



## DGDC Meeting Minutes February 8, 2018

### Attendance List:

Hillary Austin .....	DSHA
Roger Barlow .....	USGS
Mark Biddle .....	DNREC – Watershed
Lori Brown.....	DNREC-NPS
Mary Ann Burnett .....	Artesian Water
Donald Burris .....	DelaSoft
Tommy Burton.....	Artesian Water
Austin Caloman.....	Lewes BPW
Kim Cloud .....	DTI
Daniel Cook.....	DTI
Adam Crosby .....	Winterthur
Mike delTufo.....	DTI
Jim Galvin .....	Dover/Kent MPO
Bernie Gilbert .....	DelDOT
Erin Goldnre .....	Hope Street
Angle Gomez .....	Harris School of Business
Randy Gonzolez.....	US Census
Lauren Good .....	KCI Technologies
James Gough.....	Sussex County
Josh Gritton.....	Lewes BPW
Jay Hodny .....	City of Newark
George Houck.....	Kent County
Renee Hupp.....	DEMA
John Inskter.....	DNREC-Drainage
Matthew Jones .....	DNREC-WSLS
Jimmy Kroon .....	DDA
Matthew Laick .....	DSHS
Danielle Lamborn .....	Kent County
Sean Lynn.....	Washington College
Joel Marshall.....	Sussex County
Thomas Match.....	Town of Smyrna
Dorothy Morris.....	OSPC
Mark Nowak .....	City of Dover
Colton Phillips .....	DelDOT
Miriam Pomilio.....	OSPC
Mark Prettyman.....	DNREC-DAQ
Mollie Raley-Hall .....	DelDOT
Brooke Santiago.....	City of Wilmington
Lori Schnick.....	Winterthur
Jason Sealy.....	Cyclomedia
Rick Sherwood .....	DEMA
Jazlyn L. Singh.....	Harris School of Business
Katie Springman.....	Fugro
Eddie Starr .....	Eagleview/Pictometry
Bill Stephens .....	Stephens Environmental
Mike Townshend .....	DTI
Seth VanAken .....	Esri
Art Walker .....	USDA – NRCS
Carl Yetter.....	DNREC-Coastal Programs
George Yocher.....	DPH

### Welcome & Introductions

Miriam Pomilio started the meeting at 9:03 am. She welcomed everyone to the meeting and introductions were made.

### November 9, 2017 Meeting Minutes

Jimmy Kroon made a motion to approve the [November 9, 2017 Meeting Minutes](#) (PDF). Kim Cloud seconded the motion and it passed unanimously.

### Geospatial Education Committee

Miriam Pomilio provided an update that was emailed from Nicole Minni. There will be 3 GIS Day road-shows coming up this spring: Smyrna Elementary on April 16<sup>th</sup> and May 22<sup>nd</sup>; and Seaford Elementary on May 30<sup>th</sup>. Nicole is seeking volunteers to assist in the schools on those days. They are planning five stations: NRCS soils station, Delaware Geographic Alliance-Power of Maps, Map Jeopardy, Aerial Take Home, and the GIS Lab exercise. If you are interested in volunteering for any of these road-shows, please contact Nicole Minni directly ([nminni@udel.edu](mailto:nminni@udel.edu)).

Miriam further reported that the GeoEducation committee is hoping to hold workshops this spring for teachers to help with the new Geography curriculum which incorporates the use of ArcGIS Online. The funding for that will come from leftover grant money from Esri for the ConnectED program.

The GeoEducation committee is also seeking nominations for the GIS Educator award. If you know of someone working to promote the use of GIS in the K-12 arena nominate them via the [online form](#).

Delaware is always looking for GeoMentors as we need assistance in classrooms and at events such as GIS Day. If you're interested please email [Nicole Minni](#).

## Delmarva GIS Conference Update

Jimmy Kroon reported that the Delmarva Conference is scheduled for April 26<sup>th</sup> and 27<sup>th</sup>. Workshops will be held on April 26<sup>th</sup>. The workshops will be: Survey 123; ArcGIS Pro Tips and Tricks; WebApp Builder; and Map Projections and Datums. Call for Presentations is open now so if you have any great projects you'd like to showcase – get your abstracts in now. Also, registration is now open. The format this year will provide standard presentations as well as lightning talks.

Nominations are also being accepted for the GIS Service Award and the GeoEducation K-12 award. Please visit the [Delmarva GIS Conference website](#) for more information on the conference as well as to submit your abstracts and nominations.

## Aerial Imagery Update

Miriam Pomilio reported that the 2017 statewide aerial imagery is now available on FirstMap. Kim Cloud provided information regarding how to view the infrared band. A function template is included to change the symbology automatically from regular color to infrared display. FirstMap will be providing an online document with instructions on how to use the template or change the symbology manually. In order to use the template or change symbology, you will need to turn off the 'enable view cache mode'. Disabling the cache mode will also improve the quality of the imagery in exports and prints.

The hi-resolution imagery captured for State Parks at 3 inch resolution was down-sampled to 0.25 meter resolution and inter-woven into the final product. As such in those areas you will see a slightly sharper image.

Matt Laick reported that the Public Safety imagery obtained by DSHS by Eagleview/Pictometry is available to any agency that needs it for Public Safety reasons. Just contact [Matt](#) directly if you need access. They will be flying their next update in the late-winter/early-spring of 2019 and are expanding the coverage to include adjacent counties to Delaware since our emergency responders often travel into adjacent states.

## DGS Contour Update

Miriam Pomilio reported that Naomi Bates from DGS has left and the DGS will continue to work on the statewide one-foot contours that she had been working to produce. Please contact David Wunsch at DGS if you have questions or need updates. Once this dataset is completed it will be served through FirstMap.

## Technical Advisory Committee Update

Mike Townshend indicated the Technical Advisory Committee met on February 2, 2018. He reported that Miriam has scheduled the first meeting of the Long Term Strategic Planning subcommittee for February 13, 2018.

He further indicated that Miriam developed Guidelines for Municipalities for their GIS Data. These guidelines will allow the municipalities to more easily move their data into FirstMap and provide them with guidance if they are contracting for GIS data. Jim Galvin requested these guidelines be provided to the MPO's also. Miriam will forward to the MPO's.

Mike indicated that the FirstMap team is hosting free training in the next few months. The training is available through the Delaware E-Learning Center and open to everyone, not just State employees. The dates are as follows: February 21 (full); March 8 (2 seats remaining); March 15 (open) and April 11 (open). The February training will be held at DTI's training room. All the other trainings will be held at DeIDOT. Miriam thanked DTI for purchasing a bucket of registrations so that non-state agency folks can also sign up for free. If you are a non-state employee you just need to make an account on Delaware E-Learning Center so that you can register.

## FirstMap Update

Kim Cloud reported that DTI assigned a Project Manager to oversee the FirstMap 2.0 project. There are a lot of decisions to be made about how to move forward with FirstMap2.0. The project manager Hitesh Nariani will be reaching out to the stakeholder agencies for input, similar to the process that was undertaken to develop FirstMap. They are hoping to have system requirements finalized by mid-March with a launch date in July 2018.

Meanwhile, DTI is upgrading the ArcGIS software in the existing FirstMap to version 10.5.1. This process is a bit painstaking but DTI completed the upgrade in the test and development environments and will be ironing out issues before upgrading the production system.

