders absent from the farm pond pool)
- Different hydroperiods the old farm pond has water for most of the year; the swale dries out by May, even more by late summer then starts to fill up by December
- Robust community of facultative amphibians and aquatic invertebrates typical of vernal pools





Sheltered location at the foot of a hill, east of the slope

“Farm pond pool”

“Swale pool”

May, 2022

FACULTATIVE FROGS FOUND AT BOTH POOLS

Northern spring peepers (*Pseudacris crucifer*)

Adults in amplexus, stream channel pool, March

Transforming juvenile and froglet, farm pond, June

Green frogs (*Lithobates clamitans*)

Tadpole, stream channel pool, June

Tadpoles hatched throughout the summer at the farm pond

Eggs, farm pond, August

MICROCRUSTACEANS (NO FAIRY SHRIMP YET)

Ostracoda

Photos by Brandon Woo

Ostracods, “seed shrimp” were present at both pools; they appeared earlier, but were not as numerous as Daphnia

Copepoda

“Copepods” of the order Cyclopoida were present at both pools; those of the order Harpacticoida were found at the stream channel pool

Female “cyclops” (Cyclopoda) with egg sacs

Harpacticoida

Photos: cfb.unh.edu

Cladocera

Photo: tropical-fish-keeping.com

Daphnia, “water flea”, with eggs

Daphnia were very abundant in the farm pond in all stages of development. They were present, but fewer in the stream channel pool.

MOLLUSKS

Snails and clams are abundant in the farm pond, but we found only a few in the stream channel pool

Planorbid snail, Planorbidae

Abundant fingernail clams (Spheridae)

Physid snails mating

Photo: Maryland DNR

Clams actively move in the pool by extending their foot

Annelida

Annelids -- aquatic worms and leeches -- were found at both pools

Tube worms clinging to the substrate and waving in the water

Tiny leech

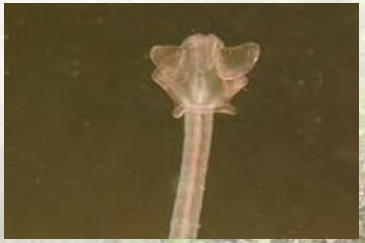


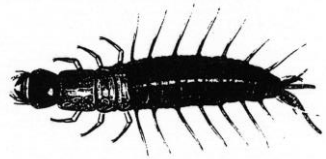
Photo: lifeinfreshwater.net

Naiadid worms, *Dero digitata*, were found at the stream channel pool

AQUATIC INSECTS AT THE FARM POND

– ALL PREDATORS OF MICROCRUSTACEANS, OTHER INSECTS, AND AMPHIBIANS

Phantom midge, Chaoboridae
Photo: *Field Guide to the Animals of Vernal Pools*, Leo Kenny & Matthew Burne



Fishfly, Corydalidae
Diagram: *Aquatic Entomology*, Patrick McCafferty

Predaceous diving Beetle larva, Dytiscidae

Water scavenger beetle, Hydrophilidae

Darner dragonfly, Aeshnidae

Skimmer dragonfly, Libellulidae

Pondhawk dragonfly, *Erythemis sp.*

Water boatman, Corixidae

Backswimmer, Notonectidae

Water scorpion Nepidae

Broad-shouldered strider, Veliidae

Water strider, Gerridae

DISTINCTIVE AQUATIC INVERTEBRATES IN THE SWALE POOL

Giant casemaker caddisfly, Phryganeidae, February 25

Photo: http://cfb.unh.edu/

Rotifer, July 6

Photo: http://cfb.unh.edu/

Aquatic mite the size of a dog tick, August 1

Water scavenger beetle larva, Hydrophilidae, June 26

Burrowing crayfish hole and chimney on the dry pool bed, August 25

Photo: dnr.Maryland.gov

Burrowing/Devil crayfish (*Lacunicambarus diogenes*)

A MAGNOLIA BOG/VERNAL POOL!

- Confirmed by John Parrish (retired NPS botanist) as a Fall-line Terrace Gravel Magnolia Bog
- Wood frogs

NW BRANCH BRANCH VERNAL POOLS

- Vernal pool complex with multiple pools that are interconnected during storms
- Abundant Marbled Salamanders
- Density of Marbled salamanders seems to dramatically decrease from January to May
- Water level: 18 inches in Jan to dry in May (2024)
- No egg masses of spotted salamanders or wood frogs on 2024 (present in 2023)

