

CITIZEN SCIENTISTS
DOCUMENTING
VERNAL POOLS AND LANDSCAPE CHANGE



WHAT IS A VERNAL POOL?



CRITICAL, THREATENED HABITATS

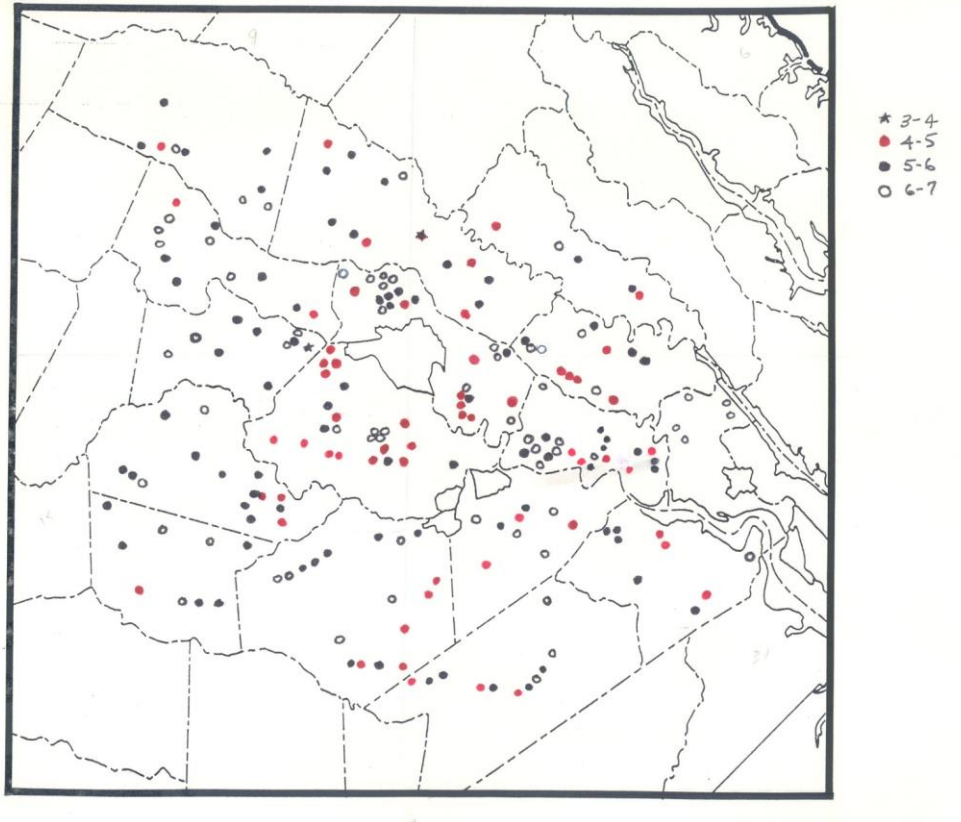


HISTORICAL DATA SET- 1988-1991

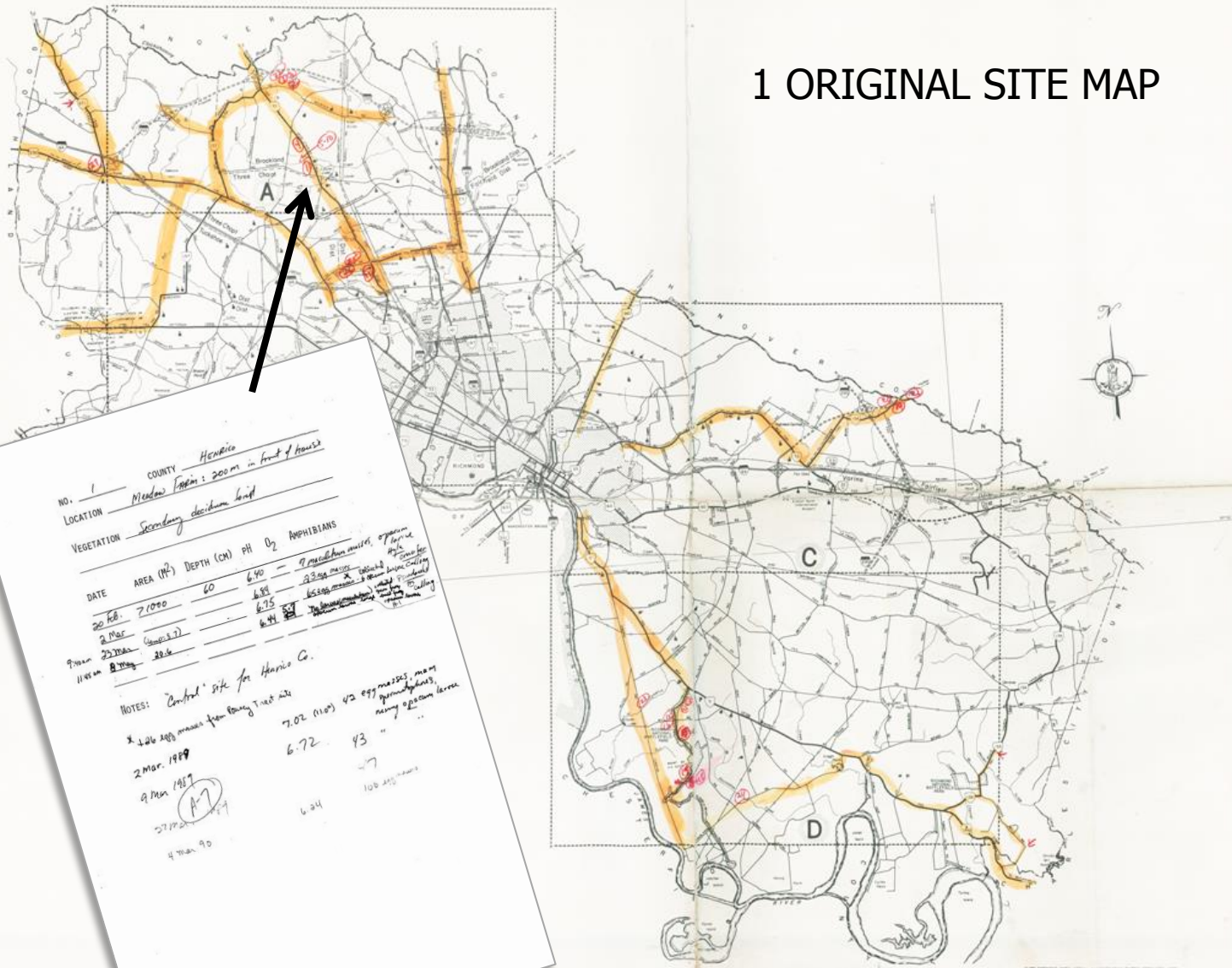
(PRE-GPS)

This photograph shows the physical materials used for data collection. A binder contains several maps and data sheets. One prominent sheet is a "GENERAL HIGHWAY MAP" for Henrico County, Virginia, prepared by the Virginia Department of Highways and Transportation in 1977. Another sheet is a detailed map with data points plotted on it. A small notepad with handwritten notes is also visible.

