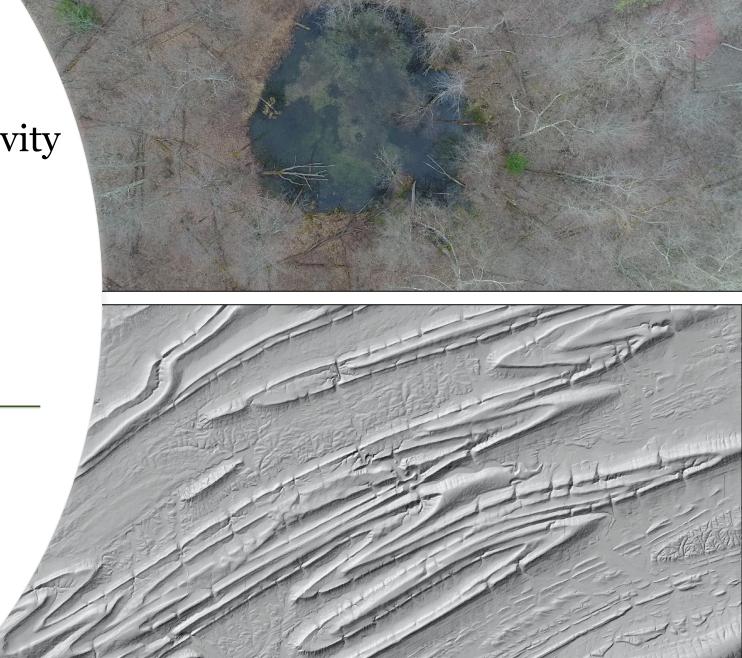
Vernal Pool
Taxonomy & Surface Connectivity
in the
Appalachian Mountains
of
Central Pennsylvania

Taylor Blackman

PhD Candidate Penn State University

Assistant Professor Juniata College



My Background:

Penn State

PhD – Forest Resources

Advisors:

- 1) Jonathan Duncan, PhD
- 2) Timothy White, PhD, PG
- 3) Douglas Miller, PhD
- 4) Margot Kaye, PhD

Ridge & Valley Wetlands, LLC
Certified Professional Wetland Scientist

Juniata College

Asst. Prof. Environmental Science & Studies











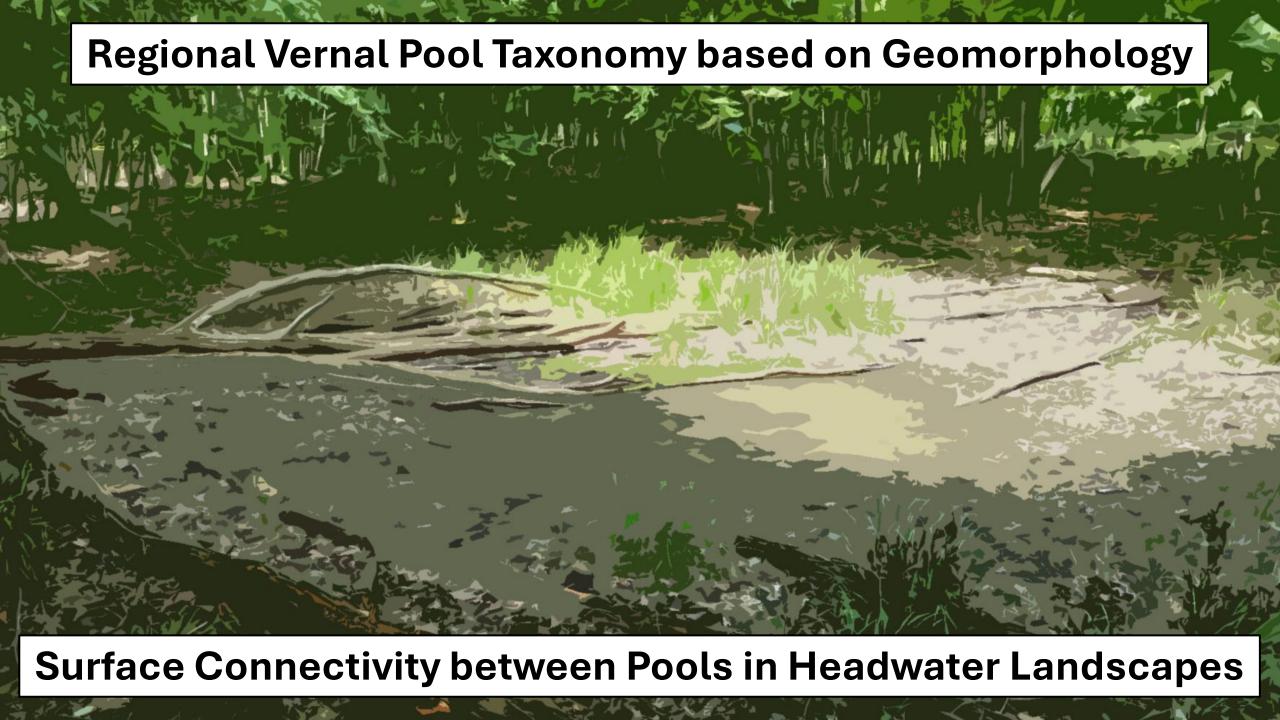
Wetlands & Biodiversity

Value Beyond the Pool

Water & Food for Terrestrial Species

A Keystone Habitat





THE NORTH ATLANTIC VERNAL POOL DATA COOPERATIVE

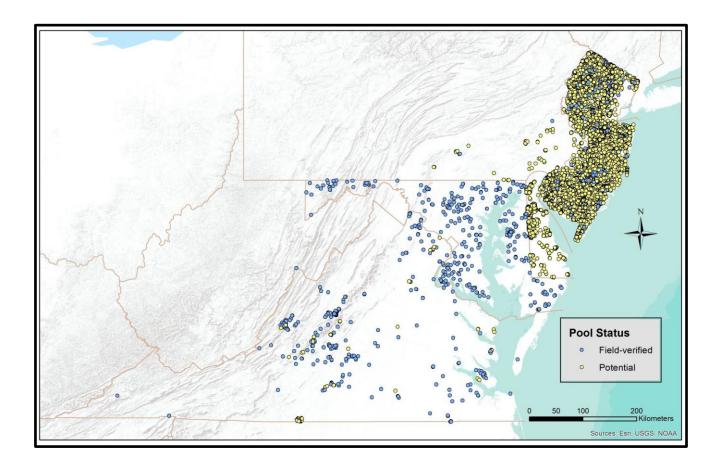
Final Report Submitted to the North Atlantic Landscape Conservation Cooperative