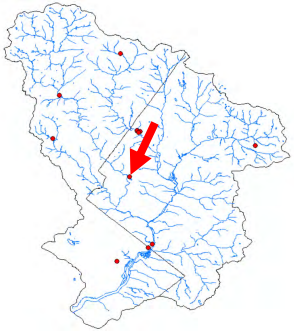


Photo Taken on May 6th, 2024

May, 2024

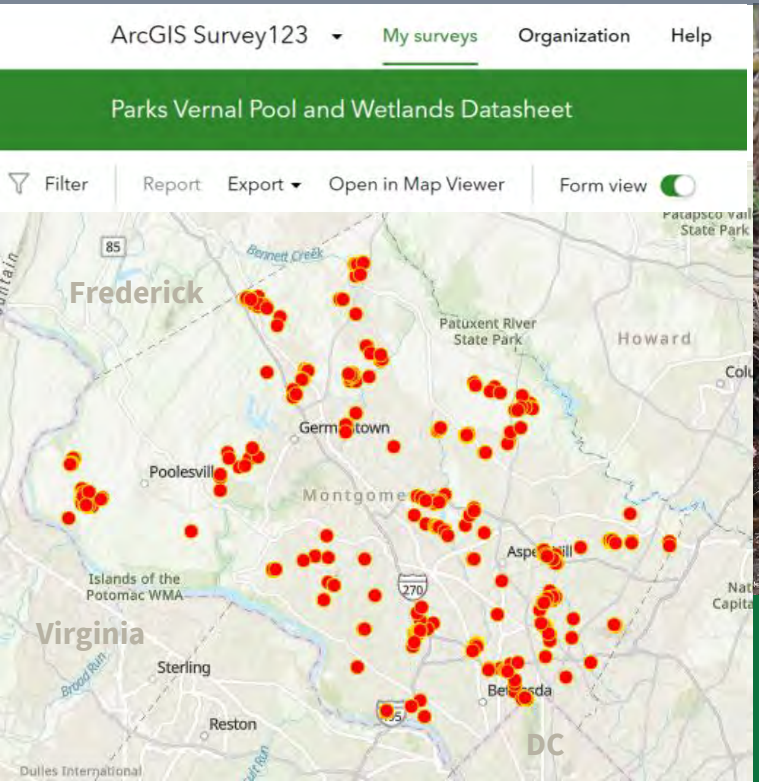
May, 2024

- Are the highly fluctuating hydroperiods (climate change) jeopardizing the survival of these obligate species locally at some sites?
- We will continue the inventory in PG Parks and other sites with permission from landowners
- Educating the public, vernal pools are “out of sight out of mind”
- Experimental enhancement of vernal pools with insufficient hydroperiod?

Questions?

Jorge Bogantes Montero
Natural Resources Specialist
Anacostia Watershed Society
jmontero@anacostiaws.org
(202) 560-6107 (cell)

Conservation Action at Your Fingertips: Documenting Ephemeral Wetlands using a Tiered Approach in ArcGIS Survey123



See the survey!
arcg.is/04bzqL

Rachel Gauza
Park Planning & Stewardship – Resource Analysis
May 21, 2024

DEFINING FEATURES

Depressional upland seasonal pool in Little Bennett RP | RGauza

Open-canopy emergent seasonal pool in Cabin John RP | RGauza

Box 1-2
Definition of a seasonal pool

- ☑ **Surficial Hydrologic Isolation**
  No permanent surface water connections to other water bodies.
- ☑ **Periodic Drying**
  Water levels generally fluctuate by season; pools experience drying or lowered water levels on a regular basis (frequency ranges from every year to just drought years).
- ☑ **Small Size and Shallow Depth**
  Small area and shallow depth compared to other productive aquatic habitats (such as lakes and types of wetlands).
- ☑ **Distinctive Biological Community**
  Support animals that are adapted to seasonal pool drying; support the breeding of animals that reproduce optimally without fish populations; do not support permanent populations of predatory fish.

Source: An Introduction to Mid-Atlantic Seasonal Pools (EPA 2008)

Ephemeral Wetland

Seasonal Pool
(Indicator species presence)

Difficult to define but easy to overlook & unintentionally impact!

HABITAT CREATION & ENHANCEMENT

Created pool habitat associated with Intercounty Connector (ICC) loss mitigation across two seasons | Matt Harper

Outfall Stabilization & Enhancement Project | Jackie Hoban

Wet low-lying/flood prone areas converted to wetland habitat | Jackie Hoban

Wetland Enhancement Project in early spring | RGauza

GOTTA CATCH 'EM ALL!

Current Status – what is present & unique?

Conservation – are habitats & species protected?

Creation – if you build it, do they come?

Comparative – natural vs. created?

Potential Vernal Pool/Ephemeral Wetland?

We want to know!