	Sizes	+	total	Area	system
WELLS	9	4	62	9000	3
CARROLL CITY	13	5	53	2070	1
DEESTFIELD	13	12	93	1970	1
GRIMMILL	19	6	62	3200	4
ROCKLAND	12	4	21	3000	1
HARDEN	13 ¹	6	26	2000	0
PERKINS	10 ¹	3 ¹	24	1750	1
JAMES CITY	5	1	9	1700	0
LONG WOODRIF	6	5	0	0	0
LEITCH	4	0	0	800	0
NEW HOE	13	1	76	2000	1
NORTHAM	1	2	4	400	0
PARMOUTH	1	8	5	670	2
PRINCE GEORGE	1	0	0	0	0
SAWY	1	9	2	170	0
SEEBY	1	1	18	600	0
	1	3	18	1800	1
	1	3	2	1800	1
181	1	1	1	1	1
182	1	1	1	1	1
183	1	1	1	1	1
184	1	1	1	1	1
185	1	1	1	1	1
186	1	1	1	1	1
187	1	1	1	1	1
188	1	1	1	1	1
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203	1	1	1	1	1
204	1	1	1	1	1
205	1	1	1	1	1
206	1	1	1	1	1
207	1	1	1	1	1
208	1	1	1	1	1
209	1	1	1	1	1
210	1	1	1	1	1



1 ORIGINAL SITE MAP



LEGEND

ROAD CLASSIFICATION

- ROAD NUMBER
- STATE HIGHWAY
- LOCAL ROAD
- UNPAVED ROAD
- ROAD UNDER CONSTRUCTION
- ROAD TO BE CONSTRUCTED
- ROAD TO BE DELETED
- ROAD TO BE MAINTAINED
- ROAD TO BE IMPROVED
- ROAD TO BE RECONSTRUCTED
- ROAD TO BE WIDENED
- ROAD TO BE NARROWED
- ROAD TO BE REALIGNED
- ROAD TO BE ABANDONED
- ROAD TO BE PRESERVED
- ROAD TO BE RESTORED
- ROAD TO BE REDEVELOPED
- ROAD TO BE REDESIGNED
- ROAD TO BE REBUILT
- ROAD TO BE REPAIRED
- ROAD TO BE REFINISHED
- ROAD TO BE REFINISHED AND REPAIRED
- ROAD TO BE REFINISHED AND RESTORED
- ROAD TO BE REFINISHED AND REDESIGNED
- ROAD TO BE REFINISHED AND REBUILT
- ROAD TO BE REFINISHED AND REPAIRED AND RESTORED
- ROAD TO BE REFINISHED AND REPAIRED AND REDESIGNED
- ROAD TO BE REFINISHED AND REPAIRED AND REBUILT
- ROAD TO BE REFINISHED AND REPAIRED AND RESTORED AND REDESIGNED
- ROAD TO BE REFINISHED AND REPAIRED AND RESTORED AND REBUILT
- ROAD TO BE REFINISHED AND REPAIRED AND RESTORED AND REDESIGNED AND REBUILT

UTILITIES

- UTILITY LINE
- UTILITY TOWER
- UTILITY VALVE
- UTILITY MANHOLE
- UTILITY BOX
- UTILITY ENCLOSURE
- UTILITY STRUCTURE
- UTILITY EQUIPMENT
- UTILITY MATERIAL
- UTILITY SUPPLY
- UTILITY STORAGE
- UTILITY DISTRIBUTION
- UTILITY COLLECTION
- UTILITY TREATMENT
- UTILITY DISPOSAL
- UTILITY RECYCLING
- UTILITY REPAIR
- UTILITY MAINTENANCE
- UTILITY INSPECTION
- UTILITY TESTING
- UTILITY RECORDING
- UTILITY ARCHIVING
- UTILITY PRESERVATION
- UTILITY RESTORATION
- UTILITY RECONSTRUCTION
- UTILITY REDEVELOPMENT
- UTILITY REDESIGN
- UTILITY REBUILD
- UTILITY REPAIR AND RESTORATION
- UTILITY REPAIR AND REDESIGN
- UTILITY REPAIR AND REBUILT
- UTILITY REPAIR AND RESTORED
- UTILITY REPAIR AND RESTORED AND REDESIGNED
- UTILITY REPAIR AND RESTORED AND REBUILT
- UTILITY REPAIR AND RESTORED AND REDESIGNED AND REBUILT

LAND USE

- LAND USE ZONE
- LAND USE DISTRICT
- LAND USE PLAN
- LAND USE MAP
- LAND USE STUDY
- LAND USE ANALYSIS
- LAND USE EVALUATION
- LAND USE IMPACT
- LAND USE MITIGATION
- LAND USE MONITORING
- LAND USE REPORTING
- LAND USE RECORDING
- LAND USE ARCHIVING
- LAND USE PRESERVATION
- LAND USE RESTORATION
- LAND USE RECONSTRUCTION
- LAND USE REDEVELOPMENT
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- LAND USE REPAIR AND REBUILT
- LAND USE REPAIR AND RESTORED
- LAND USE REPAIR AND RESTORED AND REDESIGNED
- LAND USE REPAIR AND RESTORED AND REBUILT
- LAND USE REPAIR AND RESTORED AND REDESIGNED AND REBUILT

INDEX TO COUNTY LOCATION

GENERAL HIGHWAY MAP

HENRICO COUNTY

PREPARED BY
 VIRGINIA DEPARTMENT OF HIGHWAYS
 AND TRANSPORTATION
 1221 EAST BROAD STREET
 RICHMOND, VIRGINIA 23219

ROADS CORRECT TO JANUARY 1, 1977

SCALE
 1" = 1 MILE
 1" = 2000 FEET

NO. 1 COUNTY Henrico
 LOCATION Meadow Ponds: 200m in front of house
 VEGETATION Secondary deciduous forest

DATE	AREA (M ²)	DEPTH (CM)	PH	D _g	AMPHIBIANS
20 Feb. 7:00		60	6.90		9 musculation notes, 1 frog
2 Mar. 1989			6.88		23 eggs, 1 frog
9 Mar. 1987			6.75		65 eggs, 1 frog, 1 salamander
11 Mar. 1988			6.44		20 eggs, 1 frog, 1 salamander
4 Mar. 90					100 eggs, 1 frog

NOTES: Central site for Henrico Co.
 * Late eggs, masses from being 1st site
 7.02 (110g) 42 egg masses, many peramphibians, many opercular larvae
 6.72 43 "
 6.77 "
 6.44 100 egg masses

VCU COMMUNITY ENGAGEMENT GRANT

VERNAL POOLS and the HUMAN FOOTPRINT

1_Research Geospatial analysis of 20+ yrs of landscape change

2_“Citizen Science” Hands-on data collection opportunities for scientific research. VA Master Naturalists/Wildlife Mapping

3_Awareness Little known and highly threatened wetland habitats with unique biological communities. Investment in community and local conservation issues

VCU Rice Rivers Center

The logo for the VCU Rice Rivers Center features the text "VCU Rice Rivers Center" in a serif font. The "VCU" is in a bold, yellow font, while "Rice Rivers Center" is in a dark blue font. Below the text is a stylized blue wave graphic.