July 2016 Revision

Steven D. Faccio, Sean W. MacFaden,
J. Daniel Lambert, Jarlath O'Neil-Dunne, and Kent P. McFarland

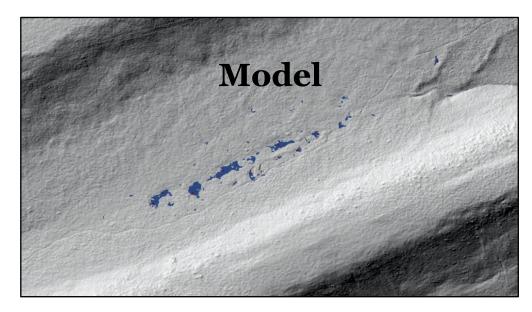
Began Mapping Vernal Pools in 2017

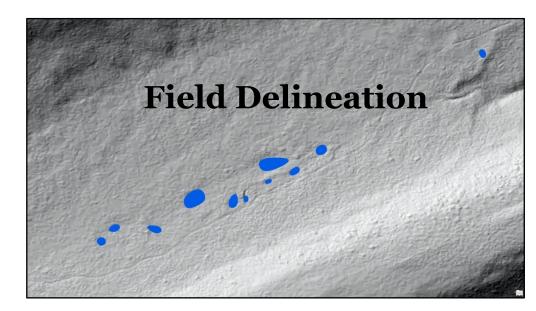


GIS Modeling



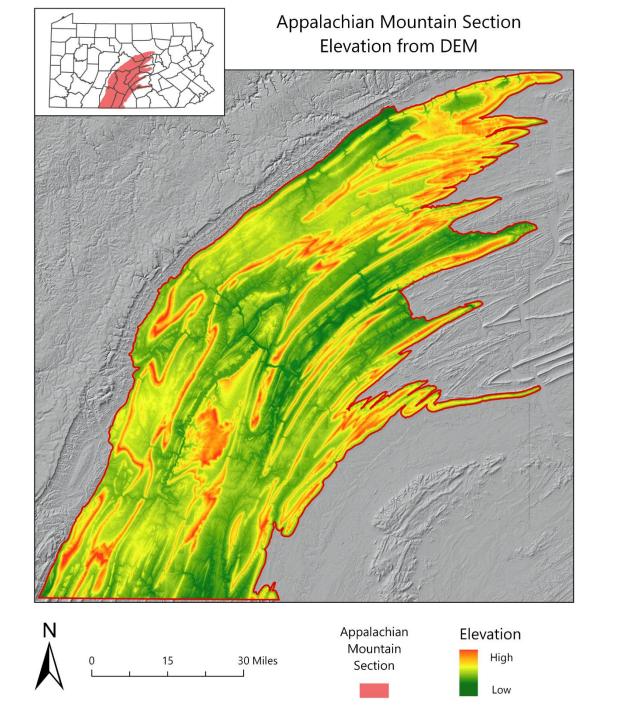
- Terrain Surface Convexity (TSC)
- Wind Exposition Index (WEI)
- Topographic Position Index (TPI)
- Multiresolution Index of Valley Bottom Flatness (MIVBF)





Suitability Model Equation:

Potential Depressional Wetland (lower values) = (TPI + WEI + TSC) - MIVBF





Taxonomy:

1) Bedrock Formation

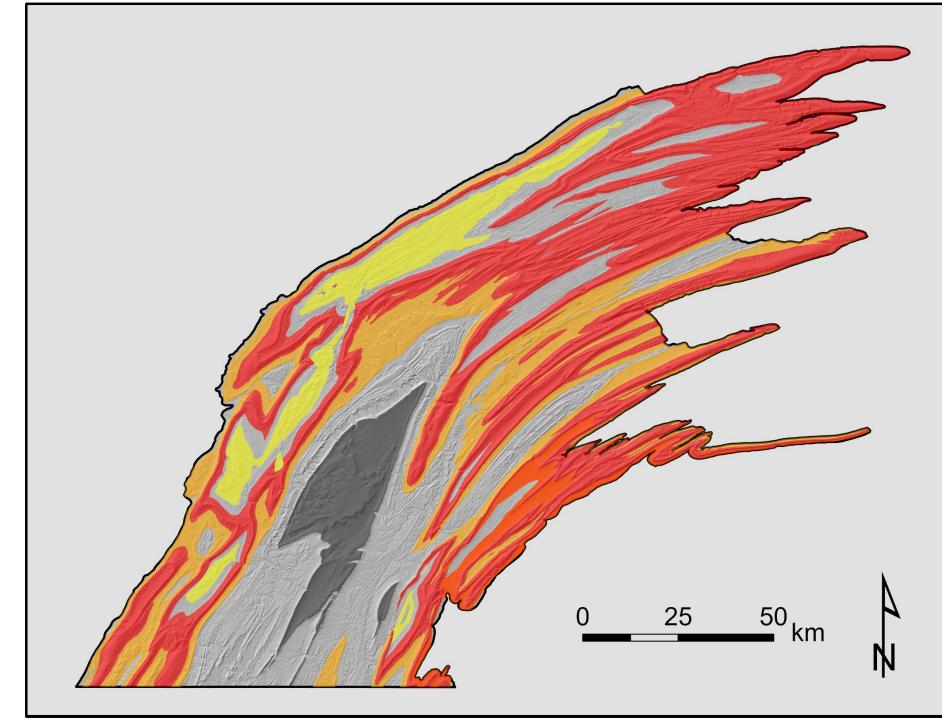
- i. Carbonate
- ii. Mixed
- iii. Clastic
- iv. Carbonaceous