→ GOAL: **Compile historic & current data from multiple sources with differing levels of effort & make interpretations**

Survey123 for ArcGIS

arcg.is/04bzqL

Photo Credits: RGauza

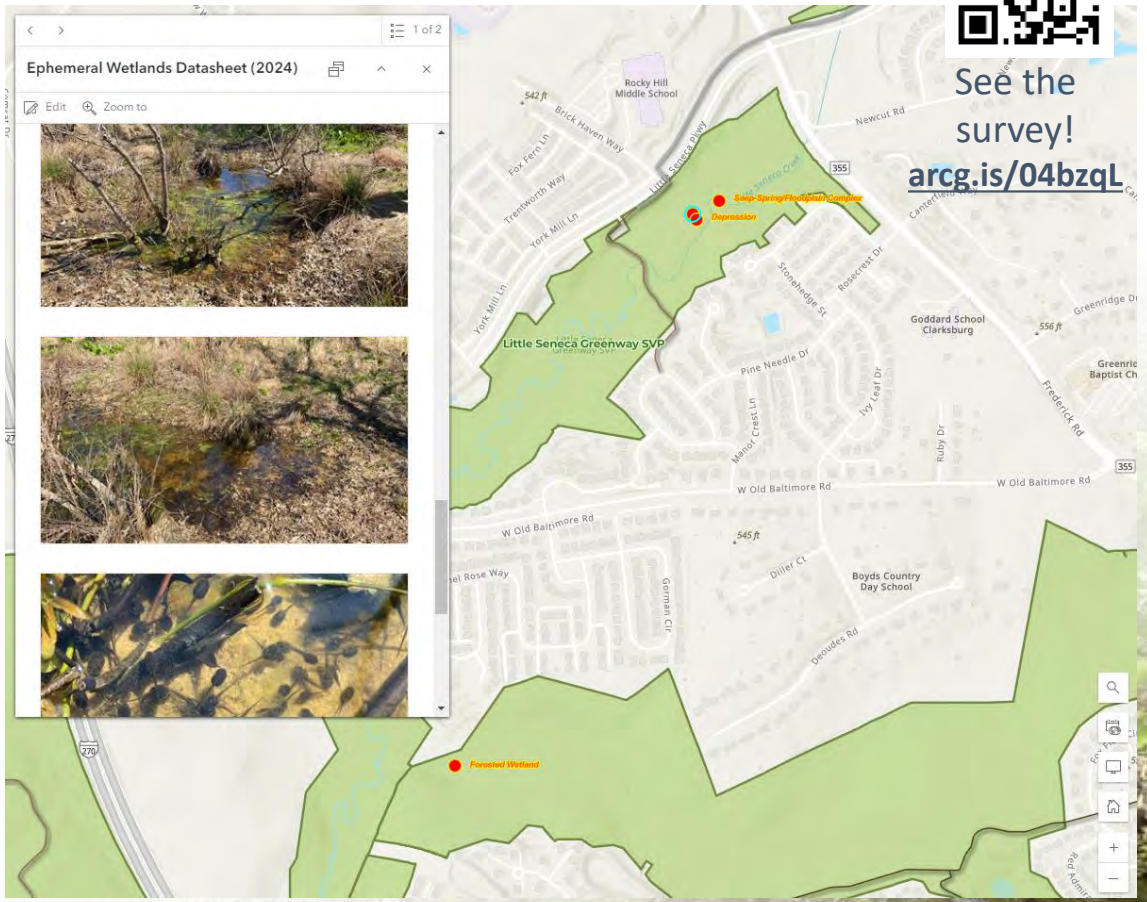
SURVEY123 INTRO. & ROLL OUT

Technology

- GIS-based field data collection tool
- Geodatabase & feature layer(s)
- Instant data availability & access
- Highly customizable

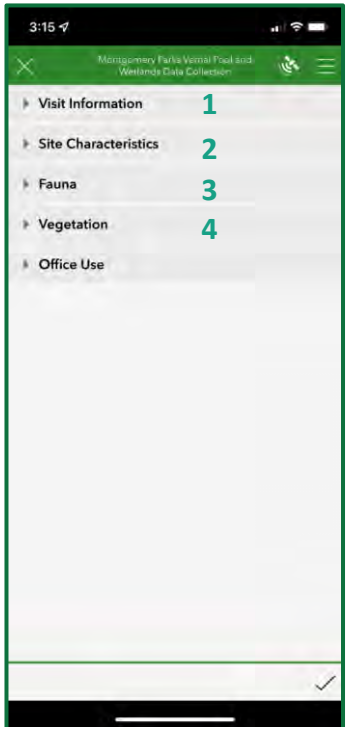
Data Collection

- Opportunistic encounters
- Pilot effort in 2021
- Data collection to present
- 10+ years of data logged!