DTI is looking to implement Esri Insights, however it isn't in our current ELA with Esri. The cost is \$500/instance and the GIS community along with DTI needs to determine the use and need for Insights before implementation.

DTI has a new way of looking at contracts and therefore there will be changes in the next ELA with Esri. If you have purchasing needs, please coordinate with Kim Cloud directly so that they can be taken into consideration.

As always if you experience issues, please contact the team at [FirstMap@state.de.us](mailto:FirstMap@state.de.us).

## Presentation – Delaware Watershed Resource Registry

Mark Biddle presented on the Delaware Watershed Resource Registry and indicated there is a soft roll out of the application for use at this time. His presentation is attached for reference or you can visit the website at: <https://watershedresourcesregistry.com/states/delaware.html>

## Presentation – Reconnaissance Coastal Vulnerability Analysis

Bill Stephens presented on a research grant looking at the vulnerability of coastal areas in Maryland. His presentation is attached for reference.

## Federal Update

**USGS** – Roger Barlow reported he attended the NOAA National Geodetic Survey seminar entitled *Blueprint for 2022, Part 2: Geospatial Coordinates*. The presentation outlined the reason for changes from the NAD 83 Horizontal Datum and the NAVD 88 vertical datum to the North American-Pacific Geopotential Datum 2022. This reference frame will utilize GPS and gravimetric data collected to quantify location and elevation at a point in time. The time component is critical because the factors that determine both x-y coordinates and z elevations are dynamic such as crustal movement, mean sea level, shape of the Geoid. The State of Delaware should plan the transition of state plane coordinate system capabilities to the new 2022 x-y scheme, similarly a translation should be planned for NAVD 88 topographic values to NAPGD 2022.

**NRCS** – Art Walker reported NRCS has just completed a major update of soils and is working with Debbie Sullivan on the FirstMap team to share this dataset.

**Census** – Kim Cloud from DTI reported that things are starting to get busy with various Census programs right now. DTI and OSPC work together to assist in a variety of programs. Kim announced that Governor Carney’s office has approved the creation of the Complete Count Commission for Delaware. That should be forming up soon. She further reported they are in Phase 2 of the Redistricting Process. DTI is working with Elections, Legislative Hall, and the Census Bureau on this initiative.

In addition, Census is holding a training this afternoon on the LUCA (Local Update of Census Addresses), here at the Kent County building. All of the Census efforts are geared towards preparation for the 2020 Census count.

## Open Comment Period

Mark Biddle from DNREC reported that the Delaware Wetlands Conference was held last week with an attendance of 370 people from the Mid-Atlantic region. In addition, Mark reported that his group has a RFP out right now for updating the Statewide Wetlands Mapping based off of the 2017 aerial imagery.

Sean Lynn from Washington College reported that they continue to work with the Maryland Highway Safety and law enforcement on a variety of projects and are working on a Summit for driving environmental work.

Jay Hodny from the City of Newark mentioned they are working on several projects right now:

- Exploring, deploying and configuring various Esri Local Government solutions using the Solution Deployment tool through ArcGIS Pro.
  - Updated our Public Parking app using solution. We now have a sign on Main Street showing available parking spaces for one of our surface lots. We developed a script which retrieves parking space data through the parking sign vendor's API, and places the count on the GIS app in real-time.
  - Developing Citizen Problem Reporter and Manager app to replace pen and paper recording of reported issues (e.g., potholes, snow removal, etc.) in Public Works.
  - Investigating the Capital Improvement Project solution as a way to provide big project information (e.g., street repair) to the residents.
- Crime Map app – plot crime data reported by UD and Newark police departments. Time enabled so one can focus on a certain time window if desired, along with the type, location, and quantity.
- Public Works and Water Resources – advancing tablet technology and field apps, using Collector and Survey123. We developed a way (hyperlink) where we can call up Survey123 from Collector, enter form data by feature, and click back to Collector. Leverage map strength in Collector and form strength in Survey123.
- ArcGIS Enterprise – hoping to bring this online in 2018. We have a new IT manager, who has experience in ArcGIS. Thus, an advocate for GIS in a leadership role.

Seth Van Aken from Esri updated us on a few product announcements: ArcGIS Enterprise will provide named Level 1 users at no cost. A new Insights release in AGOL along with WebApp Builder, Public notification widget and other enhanced widgets. AGOL will also now allow users to define their landing page and will access CSV and Excel files from Google Drive, Microsoft OneDrive and Dropbox. Seth further indicated the Fed UC is coming up in March and Mike Townshend added that the Developer Summit is tacked on right after that conference.

Jason Sealy reported he is now with Cyclomedia, a proud partner with Esri and Pictometry. Cyclomedia provides professional grade street level imagery and LiDAR.

Mike Townshend reported he is just completing a project to spatially enable Day Care locations for search and query. He has been working with the Office of Child Care and Licensing to launch this application on their website. These data are important to a lot of agencies and programs and will be available on the private side of FirstMap.

Jimmy Kroon from Department of Agriculture indicated he put together a quick application to report and track the Spotted Lantern Fly, which is a pest to grapes and apple crops. There was a report of one of these pests in Wilmington, so they launched this app and collected over 500 sites using Collector, GeoForms, and public reporting forms and used the Web Dashboard to collect information. Although

they found a dead Spotted Lantern Fly, they did not find any live ones. But they will continue monitoring this pest.

### **Next Meeting**

The next DGDC Quarterly meeting will be Thursday May 10, 2018. It will be at the Kent County Administrative Complex, Room 220 and start at 9:00 am.

### **Adjournment**

Roger Barlow made a motion to adjourn the meeting and it was seconded by George Houck. The meeting was adjourned at 11:40 am.



# Delaware Watershed Resources Registry

**Mark Biddle**

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**LaTonya Gilliam**

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**Ralph Spagnolo**

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# What is a Watershed Resources Registry?

- Watershed approach
- Preservation and restoration of resources
  - wetlands, riparian areas, terrestrial areas, and healthy hydrology
- Multiple meanings for 'registry'
  - A 'wish list'
  - A listing of specific locations
    - Simple registry for sites that user visited
    - Mitigation sites
    - Sites identified as needing restoration



# Uses for the Watershed Resources Registry

- Avoid and/or minimize impacts
- Find mitigation sites for impacts
- Find areas to permanently preserve
- Find opportunities for restoration
- Find areas for reforestation to meet TMDL
- Evaluate alignment options for transportation projects

# Current WRRs

- Maryland WRR active since 2010
- Delaware, Pennsylvania, Virginia and West Virginia now complete
- DC not participating but could if desired
- Website and framework can accommodate any state
- Interest by other states: Georgia, Tennessee, New Jersey

# Three Essential Components





# Team Collaboration

# Team Collaboration

- Include federal agencies
- Include state agencies: environmental regulatory; environmental resource protection; state transportation agency; others
- Others: nonprofits; counties; interstate commissions

# Benefits of Watershed Resources Registry

- Integrates and streamlines regulatory programs
- Promotes the watershed approach
- Maximizes public investment's value
- Guides resource planners and regulators
- Saves time and money, increases program efficiencies





# GIS Spatial Analyses

# Eight GIS Spatial Analyses

- Wetland Preservation
- Wetland Restoration
- Stream / Riparian Zone Preservation
- Stream / Riparian Zone Restoration
- Terrestrial Habitat Preservation
- Terrestrial Habitat Restoration
- Preserving Natural Hydrology for Stormwater
- Restoring Natural Hydrology / Addressing Degraded Systems