2) Landscape Position

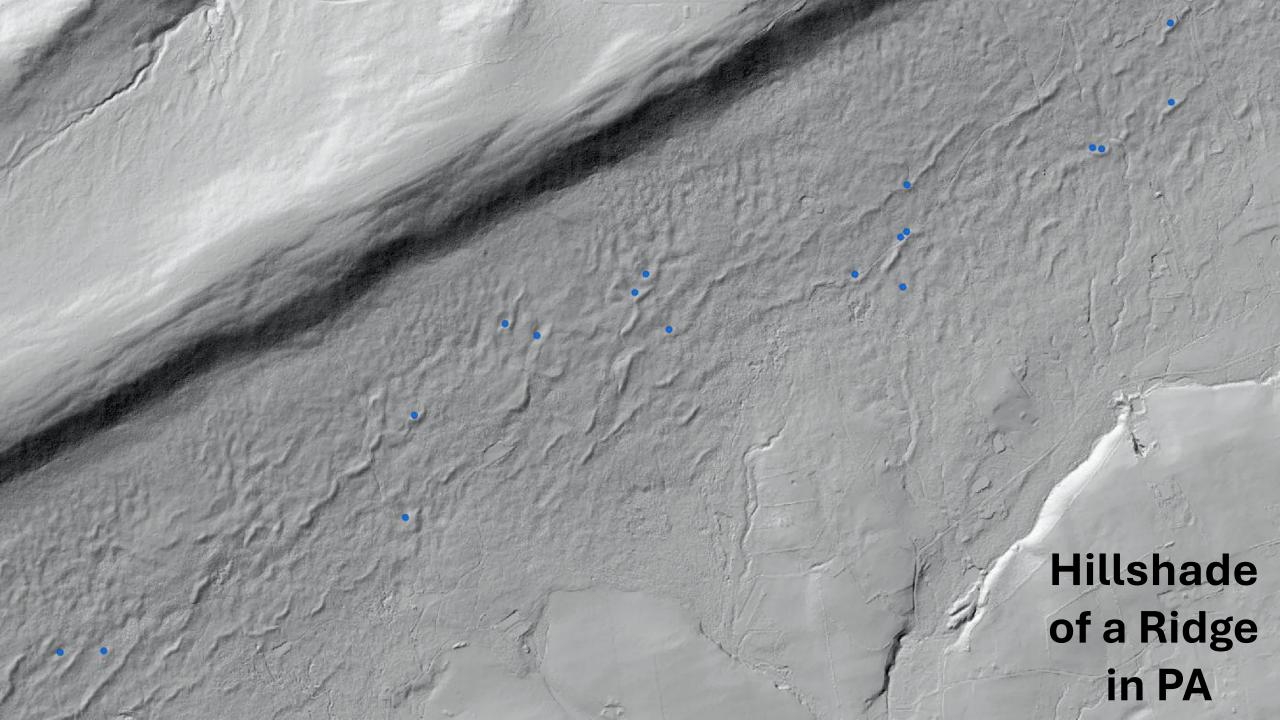
- i. Topographic Saddle
- ii. Midslope

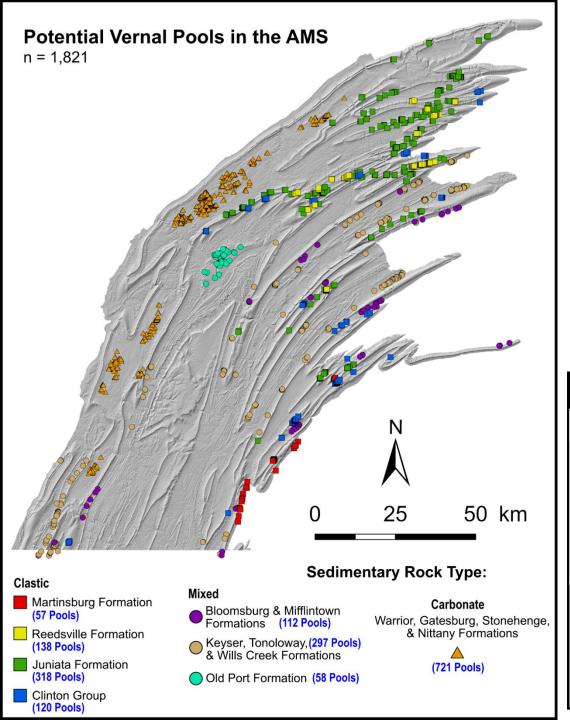
3) Soil Features

- i. Solifluction
- ii. Sinkholes









Results:

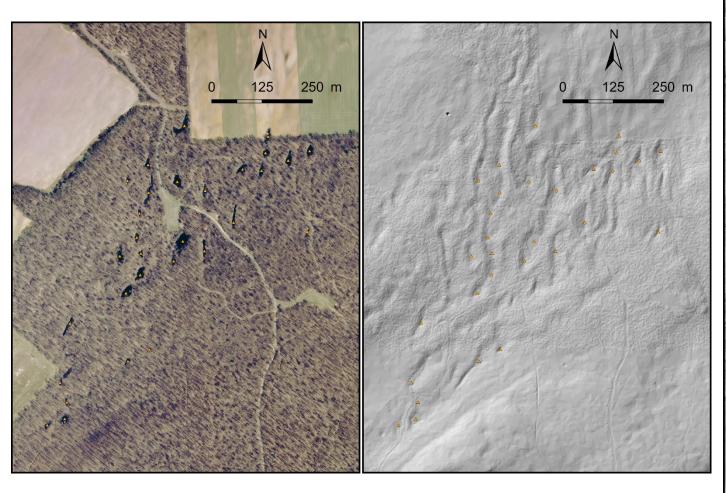
- 8 Distinct Scenarios
- 1,821 Potential Vernal Pools
- ~33% Listed on NWI