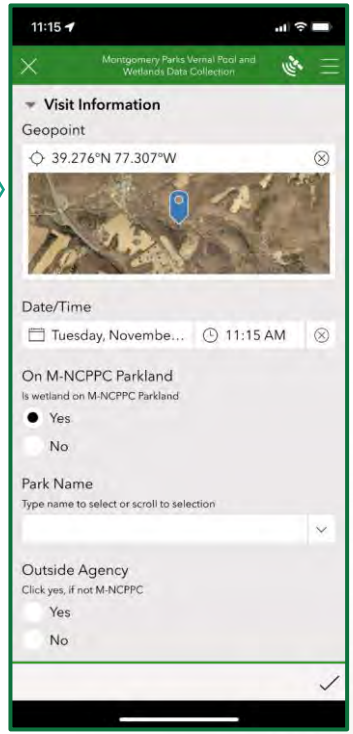


See the survey!
arcg.is/04bzqL

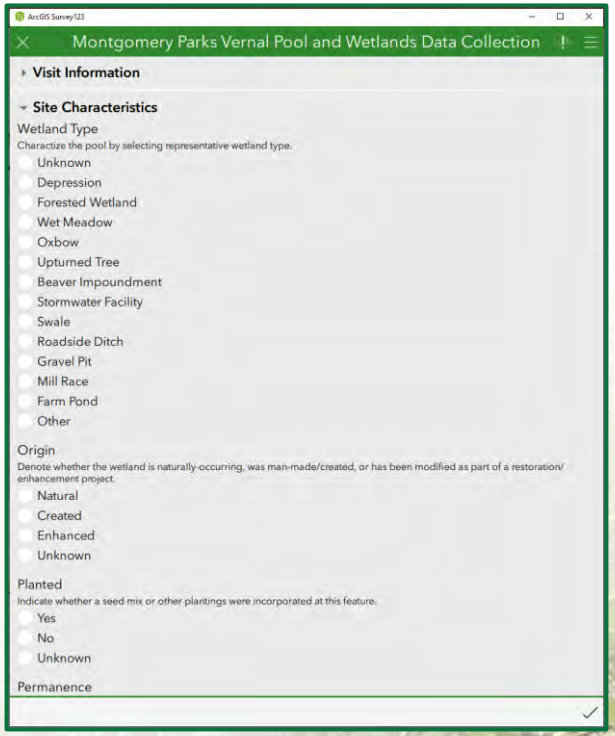
QUICK BUT COMPREHENSIVE DATA COLLECTION



TIE R 1



TIE R 2

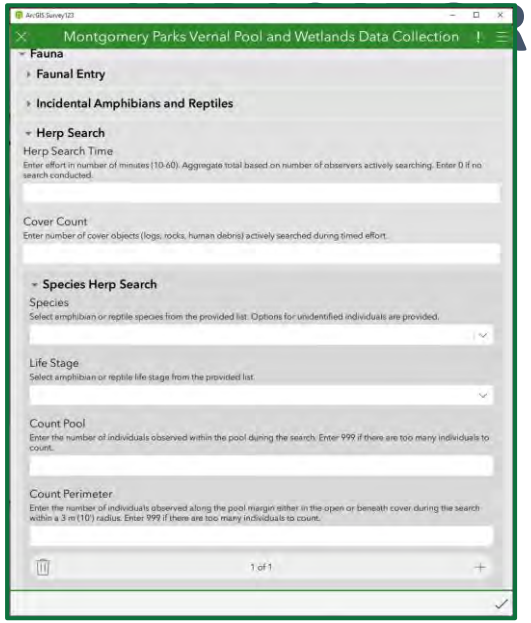


Smart Form-enabled multi-tiered approach

Enter most critical info. first

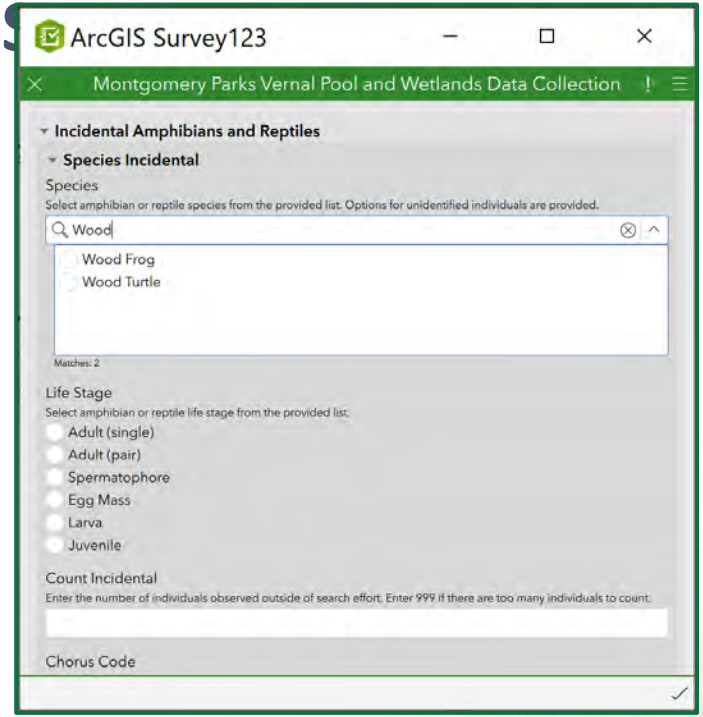
Define location using "quick click" responses