W&M

The logo consists of the letters "W&M" in a large, bold, green serif font.

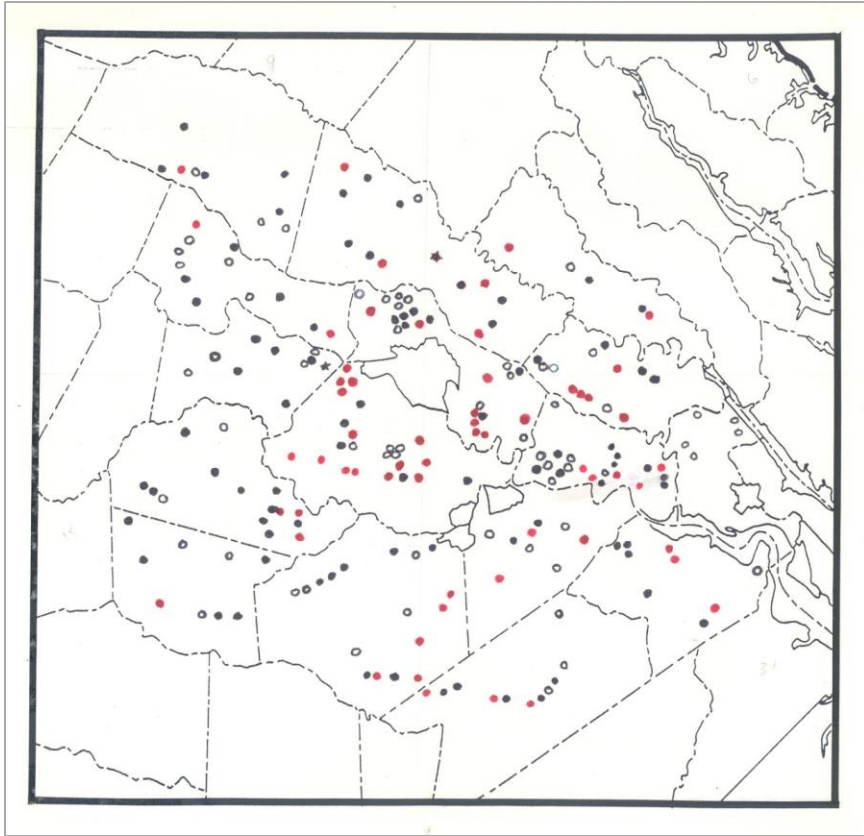
VCU Rice Rivers Center

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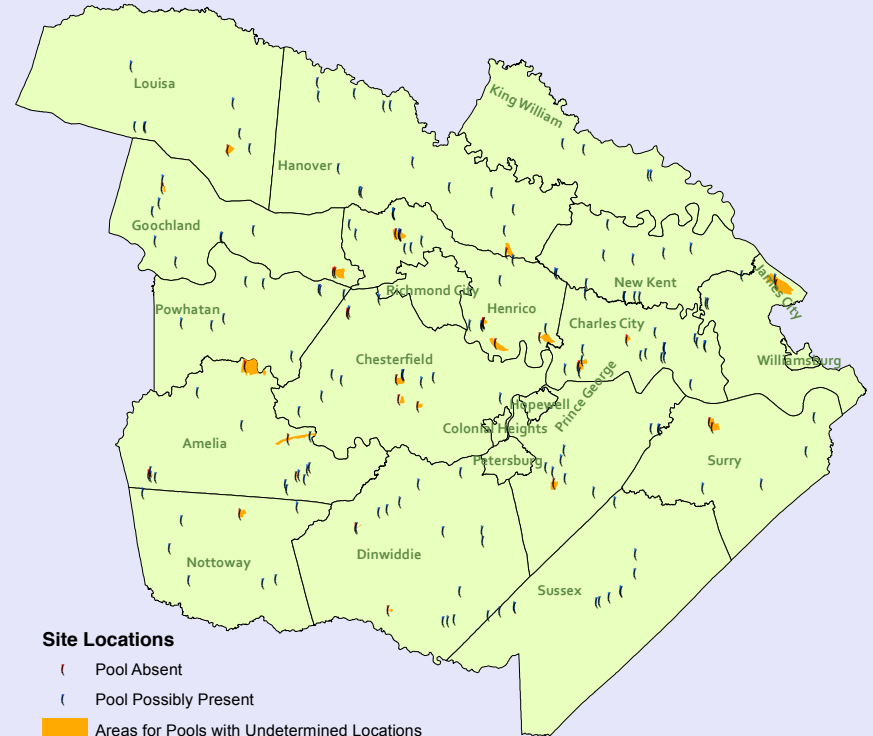
DIGITIZED DATA SET

216 SITES

16 COUNTIES



Vernal Pool Site Locations in 16 Virginia Counties



0 11,250 22,500 45,000 Meters



Phase I: Site Location

Site Code (ex. CC _____)

Date: _____

Participant Name: _____

DEVELOPED MATERIALS

A. Vernal Pool Present A vernal pool was at the location marked on the map. The latitude and longitude (WGS 84) are: _____.

B. The vernal pool location was questionable/ the written directions and the map do not agree.

Please explain. Include the latitude and longitude if you have determined the likely location of the sampling site based on Dr. Blem's written notes:

C. Vernal Pool Absent The likely location of the vernal pool has been altered.

Please indicate cause (e.g. "parking lot over potential pool area"): _____

Phase II: Property Owner Information

Parcel number: _____

Landowner Info

Name: _____

Address: _____

Other contact info (phone, email): _____

Sampling Permission

Do you have permission to sample? Yes No Maybe

Was a letter or postcard mailed to the owner? Yes No

Have you made any other attempts to contact the owner?

Salamander Pool Project



YOU HAVE A VERNAL POOL!
 Can a Master Naturalist sample it in Spring 2011?