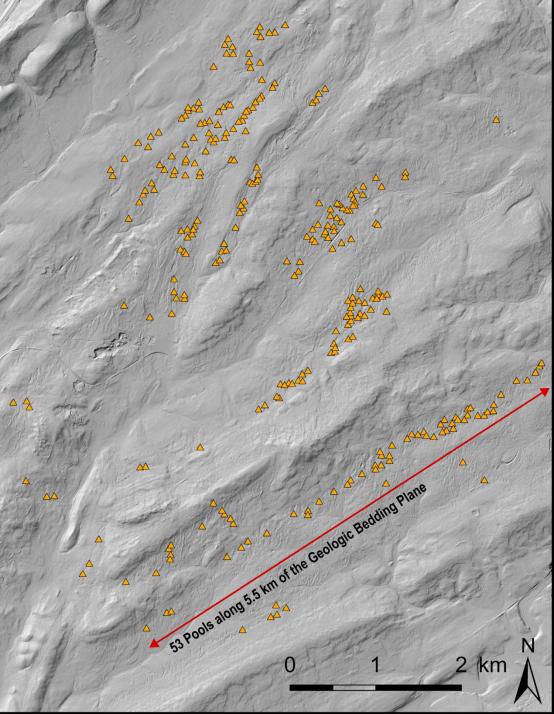
Count	Rock Type	Specific Formations	Major Lithology	Age	Total Pools	Listed on NWI	Highest Density w/in 1 km	Typical Setting
1	Carbonate	Warrior, Gatesburg, Stonehenge, & Nittany	Limestone Dolostone	Cambrian to Ordovician	721	251	80 N40.7324 W-78.0782	Along Solifluction Lobes following the Bedding Plane
2	Clastic	Martinsburg	Shale	Ordovician	57	25	17 N39.9962 W-77.8181	a) Topographic Saddles b) Midslope Solifluction Lobes
3	Clastic	Reedsville	Shale	Ordovician	138	40	19 N40.8248 W-77.2496	Topographic Saddles
4	Clastic	Juniata	Shale Sandstone	Ordovician	318	60	21 N41.0696 W-77.1353	Topographic Saddles
5	Clastic	Clinton Group	Shale Sandstone	Silurian	120	26	25 N40.1053 W-77.7425	Topographic Saddles
6	Mixed Carbonate/Clastic	Bloomsburg & Mifflintown	Shale Limestone	Silurian	112	7	30 N40.4120 W-77.4921	a) Topographic Saddles b) Midslope Solifluction Lobes
7	Mixed Carbonate/Clastic	Keyser, Tonoloway, & Wills Creek	Shale Limestone	Silurian to Devonian	297	153	21 N40.7231 W-77.2613	Along Solifluction Lobes near Sinkholes
8	Mixed Carbonate/Clastic	Old Port Members: 1) Ridgeley over 2) Shriver, Mandata, Corriganville, & New Creek	1) Sandstone 2) Limestone & Shale	Devonian	58	39	22 N40.5470 W-78.0144	Dispersed between Remnant Sandstone Beds

Carbonate

721 Pools

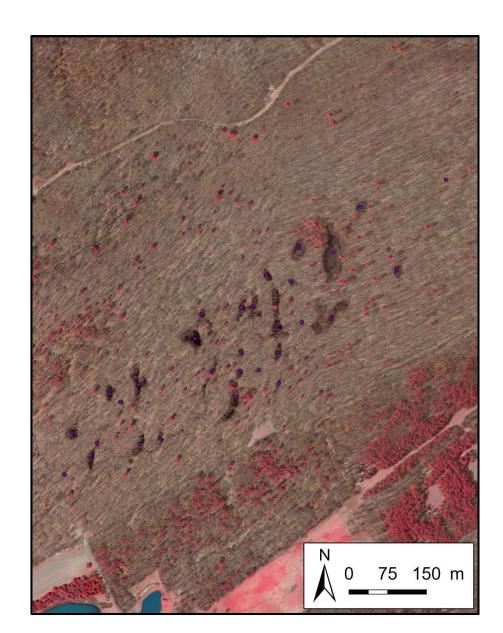
Warrior, Gatesburg, Stonehenge, & Nittany Formations