# Goal of the Analyses

- Find and score geographic areas in the state for their value and benefit to the ecologic system and/or state programs
- Avoid directing users to geographic areas that are simply not suitable
- Provide a consensus driven map for users

# GIS Objective: To Find and Score Locations for Preservation and Restoration

- Used recognized GIS analytic methods
- Best opportunities will have more 'desirable qualities'
- 'Desirable qualities' defined by the technical advisory group
- Scores range from one to five stars, or 'not eligible'

# Collect GIS Data Needed to Map Factors

- Readily available datasets: soils, land cover; streams; watersheds, etc.
- State layers that map state priorities: Stream preservation; division of forest prioritization area; wetland 'viability' analysis

# Spatial Analysis ~ Finding a New Family House

## Absolute Factors

- Must be within the Riverside school district
- Must be less than \$250,000
- Must not have stairs

## Desirable Factors

- Newish kitchen, not older than 5 years
- Within  $\frac{1}{4}$  mile of a park
- Within one mile of the train station
- Lot has some woods on it but is not entirely wooded; acceptable range is 25% - 60% wooded
- Garage is large enough for wood working studio



# Wetland Restoration Suitability Analysis Summary

## Absolute Factors

- Cannot be a wetland or open water
- Cannot be developed
- Must have 'wetland potential' (very poorly drained, or poorly drained soils - gSSURGO)
- Cannot be impervious surface
- Cannot be in an airport approach or airport transition zone

## Relative Factors

- In a 100/500 year floodplain that's been ditched/drained
- Within 200ft of stream or wetland
- Within 200ft or in a green infrastructure core or corridor
- Within 200ft but not in public protected lands
- Within 200ft but not in a stream or wetland
- Within 200ft but not in a Category 1 wetland or HCC
- Within 200ft of an existing wetland mitigation site

# Stormwater Preservation Suitability Analysis Summary

## Absolute Factors

- Cannot be open water
- Cannot be protected lands
- Cannot be cropland
- Area must be less than 10% impervious

## Relative Factors

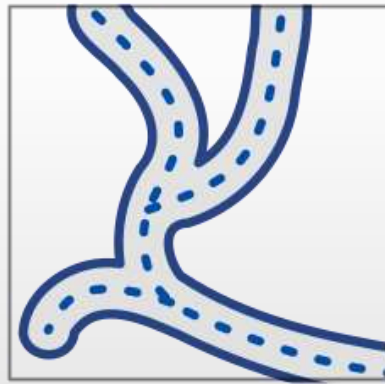
- Is a forested area
- In a green infrastructure core or corridor
- Is within 100ft and 300ft of a stream
- In 100/500 year floodplain
- Within 100ft of a headwater stream
- Is State Planning priority funding zone level 4
- Within a Natural Area
- Is adjacent to publicly protected lands

# Basics of a GIS Analysis ~ Simple Example

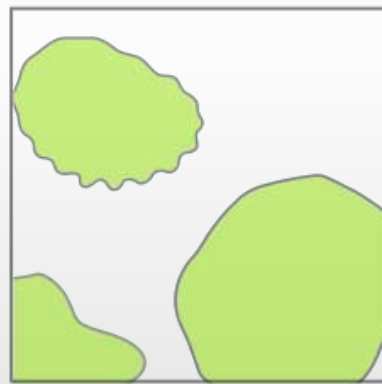
Factor: Habitat Value



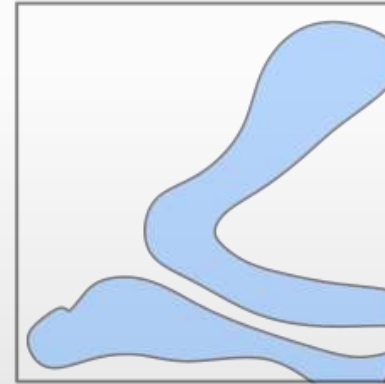
Factor: Near Water



Factor: Wooded

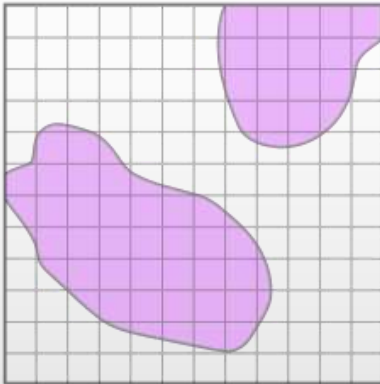


Factor: Flood Plain

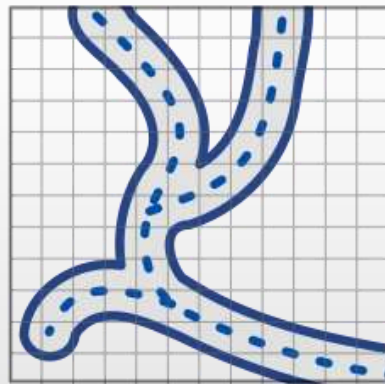


# Basics of a GIS Analysis ~ Simple Example

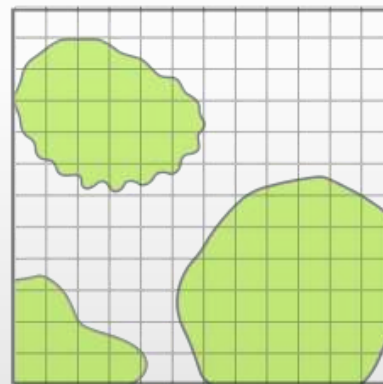
Factor: Habitat Value



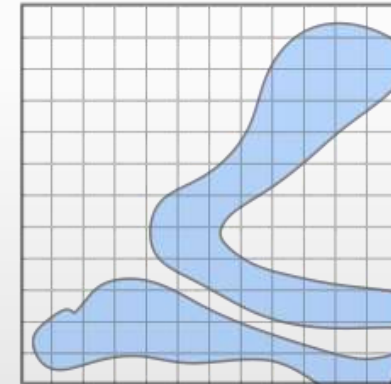
Factor: Near Water



Factor: Wooded

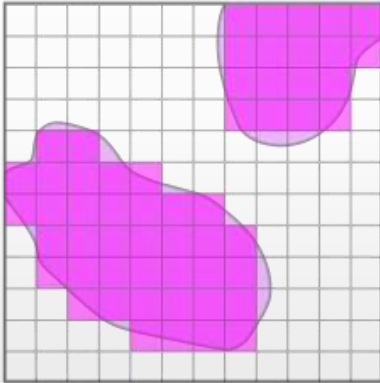


Factor: Flood Plain

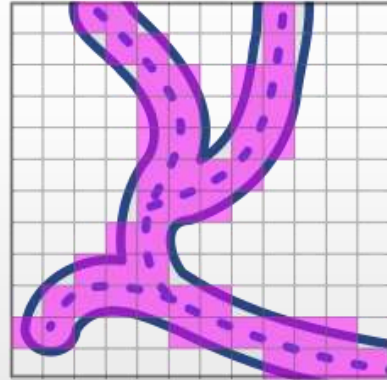


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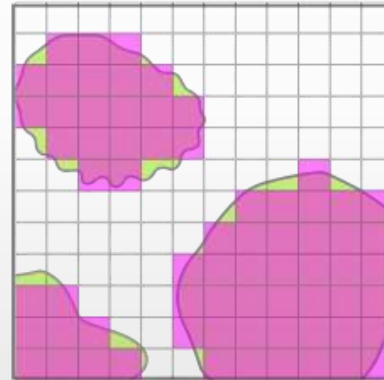
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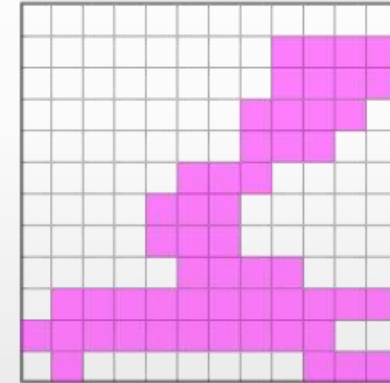
Factor: Near Water