FAUNA & VEGETATION OBSERVATIONS &



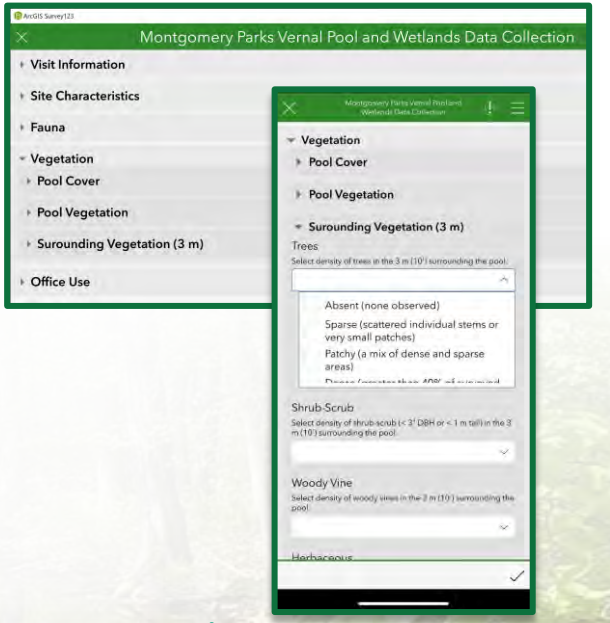
TIER 3: Fauna

- **Targeted Herp Searches**
  - **Time-limited** (10 – 60 minutes)
  - **Cover counts**



TIER 3: Fauna

- **Incidental observations** (herps et al.)
- **Notes/comments**



TIER 4: Vegetation

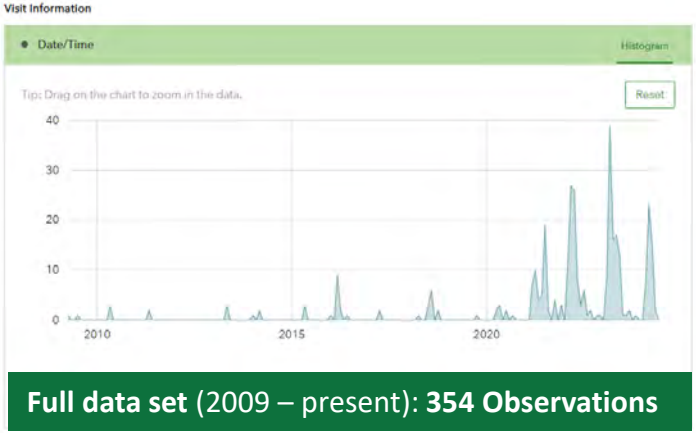
Guided by hint text & drop downs

Office Use Section

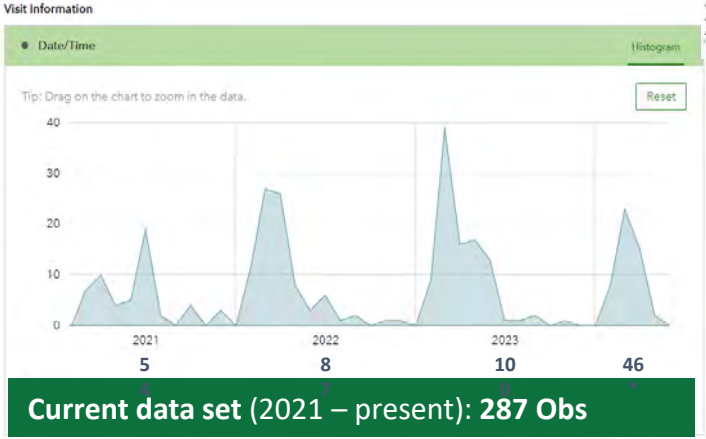
Station naming, edit & photo tracking, etc.