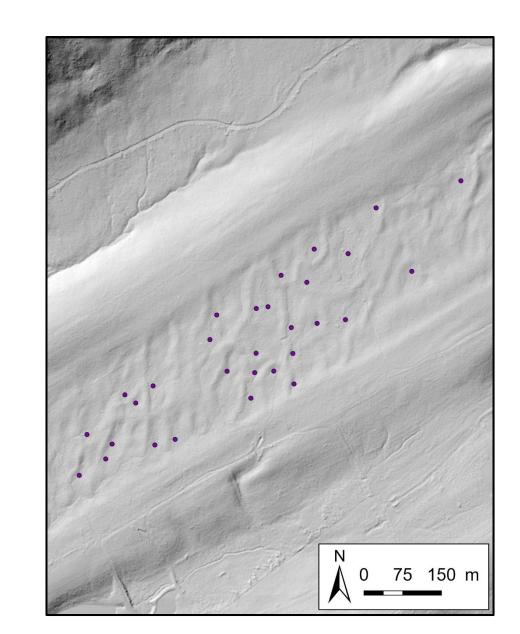


Mixed, Carbonate & Clastic

Bloomsburg & Mifflintown Formations



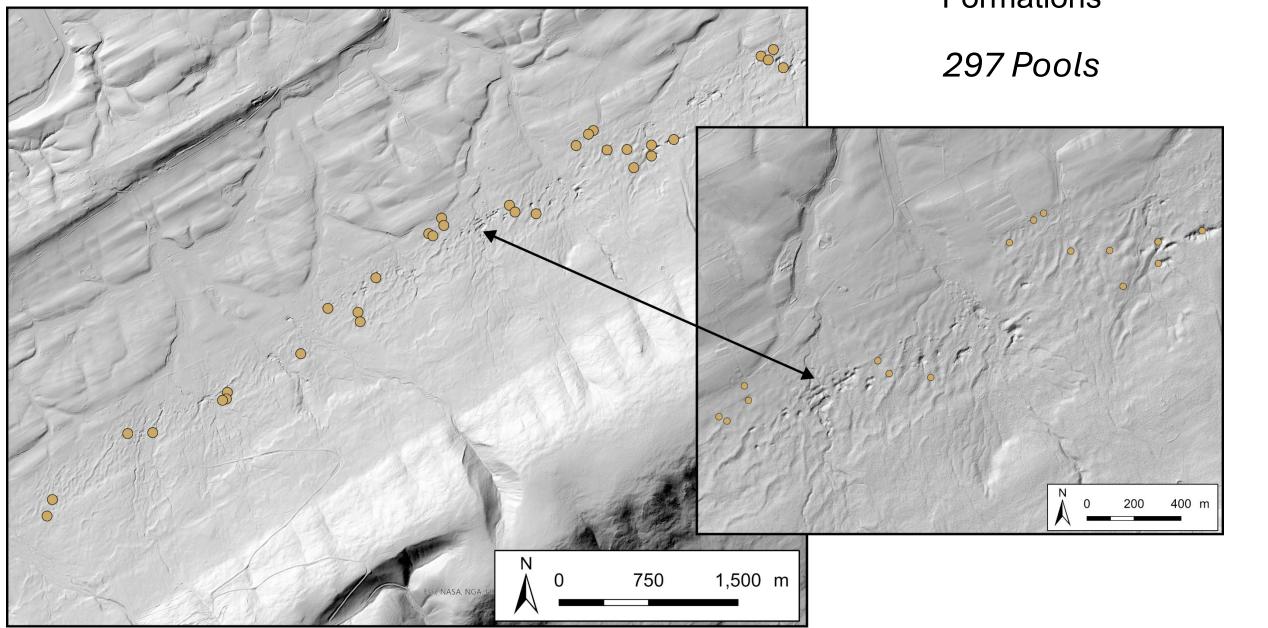
112 Pools



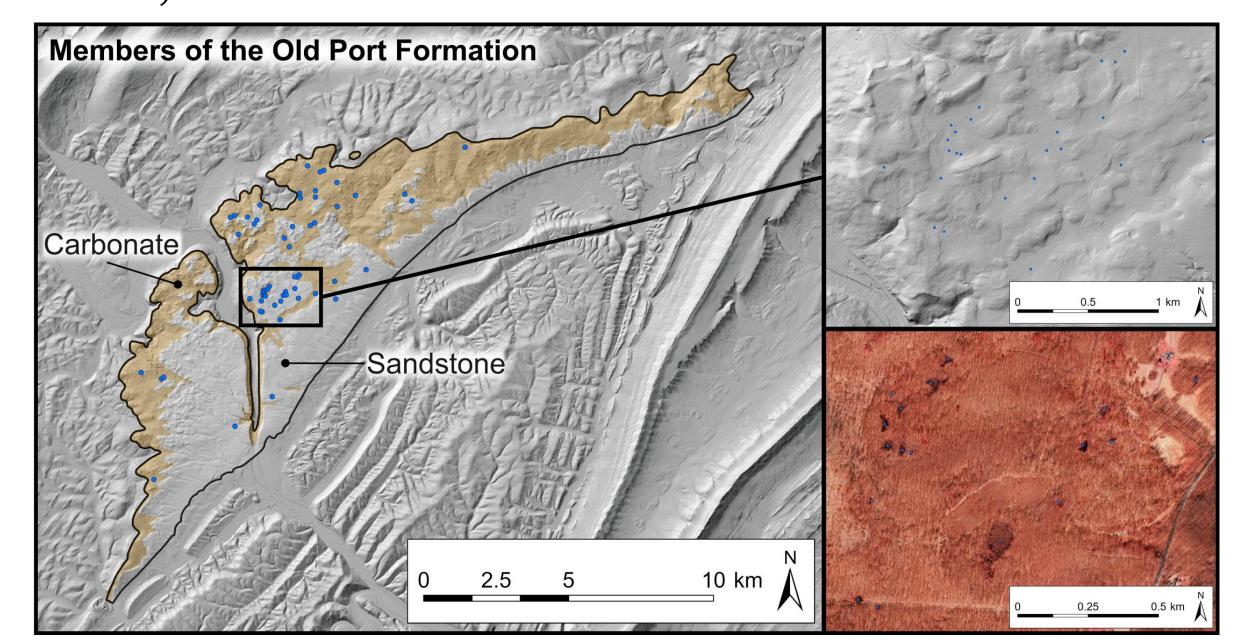
Mixed, Carbonate & Clastic

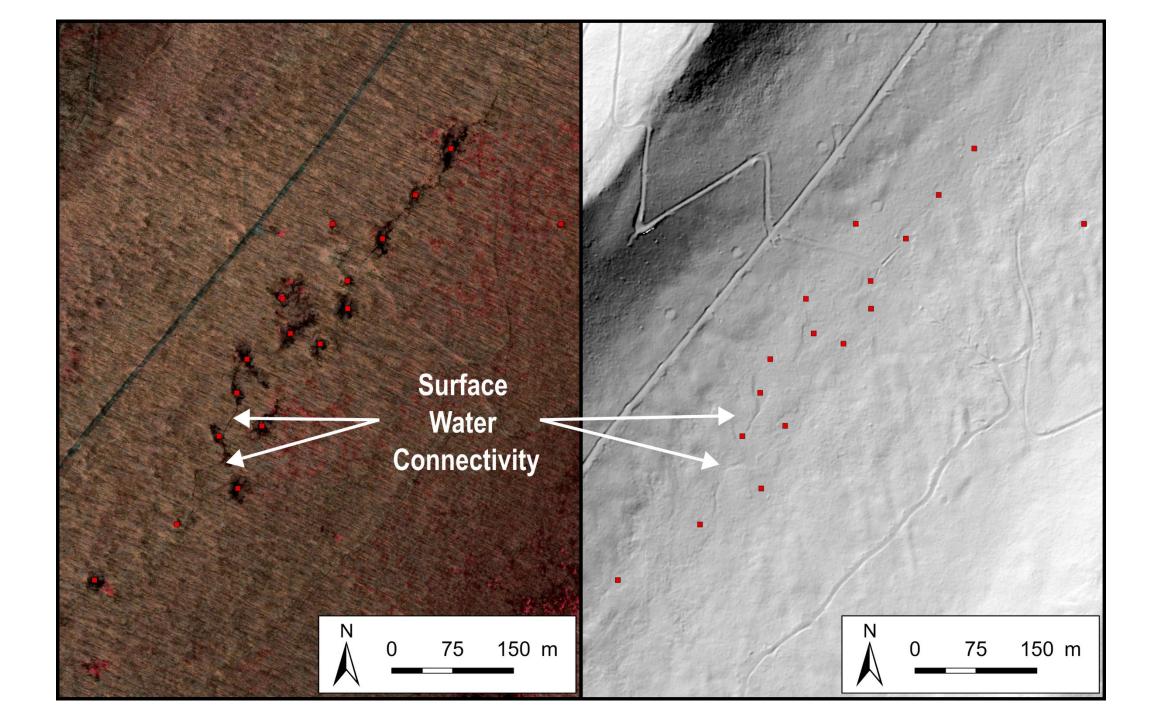
Keyser, Tonoloway, & Wills Creek

Formations



Mixed, Carbonate & Clastic Members of the Old Port Formation – 58 Pools

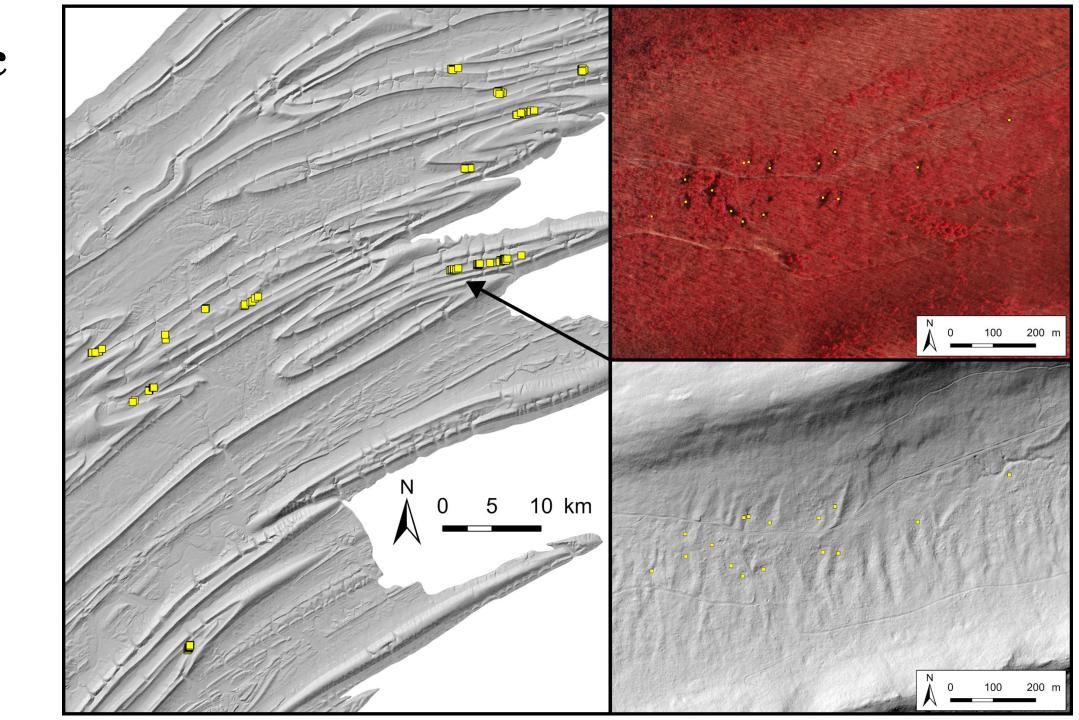