Factor: Wooded

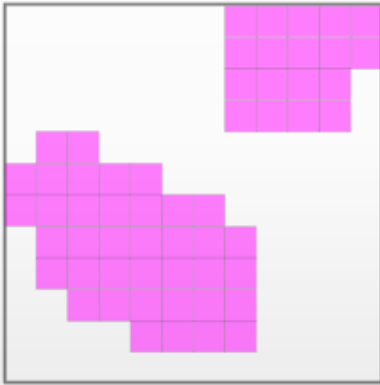


Factor: Flood Plain

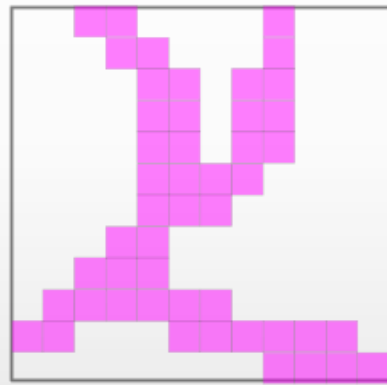


# Basics of a GIS Analysis ~ Simple Example

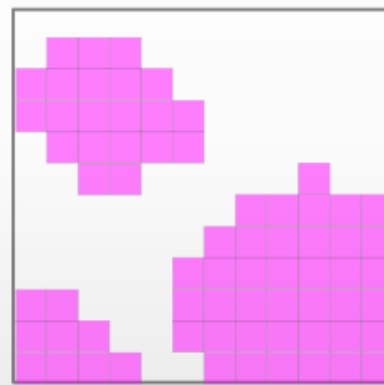
Factor: Habitat Value



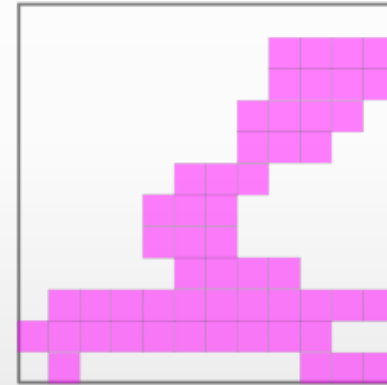
Factor: Near Water



Factor: Wooded

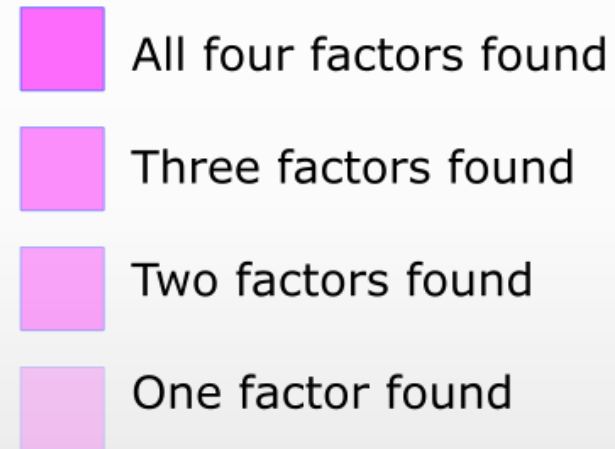
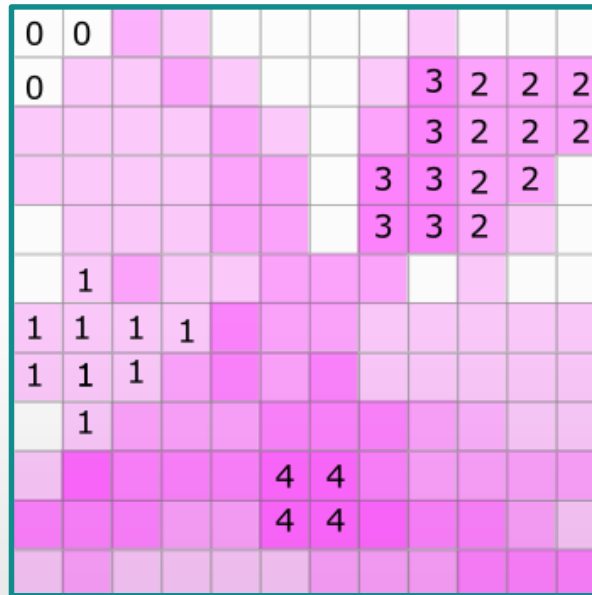


Factor: Flood Plain





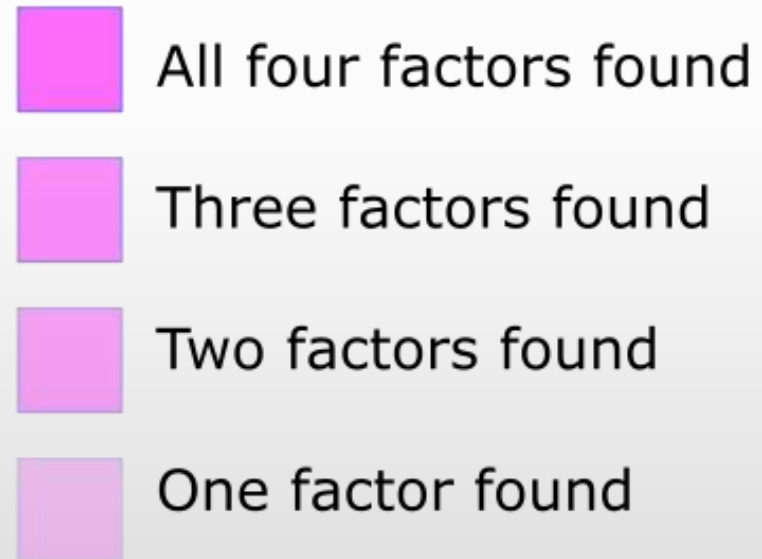
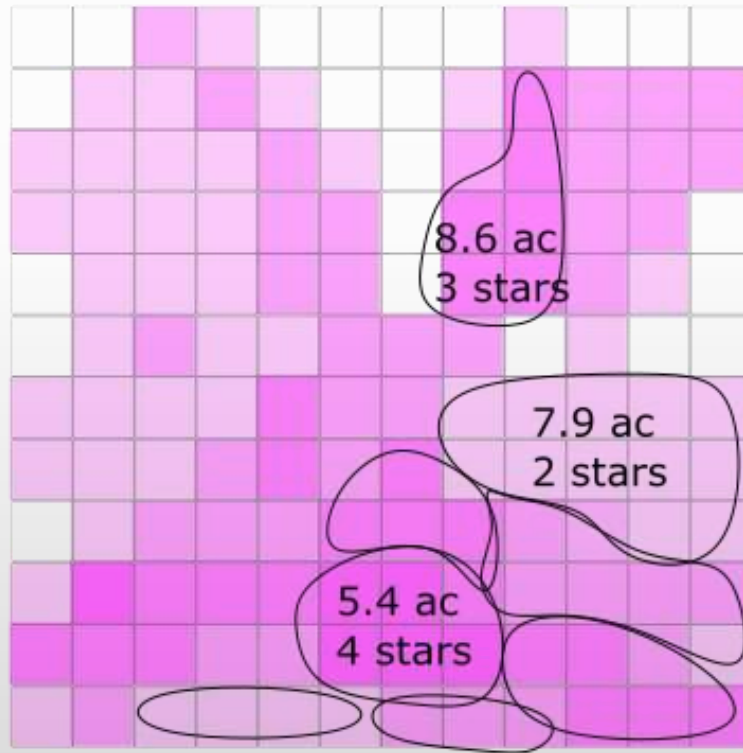
# Basics of a GIS Analysis ~ Simple Example