Yes! Include my vernal pool in the Salamander Pool Project. I would like to receive an [aerial image of my property](#), information about [biodiversity in my pool](#), and [A Field Guide to the Animals of Vernal Pools](#) by L. P. Kenney and M.R. Burne.
 Signature: _____

Please contact me with more information about the project.
 Phone number: _____

No thanks.

To:
 Anne Wright
 1000 W Cary St.
 PO Box 842012
 Richmond, VA
 23284-2012

Site Code: _____

Phase III: Environmental Data

Site Code (ex. CC_1, GOO_3): _____

Date: _____ Time: _____

Participant Names: _____

<p>Conditions in Pool:</p> <p>Inlet Observed No <input type="checkbox"/> Yes <input type="checkbox"/> <u>Flowing</u> <input type="checkbox"/> <u>Not Flowing</u> <input type="checkbox"/></p> <p>Outlet Observed No <input type="checkbox"/> Yes <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>Percent Tree Canopy Closure:</p> <p>0% - 25% of pool is shaded <input type="checkbox"/></p> <p>25% - 50% of pool is shaded <input type="checkbox"/></p> <p>50% - 75% of pool is shaded <input type="checkbox"/></p> <p>75% - 100% of pool is shaded <input type="checkbox"/></p> <p>Pool Substrate:</p> <p>Leaf Litter <input type="checkbox"/> Sand/Silt <input type="checkbox"/> Bedrock <input type="checkbox"/></p> <p>Mud/Muck <input type="checkbox"/> Silt/Clay <input type="checkbox"/> Grave/Cobble <input type="checkbox"/></p> <p>Road Activity:</p> <p>Are the roads near your pool busy (more than one car passes every 10 minutes)? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Weather:</p> <p>Please include a general description of the weather conditions (sunny, cloudy, rainy, etc.)</p> <p>_____ _____ _____</p>	<p>Spotted Salamander Egg Masses:</p> <p>Egg masses intact <input type="checkbox"/></p> <p>Egg masses breaking apart <input type="checkbox"/></p> <p>Larval salamanders hatching <input type="checkbox"/></p> <p>Total number of egg masses: _____</p> <p>Did you sample by walking through the entire pool or sample from the perimeter? <input type="checkbox"/></p> <p>Entire pool <input type="checkbox"/> From the perimeter <input type="checkbox"/></p> <p>How long did you sample? _____ minutes</p> <p>Other Vernal Pool Species:</p> <p>Marbled salamander larva? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Fairy shrimp? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Finned fish? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Wildlife Observations: (optional)</p> <p>Wood Frog <input type="checkbox"/> Red-spotted Newt <input type="checkbox"/></p> <p>Bull Frog <input type="checkbox"/> N. Water Snake <input type="checkbox"/></p> <p>Green Frog <input type="checkbox"/> E. Garter Snake <input type="checkbox"/></p> <p>Leopard Frog <input type="checkbox"/> Ribbon Snake <input type="checkbox"/></p> <p>Pickeral Frog <input type="checkbox"/> Wood Turtle <input type="checkbox"/></p> <p>Gray Treefrog <input type="checkbox"/> Snapping turtle <input type="checkbox"/></p> <p>Spring Peeper <input type="checkbox"/> E. Painted Turtle <input type="checkbox"/></p> <p>Spadefoot Toad <input type="checkbox"/> E. Box Turtle <input type="checkbox"/></p> <p>Fowler's Toad <input type="checkbox"/> American Toad <input type="checkbox"/></p>
--	--

Sketch of Pool: →

Please sketch the general shape of the pool. Include features, such as logs and islands. Pinpoint locations of egg mass clusters. Include a north arrow and an approximate scale.

Approximate Pool Area:

< 50 m²

50 - 100 m²

100 - 200 m²

> 200 m²

Photographs

Did you take pictures?
 Yes No

How many? _____

Macroinvertebrate Observations: (optional)

Caddisfly Backswimmer Amphipod

Predaceous Diving Beetle Water Boatman Isopod

Crawling Water Beetle Water Scorpion Mosquito

Water Scavenger Beetle Giant Water Bug Leech

Whirligig Beetle Water Strider Aquatic Worm

Damselfly Chironomid Midge Clam

Dragonfly Phantom Midge Snail

Additional Notes:



RECRUITED AND TRAINED 80 MN VOLUNTEERS FROM 3 CHAPTERS

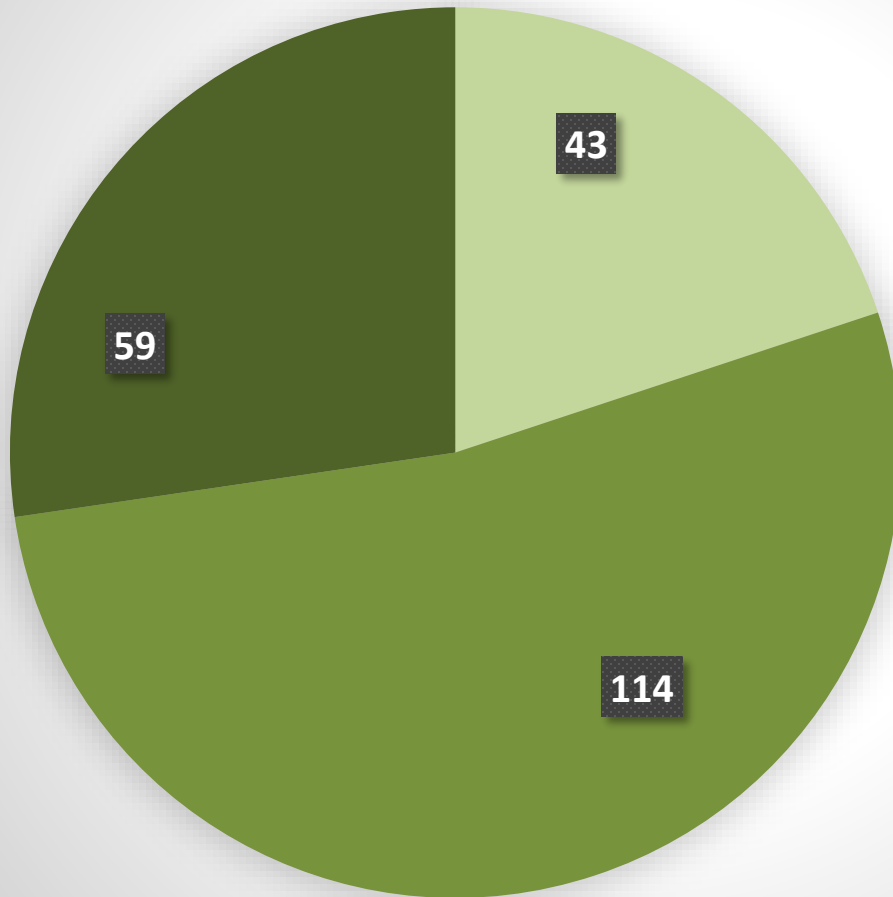




Site example: Chesterfield Co.