CURRENT & HISTORIC OBSERVATIO

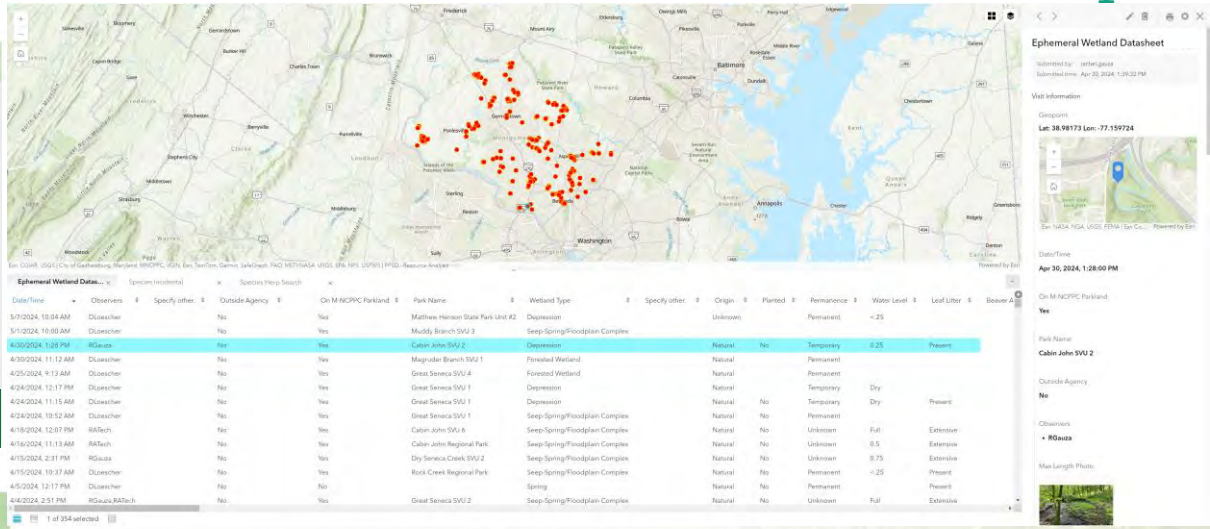
Visit Information TIER 1



Full data set (2009 – present): **354 Observations**



Current data set (2021 – present): **287 Obs**



Visit Information Captured by Survey123:

- **Tracking of observation dates & observer activities**
- **Distributions & counts of entries**
- **Observation frequencies over time**

WETLAND HABITAT CHARACTERIZA

Site Characteristics TIER 2

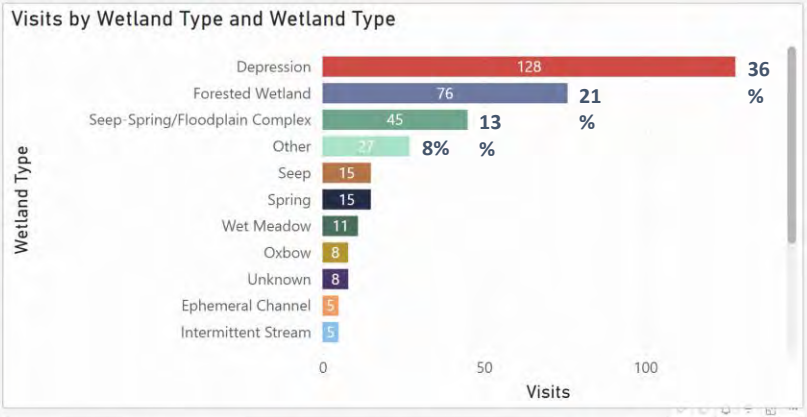
Visit Summary

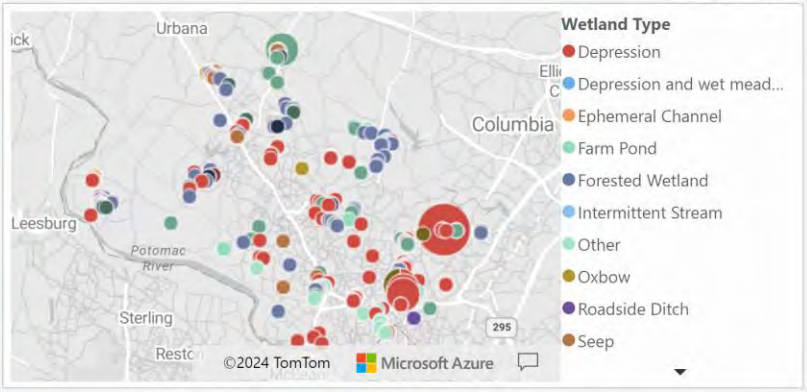
- **28 Observers** (historic – present)
- **22 County Watersheds** (73.3%)
- **70 Parks** (16.7%)

- **19 of 22 aquatic feature types (incl. “unknown” & “other”)**
  - Top 3 same as pilot
  - 8% other (decrease from 18%)

- **Filtering for potential VPs:**
  - **Observations: 314** (89%)
  - **Watersheds:** 21
  - **Parks:** 67