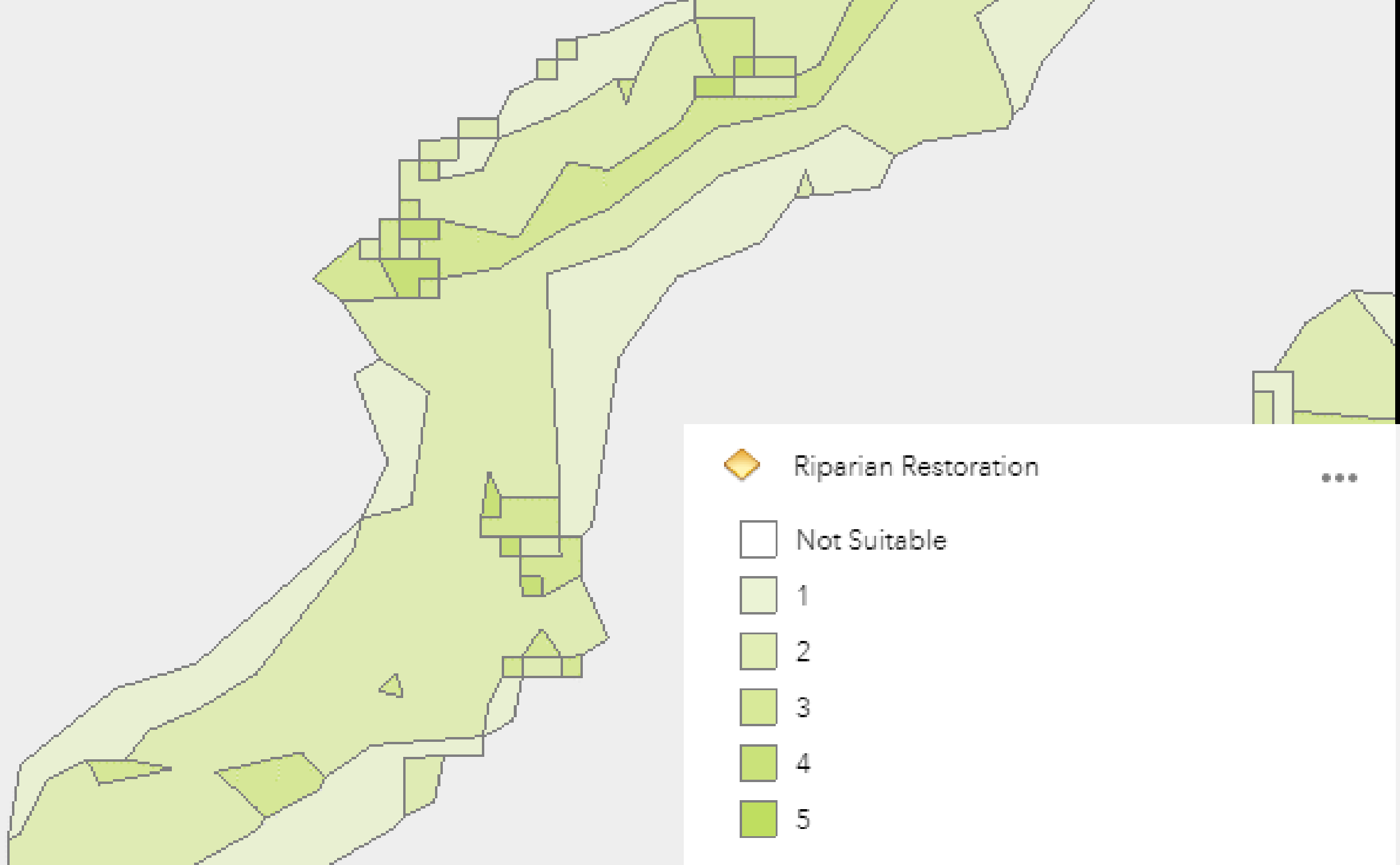


Overlay all factors, one on top of the other.

We can now total how many were found in each cell

# Building the Registry: Basics of a GIS Analysis





Riparian Restoration



Not Suitable



1



2



3



4



5



Interactive Online Tool



A Real-world Stormwater Project  
From the Transportation Perspective



# SWM Sites Search Process

- Target areas in specific watersheds that are in need for water quality/quantity improvements
- Watershed based approach to identify potential SWM retrofit opportunities to meet TMDL reduction goals





# Watershed Characteristics – Find Opportunities

The screenshot displays the Watershed Resources Registry web application interface. The main map shows a satellite view of a watershed area with various overlays, including blue stream networks and green shaded regions. A search bar at the top center allows users to find addresses or places. On the left, a Layer List panel contains various map layers, with 'Runoff Reduction Feasibility' checked. On the right, the 'FindOps' panel is open, showing search criteria for finding opportunities. The 'Find Opportunity' section includes dropdowns for 'New Castle' county and 'Middle Christina River: 020402050503' watershed. Radio buttons allow selection of opportunity types: Upland Preservation, Wetland Preservation, Riparian Preservation, Stormwater Natural Infrastructure Preservation, Upland Restoration, Wetland Restoration, Riparian Restoration, and Stormwater Compromised Infrastructure Restoration. The 'Stormwater Compromised Infrastructure Restoration' option is selected. Below this, 'Select Score' is set to 4 stars, and 'Select Score Operator' is set to '='. The 'Where Acres is Greater Than (>)' and 'Where Acres is Less Than (<)' options are both set to 'Any Area'. A 'Search' button is at the bottom of the panel. Below the map, a table displays the results of the search.