Clastic

Reedsville Formation

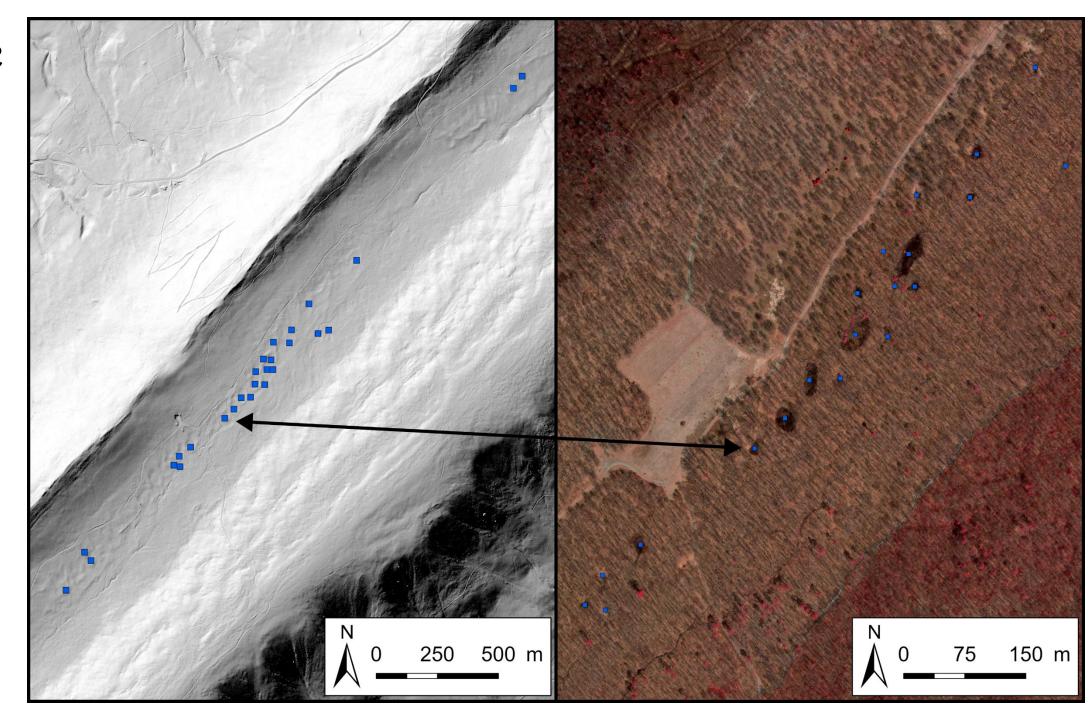
138 Pools

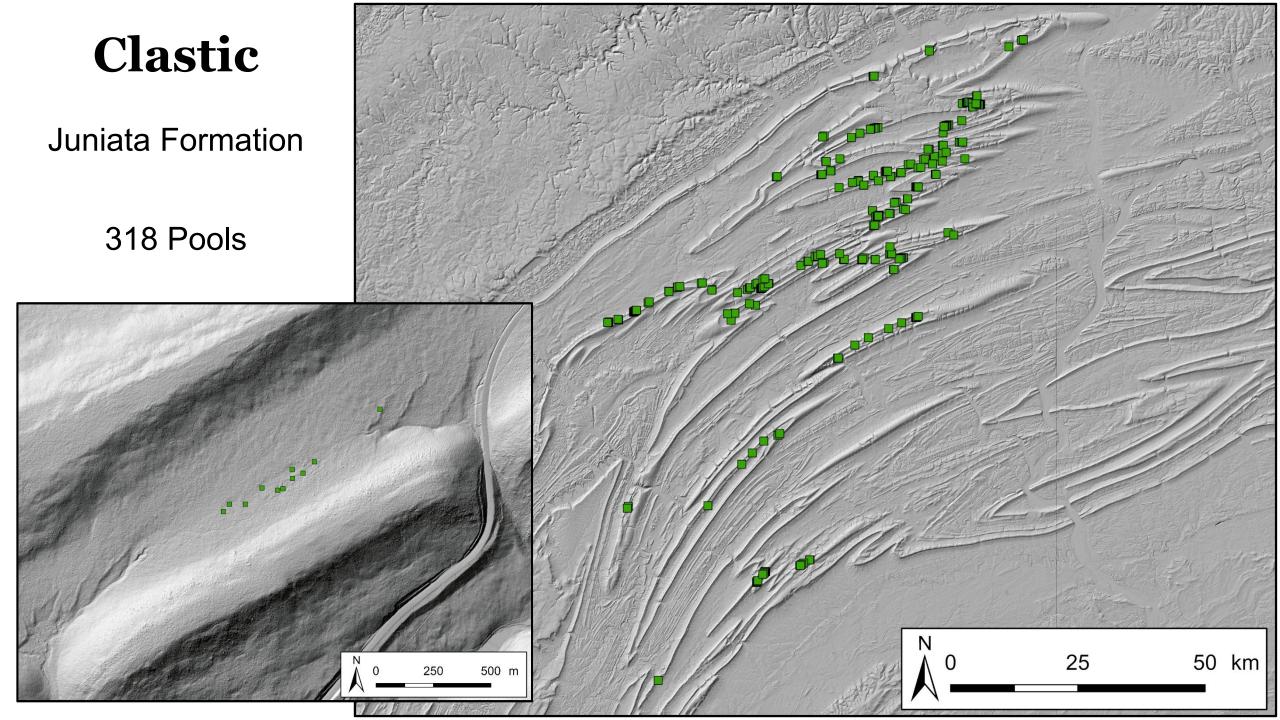


Clastic

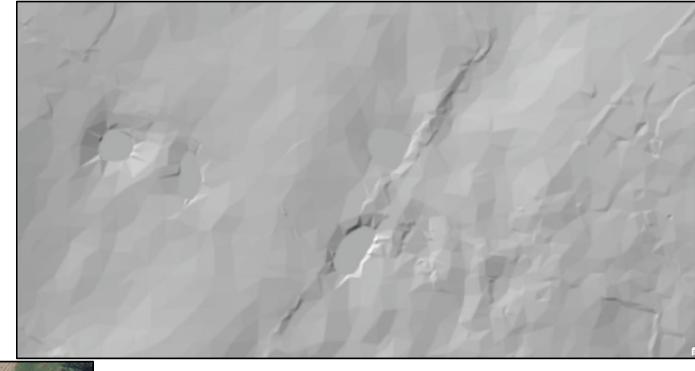
Clinton Group

120 Pools





Several Lost to Disturbance

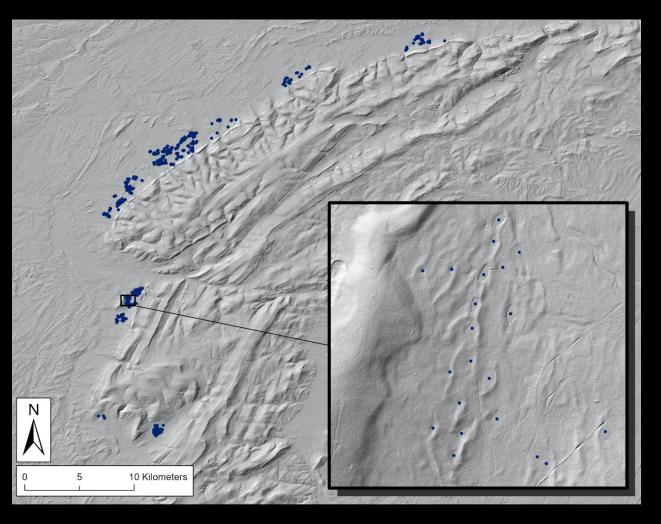




Ag

Housing

Roads



Why Study Clusters of Pools?

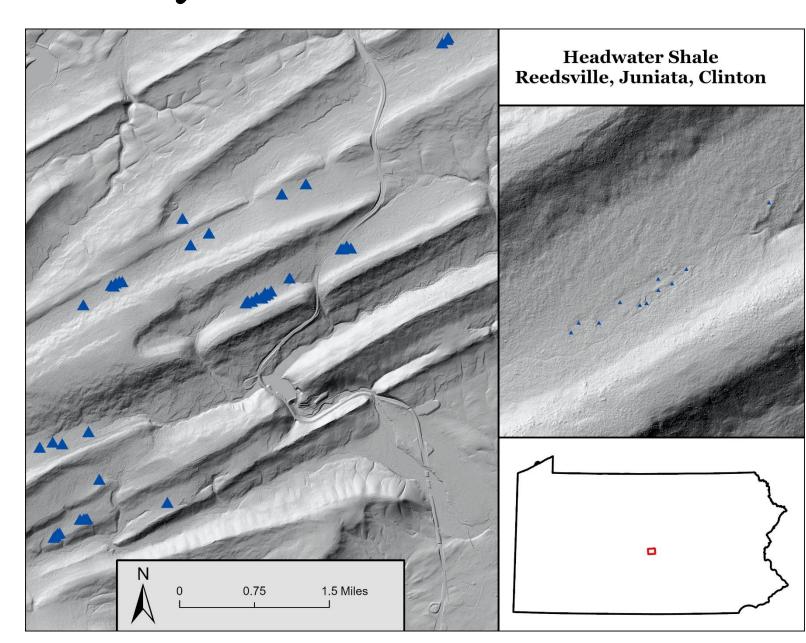
- Key environmental conditions can be held constant