Visits | Wetland Type | 354 Visits





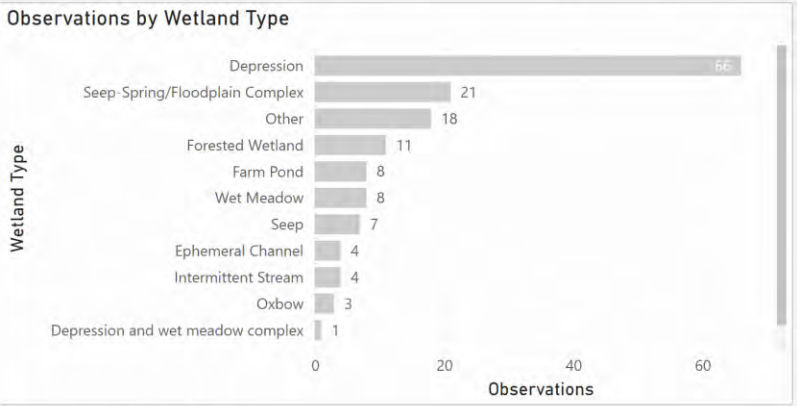
HERP DATA COLLECTION

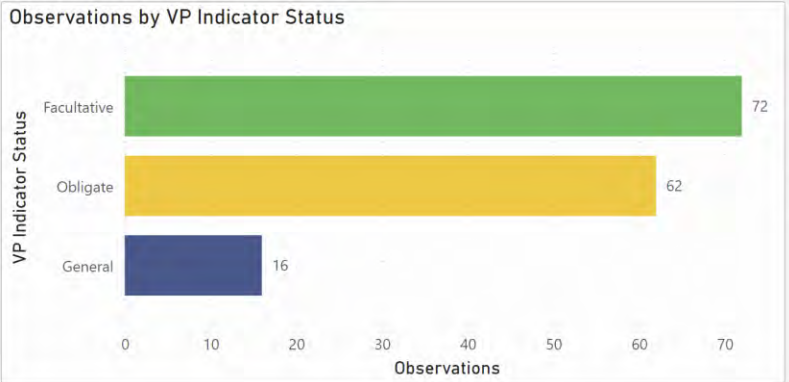
Fauna TIER 3

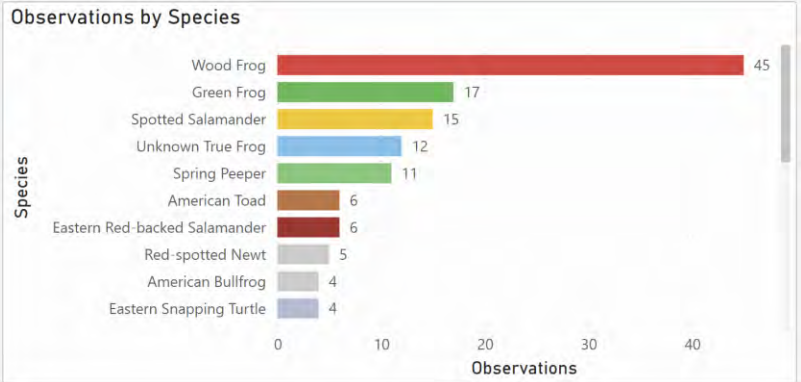
Herp Search & Incidental

Observations | Wetland Type | 152 Observations

- **23 Herp Taxa Observed**
  - 17 amphibians | 6 reptiles
  - Incidental > Search Counts
- **Wood Frog (VP indicator) encountered most frequently**
  - Marbled Salamander & Eastern Newt assoc. w/searches