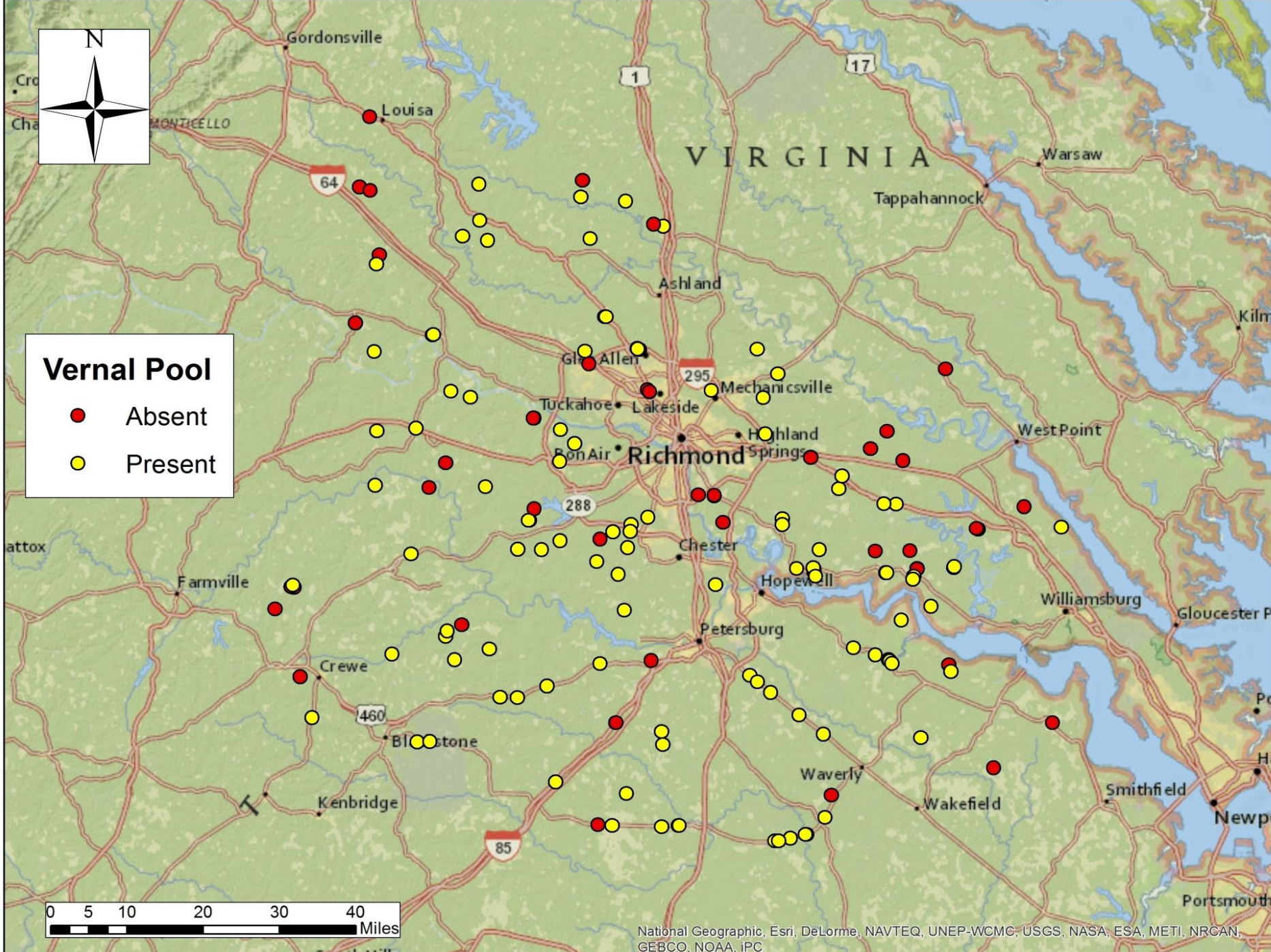


HUMAN FOOTPRINT RESULTS_2010-2012



- LOST
- PRESENT
- UNCONFIRMED

Development
Logging
Agriculture
Roads/Fill



ACCOMPLISHMENTS and NOT....

- ✓ 1_Research Geospatial analysis of 20+ yrs of landscape change
- ✓ 2_Citizen Science Hands-on data collection opportunities for scientific research. VA Master Naturalists/Wildlife Mapping
- ✓ 3_Awareness Little known and highly threatened wetland habitats with unique biological communities. Investment in community and local conservation issues
- ✗ 4_Statewide VA Monitoring Program Identify, register, and monitor vernal pools
- ✗ 5_Vernal Pool Database VDGIF Wildlife Mapping





Lee and Jane Hesler, Pocahontas MN Chapter
Mark Battista, Chesterfield Co.

_COUNTY/CHAPTER LEVEL Identify, register, and monitor vernal pools on all **public** lands; Provide data for conservation and management

_COLLABORATORS VDCR, VDGIF, VDOF, VDOT, NPS, USFWS, James River SWCD, VCU, W&M, 7 VMN Chpts

_TEMPLATE Statewide Vernal Pool Project

_CITSCI WEBSITE To house project data



SOCIAL MEDIA

https://www.facebook.com/VernalPoolsVA

Vernal Pools VA

Page Activity Insights Settings Help

Create Ad

Vernal Pools VA Community

+ Follow Share

Timeline About Photos Likes Manage Tabs

PEOPLE 149 likes

Status Photo / Video Offer, Event +

What have you been up to?

THIS WEEK

0 Page Likes

56 Post Reach

UNREAD

0 Notifications

0 Messages

Recent 2014

See Your Ad Here

<https://m.facebook.com/VernalPoolsVA>



Vernal Pools VA

- CitSci selected for data collection and storage.
- CitSci developed to promote citizen involvement in scientific research.

Colorado State University





NSF Grant

Partnering with Citizen Science Central and
DataONE.

Currently have over 100 active projects.

Enter the CitSci website www.CitSci.org
 Select the Projects tab and type in “vernal”

The image shows a screenshot of the CitSci.org website. The top navigation bar includes 'About', 'Projects', 'Maps', 'Features', 'Outcomes', 'Get Started', and 'What's Being Measured'. The 'Projects' tab is selected. A search bar contains the text 'vernal'. Below the search bar, a table lists two projects:

Photo	Project Name	Description	StartDate	Options
	Vernal Pools VA 2013-2014	Locate and characterize vernal pools on public lands in Virginia.	2013-11-30	 Member
	Vernal Pools VA 2014-2015	Locate and characterize vernal pools on public lands in Virginia. Pools located on private property ...	2014-10-01	 Member

Showing 1 to 2 of 2 entries (filtered from 109 total entries) [Previous](#) [Next](#)

- Projects contain historical and current experience.
- Vernal pool observations entered via DataSheets in CitSci.