OBJECTID	Shape	Score	County	Acres	CODE_ACRES	HUC 12	OBJECTID_1	Watershed
592		4	New Castle	4.15495603139	4 - 4.15495603139	020402050503	5546	Middle Christina River
592		4	New Castle	3.63655747585	4 - 3.63655747585	020402050503	5560	Middle Christina River
592		4	New Castle	1.55676390324	4 - 1.55676390324	020402050503	5562	Middle Christina River
592		4	New Castle	2.23618647915	4 - 2.23618647915	020402050503	5582	Middle Christina River
592		4	New Castle	2.33385972746	4 - 2.33385972746	020402050503	5598	Middle Christina River
592		4	New Castle	1.62994760672	4 - 1.62994760672	020402050503	5620	Middle Christina River
592		4	New Castle	1.41434650236	4 - 1.41434650236	020402050503	5657	Middle Christina River



# Watershed Characteristics

**Watershed Resources Registry** Delaware Version

Find address or place

Layer List

- Well Head Protection Areas
- Watersheds
- Water Features
  - Major Rivers
  - FlowLine
  - WaterPolys
- HUC Watersheds
- 303d Streams
  - Impaired Waters Point
  - Impaired Waters Line
  - Impaired Waters Area
- Water Table Elevation (feet)
- Tax Ditch
- Public Protected Lands
  - Public Protected Lands
- Elevation Contours
- Environmental Justice
- Aeronautics
- Road Inventory

Iron Hill Park, Salem Woods Park, Beck's Pond Park

Division of Historical and Cultural Affairs | State of Delaware Department of State, Public Arch... esri

Leaking Tanks | Certified Brownfield Sites | Large Spray Irrigation Sites | Solid and Hazardous Waste | SIRB Sites | Delaware Wetlands 2007 | NWI Wetlands | State Boundaries | FEMA Flood Maps | Found Opportunities

Options Filter by map extent Zoom to Clear selection Refresh

OBJECTID	Shape	Score	County	Acres	CODE_ACRES	HUC 12	OBJECTID_1	Watershed
592		1	New Castle	2.92935707686	1 - 2.92935707686	020402050503	6015	Middle Christina River
592		1	New Castle	1.33436905992	1 - 1.33436905992	020402050503	6272	Middle Christina River

2 features 0 selected



# A Real-world Alternative Analysis From the Transportation Perspective

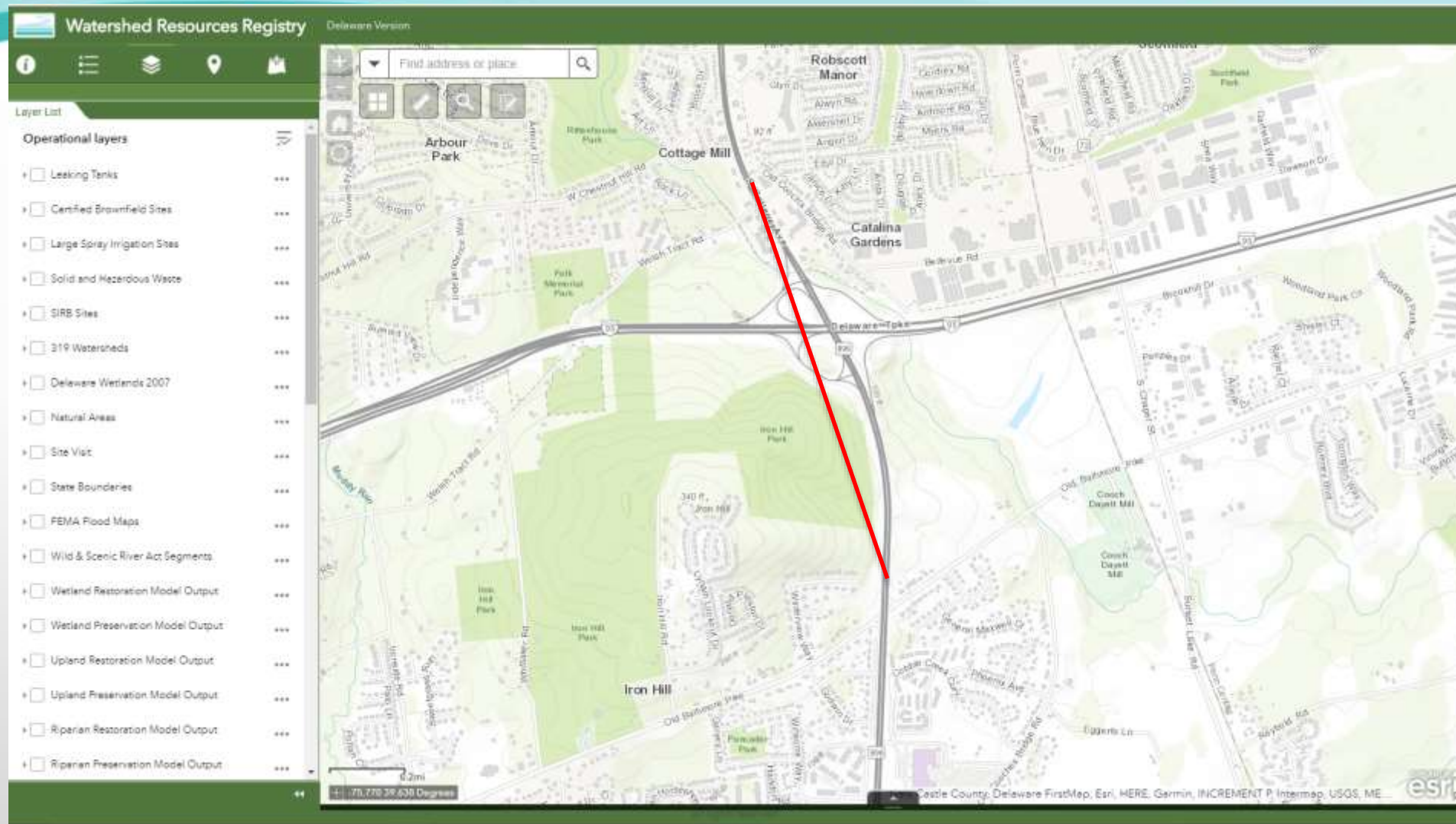
A decorative graphic at the top of the slide consisting of several overlapping, wavy, teal-colored shapes that create a sense of movement and depth.

The WRR can be used by regulatory agencies and applicants to evaluate impacts . . .