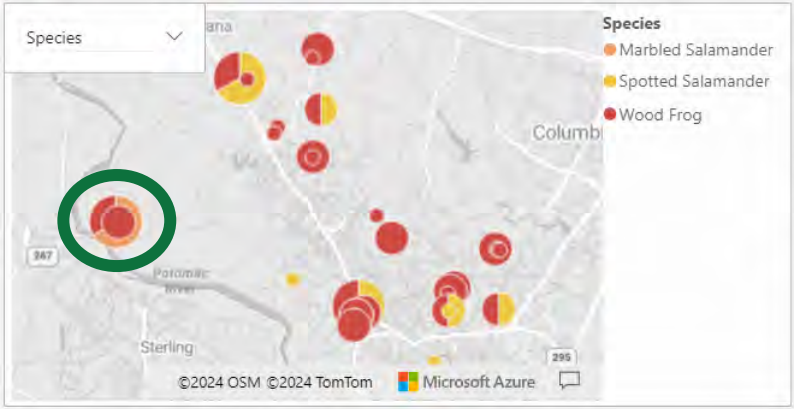


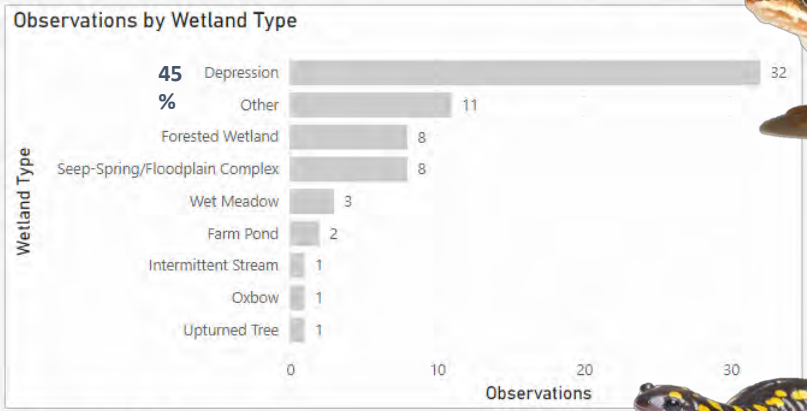
INDICATOR SPECIES RECORDS

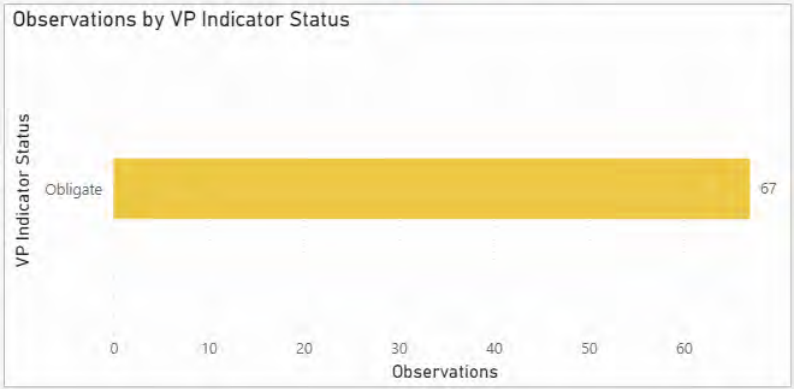
Fauna TIER 3

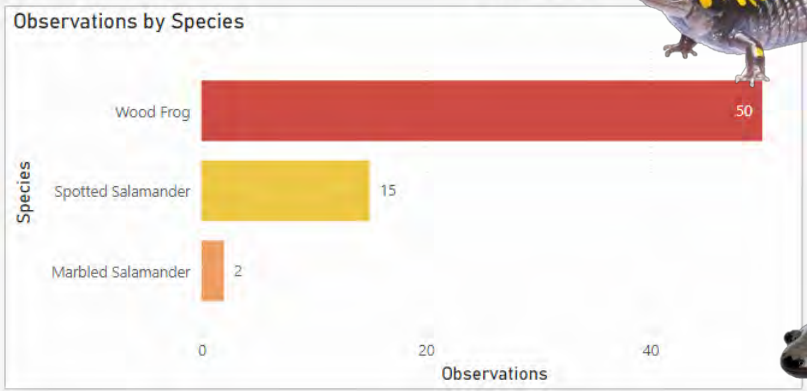
Herp Search & Incidental

Observations | Wetland Type | 67 Observations









Indicator species detected in 17 parks & 12 watersheds

WHAT ARE WE LEARNING?

- **Current Status & Conservation**
  - *What is present & unique?*
- **Habitat Management & Restoration**
  - *If you build it, will they come?*

Marbled Salamander detected at newly acquired parkland (2022)

Little Bennett Regional Park is a refuge for Eastern Newt (2023)

Habitat restoration & enhancement projects can create new / neighboring natal breeding habitat for Spotted Salamanders (2024)

Wood Frogs use a variety of seasonal pool habitats in an array of settings and can colonize new areas – and aquatic insects may, too! (2020-2021)

NEXT STEPS & FUTURE DIRECTIONS

Collecting & examining data

- **Ongoing data collection**
- **QA/QC & data integrity**
- **Expanded access**
- **Dashboards**
- **Visualizations**
- **Interim updates / summaries**

Evaluating data & processes

- **Tweaking protocol & form, if/when needed**
- **Examining with past VP location data & other data sources**
- Clustering of observations
- Rating/ranking features, identifying data deficiencies, etc.

Bringing it all together!

- **"Master" Ephemeral Wetland Layer**
- **Acoustic surveys at select features**
- Integrating herp data from stream corridor searches for range maps, relative abundance evaluations, etc.

Future directions

Expanded use (Naturalists, MCDEP, community scientists)?

ONGOING GOAL: Maintain a clean, comprehensive data set that is easy to examine, interpret, & apply

Thank you!

Fairy Shrimp in Montgomery County | R. Gauza

Acknowledgements

Technical Wizardry:

Geoffrey Mason, Carter Hughes, Tiffany Wu, Keegan Clifford

Data Collection & Support:

Resource Analysis Team
Wildlife Ecology & Mgmt. Unit
Veg. Ecology & Mgmt. Unit

Wood Frog Breeding in Rock Creek Regional Park | Tiffany Jenkins (2022)

arcg.is/04bzqL

Obligate Seasonal Pool Salamander Species: ***Amybstoma jeffersonianum, A. maculatum, A. opacum*** | R. Gauza

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