Vernal Pools VA 2013-2014

Project Profile

Project Manager: Lee Hesler [Email Lee](#)

Number of Observations: **281**


Number of Locations: 119

Number of Members: 46

▸ Project Details

▸ Team Members

Untitled



Statistics




Observations

Edit Profile
Manage Members
Invite Members
Email Members

View Data
Submit Data
Resources
Media
Feedback
Questions
Analyses
Forum

Observations
Map
Locations

Search:
Show entries

Date	Location Name	Latitude	Longitude	Photo	Options
August 19, 2014	Bath DOSP VP 01	37.90317	-79.80472		Delete View
July 7, 2014	Bath DOSP VP 01	37.90317	-79.80472		Delete View
June 25, 2014	Bath DOSP VP 01	37.90317	-79.80472		Delete View

Vernal Pools VA 2014-2015


To Project Profile

If you made a new sketch of the pool or took pictures, please insert them into the Datasheet if necessary or needed.

Date of Observation	
Date:	<input type="text" value="22nd"/> <input type="text" value="2014"/>
Recorder:	<input type="text"/>
Authority:	<input type="text"/>
Search Time (<input type="text"/> Minutes
Comments:	<input type="text"/>

Location Information	
Please select a location from the map to the right once selected)	
Location:	<input type="text" value="Chesterfield Atkins Acres Pool 2"/>

- Select a Location ---
- Bath DOSP VP 01
- Chesterfield Atkins Acres Pool 1
- Chesterfield Atkins Acres Pool 2**
- Chesterfield Atkins Acres Pool 3
- Chesterfield Atkins Acres Pool 4
- Chesterfield B and W Cons. Area Pool 1
- Chesterfield B and W Cons. Area Pool 2
- Chesterfield B and W Cons. Area Pool 3
- Chesterfield Chesterfield State Forest Pool 1
- Chesterfield Chesterfield State Forest Pool 2
- Chesterfield Cogbill Park Pool 1
- Chesterfield Cogbill Park Pool 2
- Chesterfield Dutch Gap Pool 1
- Chesterfield Dutch Gap Pool 10
- Chesterfield Dutch Gap Pool 11
- Chesterfield Dutch Gap Pool 12
- Chesterfield Dutch Gap Pool 13
- Chesterfield Dutch Gap Pool 14
- Chesterfield Dutch Gap Pool 15



Map data ©2014 Google Terms of Use Report a map error

Straight forward data entry

Select a Species:

Presence:

[Report Another](#)

Site Characteristics	
Pool is located on public or private property?	: <input type="text" value="--- Select a Pool is located on public or private property?"/>
Pool inlet observed	: <input type="text" value="--- Select a Pool inlet observed ---"/>
Pool inlet flowing	: <input type="text" value="--- Select a Pool inlet flowing ---"/>
Pool outlet observed	: <input type="text" value="--- Select a Pool outlet observed ---"/>
Pool outlet flowing	: <input type="text" value="--- Select a Pool outlet flowing ---"/>
Tree canopy closure	Estimate how much of the pool is shaded: <input type="text" value="25%-50% of the pool is shaded"/>
Pool Substrate	: <input type="text" value="--- Select a Tree canopy closure ---"/>
Road Activity	Are the roads near the pool busy - more than one car every 10 minutes?: <input type="text" value="0%-25% of pool is shaded"/>
Subjective Weather Conditions	: <input type="text" value="25%-50% of the pool is shaded"/>
Air Temperature	: <input type="text" value="50%-75% of the pool is shaded"/> Fahrenheit
Spotted Salamander egg masses (jelly can be clear or opaque-white)	Total number of egg masses observed in the pool.: <input type="text" value="75%-100% of the pool is shaded"/> Count
CLEAR egg masses	Number of CLEAR egg masses observed in the pool.: <input type="text" value=""/>

- Pool locations are mapped and photos or sketches can be added.
- Data can be downloaded to Mac or PC machines for further analyses or saving.

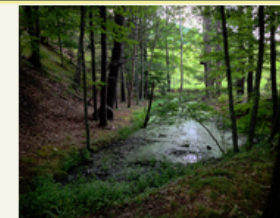
Observation Details

[To Project Profile](#)