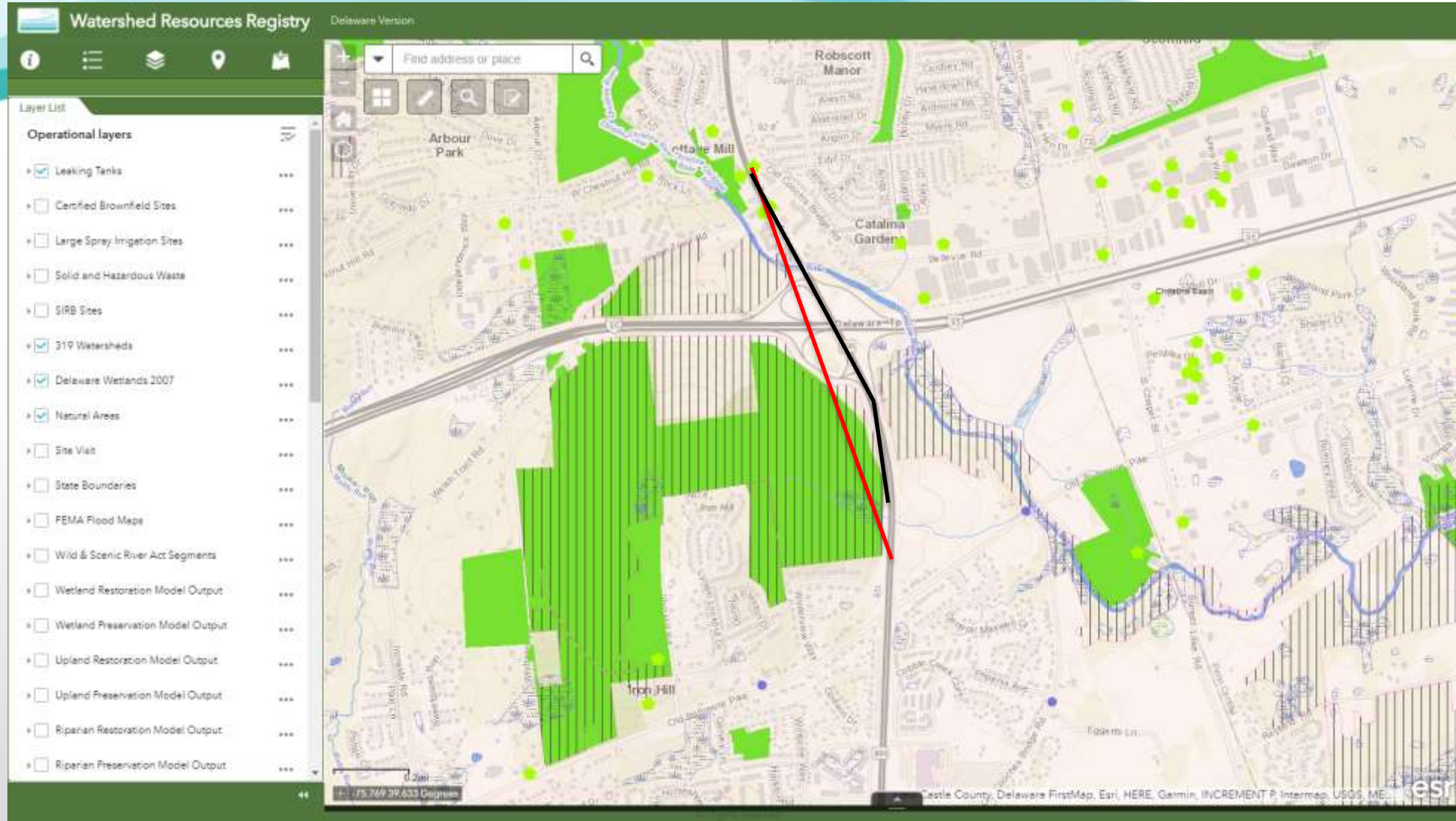
- Proposed impacts (e.g., linear projects)
- Impact alternatives (e.g., alternate alignments)
- Screen site before site visit



# Interchange Improvement Project - Desktop Screening



# Interchange Improvement Project - Resource Identification



— Alternative 1  
— Alternative 2

Use of the WRR to identify resources in the project area early in the planning process and develop concept plans that avoid impacts to natural and cultural resources



# A Real-world Wetland Mitigation Project From the Regulatory Perspective



A decorative graphic at the top of the slide consisting of several overlapping, wavy, teal-colored shapes that create a sense of movement and depth.

The WRR can be used by regulatory agencies and applicants to evaluate compensatory mitigation . . .

- Assist in finding a mitigation site
- Evaluate ecological benefits of a proposed mitigation site (permittee, bank, or In-Lieu Fee)
- Compare different proposed mitigation sites

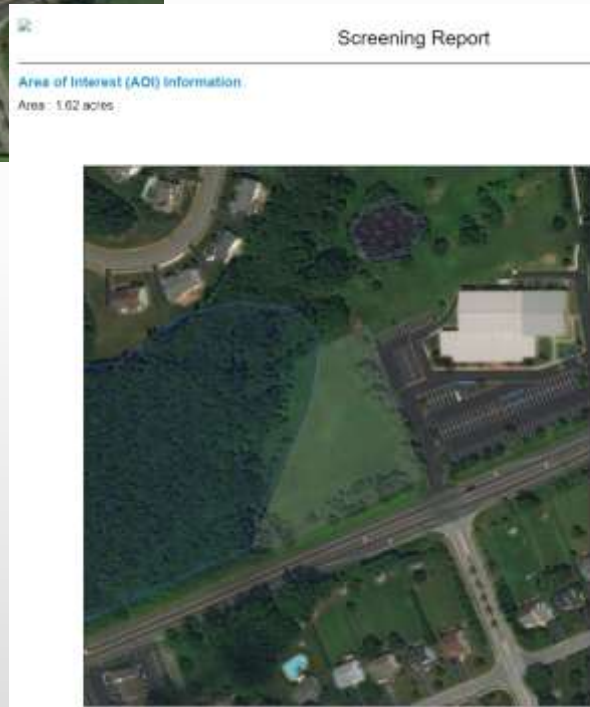
# Finding a Potential Mitigation Site

The screenshot shows the 'Watershed Resources Registry' web application interface. The title bar indicates 'Delaware Version'. The interface includes a search bar at the top with the placeholder text 'Find address or place'. On the left, a 'Layer List' panel contains various map layers, with 'Wetland Restoration Model Output' selected and highlighted. The main map area displays an aerial view of a residential and agricultural area, overlaid with orange and yellow polygons representing wetland restoration potential. A blue circle highlights a specific site. A popup window titled 'Wetland Restoration:' provides the following details:

Wetland Restoration:	
Score	-2
County	New Castle
Acres	7.06
HUC 12	020402050501
Watershed	Muddy Run
<a href="#">Zoom to</a> ...	

At the bottom of the map, there is a scale bar showing '0.75 1.71 39.629 Degrees' and a logo for 'Delaware State Parks | Microsoft esri'.

# Evaluating a Potential Mitigation Site



Step 1. Create location details report

## Summary

Name	Count	Area (acres)	Length (mi)
Wetland Restoration	2	1081176.97	N/A
Wetland Preservation	1	1.62	N/A
Upland Restoration	3	80085.61	N/A
Upland Preservation	3	1.62	N/A
Riparian Restoration	2	1.61	N/A
Riparian Preservation	2	1.62	N/A
Stormwater Compromised Infrastructure Restoration	1	1.62	N/A
Stormwater Natural Infrastructure Preservation	1	939770.33	N/A
Leaking Tanks	0	N/A	N/A
Certified Brownfield Sites	0	N/A	N/A
SIRB Sites	0	N/A	N/A
Large Spray Irrigation Sites	0	0	N/A
Delaware Wetlands 2007	1	0.01	N/A
Natural Areas	0	0	N/A
FEMA Flood Maps	0	0	N/A
Airports	0	N/A	N/A
Delaware Ecological Network	0	0	N/A
Flood Risk Adaptation Map	0	0	N/A
Tax Ditch Areas	0	0	N/A
Water Flow Lines	0	N/A	0

Step 2. Review Results

Step 3. Visit the Site. This is a Desktop Screening Tool. Verify! Verify! Verify!



# Thank You!



Watershed Resources Registry

[Your Registry](#) [State Registries](#) [Contact Us](#) [What is it?](#) [FAQs](#)

## Delaware Registry

[Home](#) / [Delaware](#)

[View Map \(Beta\)](#)

### Background

Delaware started its Watershed Resources Registry project in March of 2016. The Delaware team was inspired by neighboring Maryland. The collaborative effort included staff from the Delaware Center for



Inland Bays, members of Delaware's Division of Fish and Wildlife, multiple representatives within the Delaware Department of Natural Resources & Environmental Control, and staff from Delaware Department of Transportation, EPA Region 3 staff and the US Army



Corps of Engineers. The project was funded in part by a US Federal Highways Administration grant.

If you're interested in learning more about Delaware's WRR project, any of the following persons would be glad to answer questions.

### Additional Resources

#### Spatial Analyses

Get more information about the spatial analyses and factors selected by the state of Delaware for their models.