- Clusters offer a variety of pool morphologies, hydroperiod, and landscape position
- Many are found on public land, thus can be managed

Surface Water Connectivity in the Clastic Headwaters

Topographic Saddles on Shale

105 Saddles with 473 Pools
Adjacent to and above the
Headwaters

Timing, Frequency, & Duration of Connectivity



Study Site – Rothrock State Forest

Saddle along the Juniata Formation

<u>High-frequency Monitoring Network</u>

10-min readings
Water Year 2022

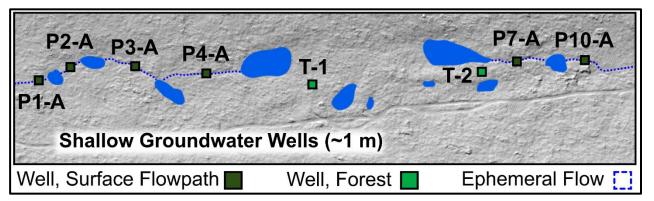
11 Vernal Pools

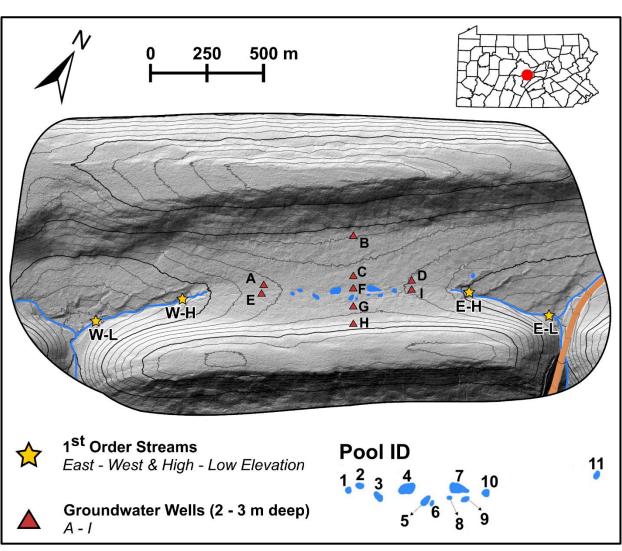
4 Stream Points

~5 years

9 Wells (2 – 3 m Deep)

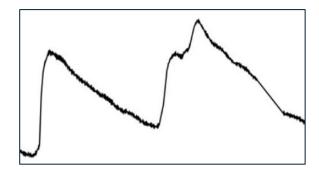
8 Wells (~1 m Deep)

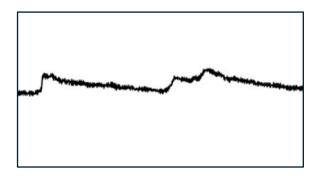






Water Level Stability





Hydrology is Imprinted on the Landscape







DrySparse to Devoid of Vegetation





Wet
Thick Coverage
of Wetland Plants