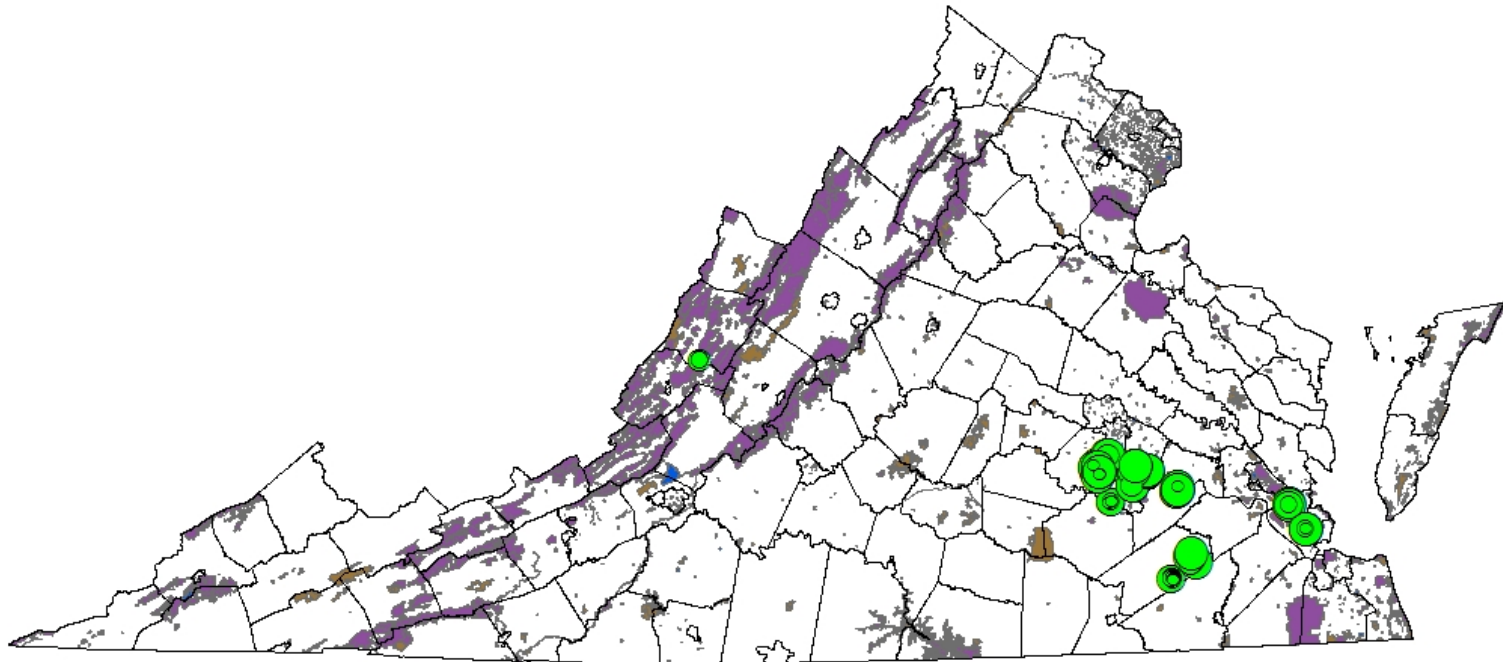
Observation Details

Date:	August 19th, 2014
Recorder:	Merv Broce
Authority:	Merv Broce
Elapsed Time:	35
Location Details:	<u>Bath DOSP VP 01</u>
Latitude:	37.90317
Longitude:	-79.80472
Accuracy:	
Survey Type:	Point
Project:	<u>Virginia Vernal Pools 2013-2014</u>
Data Source:	<u>Datasheet inserted from Merv Broce on September 3rd, 2014</u>
Comments:	Pool entirely covered with Duckweed. Frogs (unknown sp.) present at the pool. Water temp: 67F NNE and 72F WSW

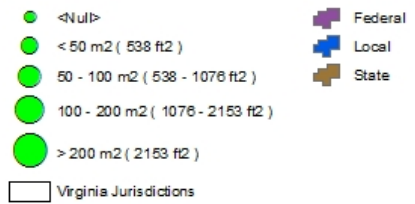


Downloaded Excel file

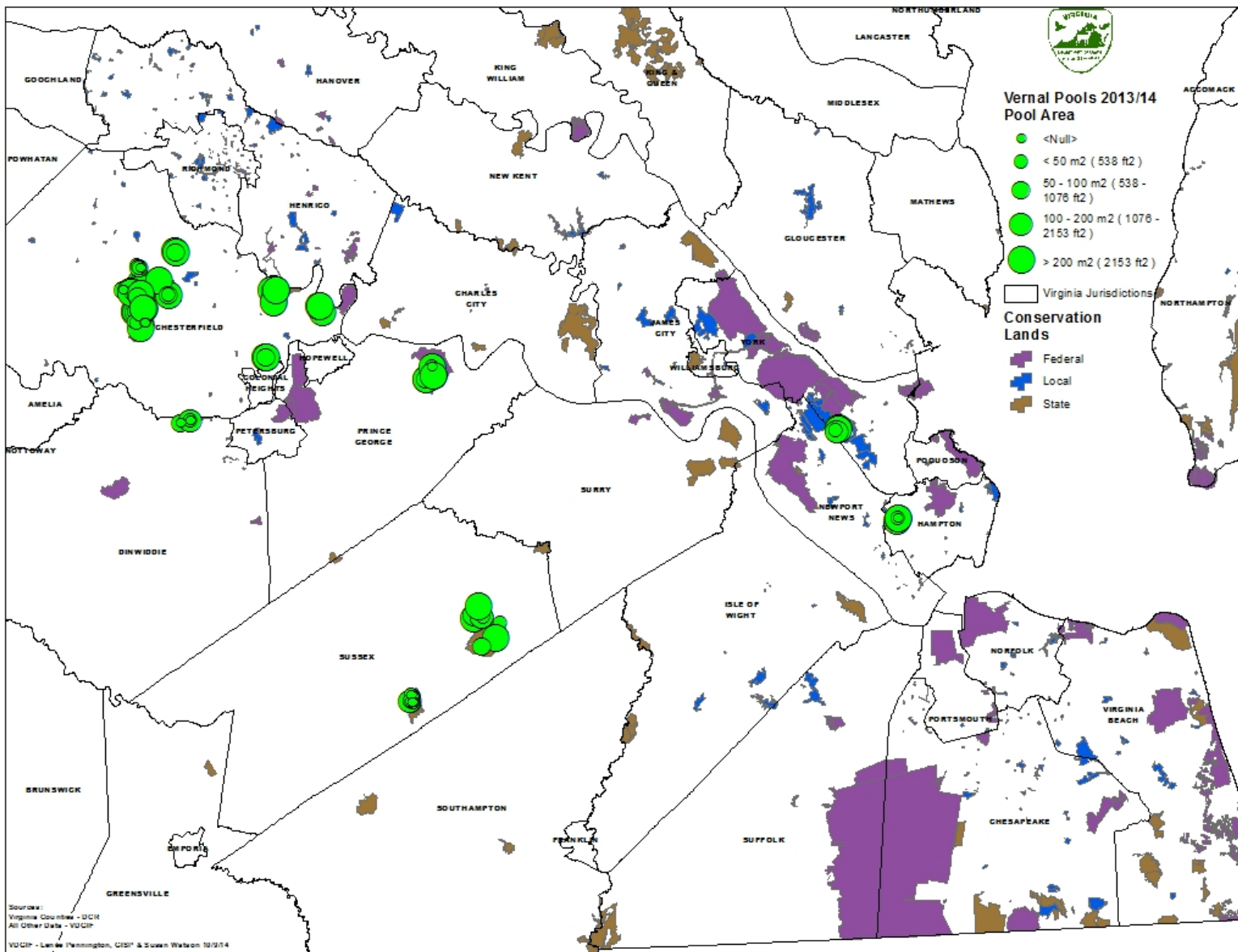
	A	B	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	Visit ID	Visit Date	Area Name	Comments	Recorder	Authority	Search Time	Latitude	Longitude	Pool inlet observed	Pool inlet flowing	Pool outlet observed	Pool outlet flowing	Tree canopy closure	Pool Substrate	Road Activity
1																
2	1434694	2013-03-04	Chesterfield POSP Pool 1		Jane Hesler	Lee Hesler	10	37.38273	-77.59193	No	No	No	No	75%-100% of the pool is shaded	Leaf Litter	No
3	1434695	2013-03-04	Chesterfield POSP Pool 2	Pool is very deep.	Jane Hesler	Lee Hesler	10	37.3827	-77.5925	No	No	No	No	50%-75% of the pool is shaded	Leaf Litter	No
4	1434696	2013-03-04	Chesterfield POSP Pool 3	Deep in center.	Jane Hesler	Lee Hesler	10	37.38168	-77.59326	No	No	No	No	75%-100% of the pool is shaded	Leaf Litter	No
5	1434697	2013-03-04	Chesterfield POSP Pool 4	Estimate ~6 inches deep.	Jane Hesler	Lee Hesler	5	37.38013	-77.5903	No	No	No	No	75%-100% of the pool is shaded	Leaf Litter	No
6	1434698	2013-03-10	Chesterfield POSP Pool 4	Found more egg masses.	Lee Hesler	Lee Hesler	10	37.38013	-77.5903							
7	1437687	2013-03-04	Chesterfield POSP Pool 5	With a little more water this pool would connect to pool #5. This is probably Blem pool #17.	Jane Hesler	Lee Hesler	10	37.38182	-77.59158	Yes	No	Yes	No	75%-100% of the pool is shaded	Leaf Litter	No
8	1437693	2013-03-04	Chesterfield POSP Pool 6	With a little more water this pool would be connected to Pool #5. This pool is probably Blem Pool #17.	Jane Hesler	Lee Hesler	10	37.38181	-77.59157	Yes	No	Yes	No	75%-100% of the pool is shaded	Leaf Litter	
9	1437694	2013-04-16	Chesterfield POSP Pool 7	Located by Steve. Off Boundary Forest Trail to the left where water crosses the trail.	Lee Hesler	Unknown	20	37.37608	-77.53418	Yes	No	Yes	No	75%-100% of the pool is shaded	Leaf Litter	No
10	1437695	2013-04-16	Chesterfield POSP Pool 8	Pool located by Steve. Estimated to be 250 feet from Pool #7. I was not able to find it.	Lee Hesler	Unknown	0	37.37652	-77.53486							
11	1437696	2013-04-14	Chesterfield POSP Pool 9	Retention pond located across the road from the new playground. Road is close but little traffic. Lots of tadpoles. Located by Steve	Lee Hesler	Unknown	15	37.37953	-77.5769	Yes	No	No	No	0%-25% of pool is shaded	Mud/muck	No
	1437697	2013-04-	Chesterfield POSP	Located near the Equestrian	Lee		15	37.36108	-77.57333	Yes	No	No	No	75%-100% of	Leaf	No

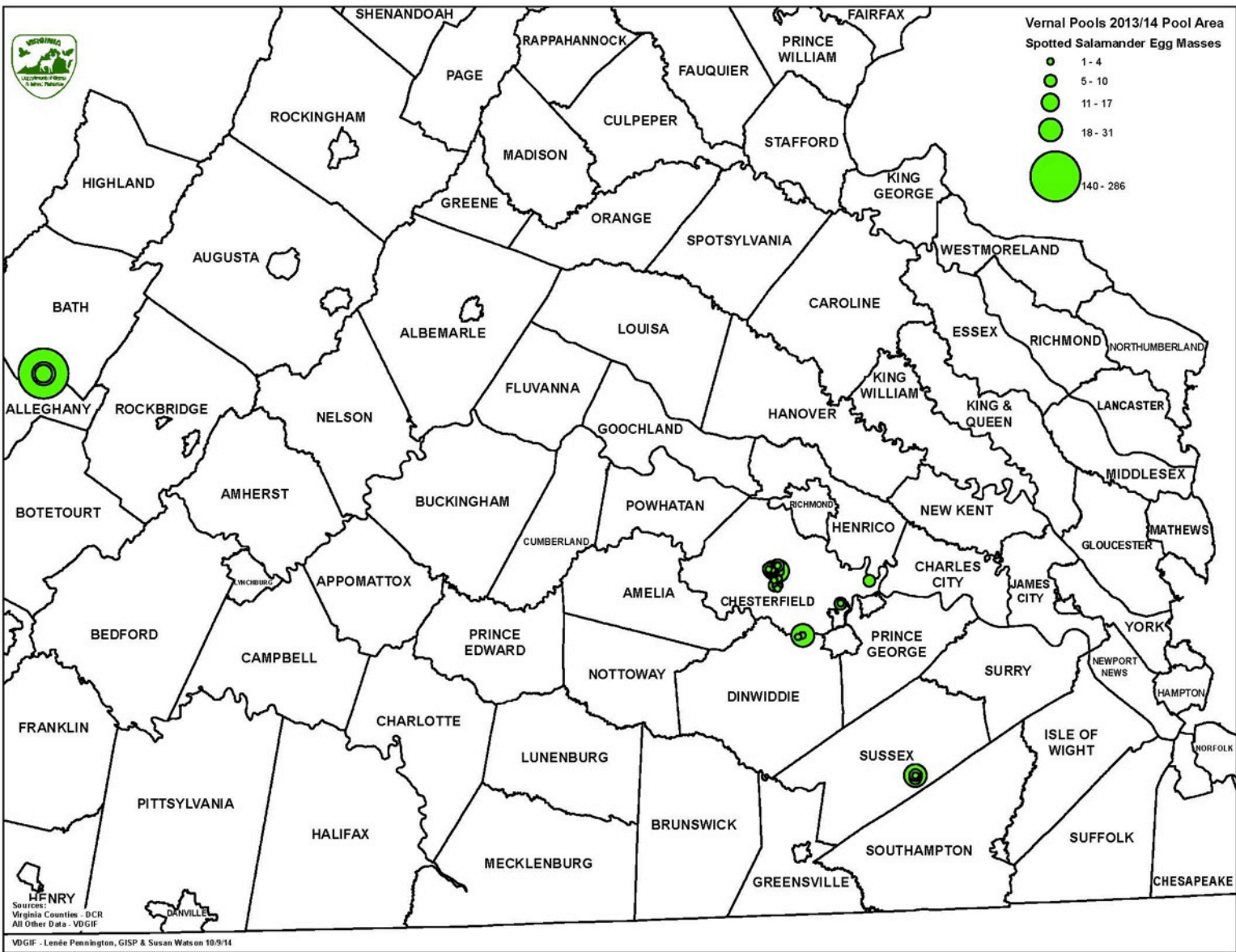


Vernal Pools 2013/14 Pool Area Conservation Lands



Source:
Virginia Counties - DCIF
All Other Data - VDCIF
VDCIF - Leslie Pennington, GISP & Susan Wilson 10/2014





Next Steps

- Determine if VMN Chapter is interested.
 - Chapter leaders contact Lee or Anne.
- Training is required
 - Species identification (QA/QC of this data by agencies)
 - Sanitation protocols
 - Permits needed or not

Contacts:

Lee Hesler, VMN Pocahontas Chapter
ljhesler@gmail.com

Susan Watson, VDGIF
susan.watson@dgif.virginia.gov

Anne Wright, VCU
abwright@vcu.edu

QUESTIONS?