*Coming Soon*

[www.watershedresourcesregistry.org](http://www.watershedresourcesregistry.org)  
(best with Chrome and Firefox)





*RECONNAISSANCE  
COASTAL VULNERABILITY  
ASSESSMENT OF 3  
ARCHAEOLOGICAL SITES  
IN SOUTHERN MARYLAND*

By  
BILL STEPHENS, PG  
STEPHENS ENVIRONMENTAL  
CONSULTING, INC.



# ***What is Coastal Vulnerability and Why do we Care?***

- **“Coastal Vulnerability”**: A Suggested Neutral Definition = *“Degree to which the Coastal system is susceptible to and rate at which that system is altered by natural processes and anthropogenic activities”*  
Vulnerability in general is a function of the character, magnitude and rate of change and variation to which the system is subjected, its inherent sensitivity and adaptive capacity.
- The coasts are typically the most densely populated and highly developed areas on the planet. No one wants changes that affects their property, livelihood, resources or aesthetic sensibilities.

# NATURAL PROCESSES AFFECTING COASTS

- TIDAL VARIATION-DAILY
- STORM SURGE AND HIGH TIDES
- WAVE-RELATED EFFECTS INCLUDING VELOCITY WAVE ACTION DURING ANY STORM EVENT OR HIGH WINDS
- SEA LEVEL RISE
- MASS WASTING, FREEZING AND THAWING
- Sea Ice
- Subsidence
- Longshore sediment transport systems
- Wave regime and regime change
- Drought
- Groundwater breakthrough
- Changes in vegetation
- Sediment discharge from streams



# *COASTAL CHARACTERISTICS AFFECTING VULNERABILITY & USED IN RANKING*

- GEOMORPHOLOGY (INCLUDING GEOLOGY/LITHOLOGY)
- SHORELINE EROSION/ACCRETION
- COASTAL SLOPE (%)
- RELATIVE SEA LEVEL CHANGE
- MEAN WAVE HEIGHT
- MEAN TIDE RANGE

# *FUNDING, CONTRACT SCOPE AND GOALS*

- GRANT: “Archaeological Services to Conduct Excavation and Documentation of the Endangered River Farm Archaeological Site” [River Farm (19AR881), Lower Brambly I (18ST51), and Calverton (18CV22) (this was a Hurricane Sandy Related grant)]
- CONTRACT SCOPE: (1) Conduct a desktop review and research publicly available sources for relevant information, review MHT files, (2) hold a scoping meeting, (3) conduct a reconnaissance of each site, take photos, examine geologic and hydrogeomorphologic conditions, collect samples; (4) set GPS control and (5) survey selected features of interest; (6) analyze the data and assess relative risk to the cultural resources; (7) prepare a report containing the findings, opinions and recommendations for management of the resource.
- GOALS: (1) Provide a professional geologic opinion for each site as to the relative risk/vulnerability of the resource to coastal processes; (2) provide some survey quality GPS control; (3) if warranted, make some recommendations for management and remedies, as appropriate.



# RIVER FARM



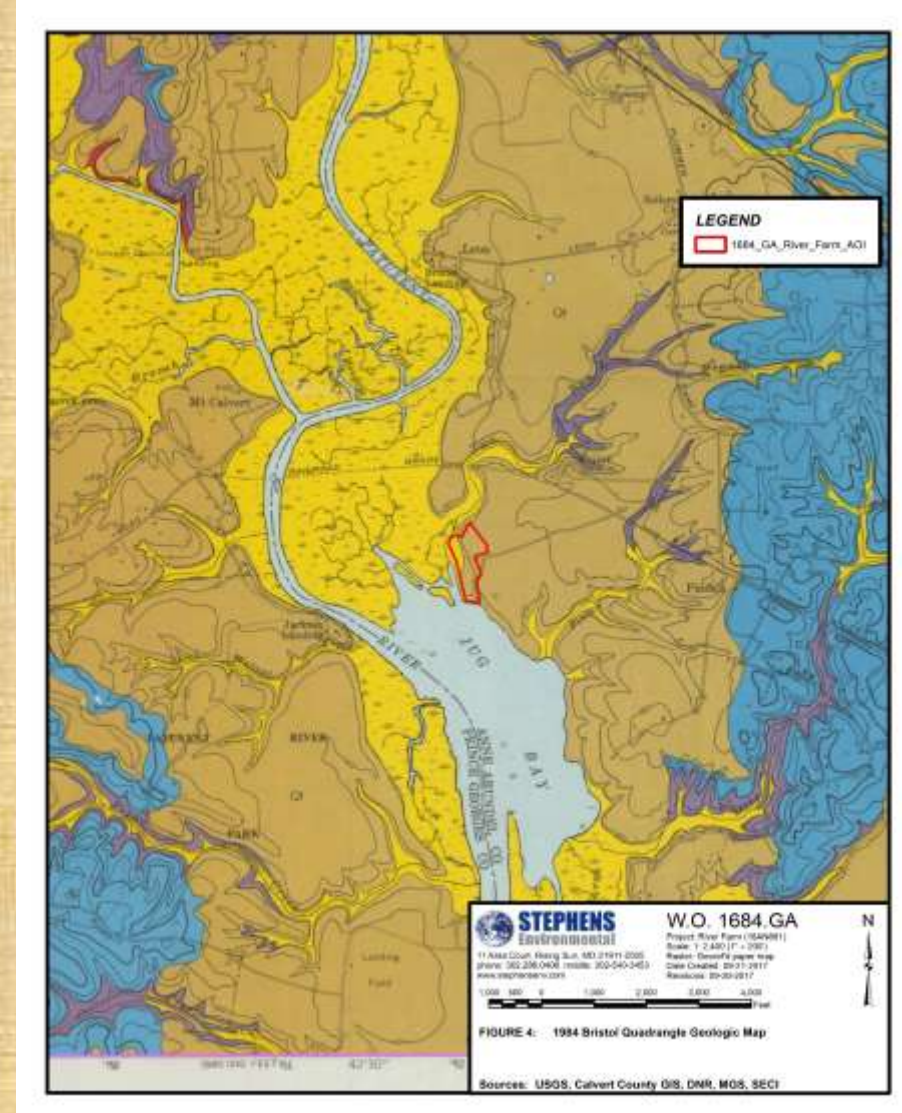


# MAPPING RESOURCES

## Digital Topo (2 ft Contours) & Soils



## Georeferenced Geologic Map





# MORE MAPS

## FEMA FLOOD ZONES



## 2007 Ortho with 1993 & AA County Shorelines







**View from the western shore looking northerly at low tide**



**View from the same spot looking southerly**



**View from the southerly shore near the point looking westerly at low tide**



**View from the same spot looking east northeasterly**





**Test Unit recently excavated in the woods**



**Another test unit located in the woods  
Note the nail spikes used by the  
archaeologists to define the unit limits**





**Test Unit recently excavated in the woods. Note the screenings appear mostly sandy.**



**Setting and observing GPS control points during the initial reconnaissance for future conventional survey work**





**Conventional surveying of a portion  
of the southerly facing shoreline**



**Measuring and Describing an open test  
unit**



**Examining the shoreline at the location of a cross-section/ Profile**



**Collecting survey quality data at the cross-section**





**Examining the shoreline at the location of a cross-section/ Profile. Paint spots are at nail spikes surveyed by conventional methods.**



**Measuring the profile in a test unit along the cross section. Elevations referenced to survey observations on the corner nail spikes. Additional depth attained by hand auger.**

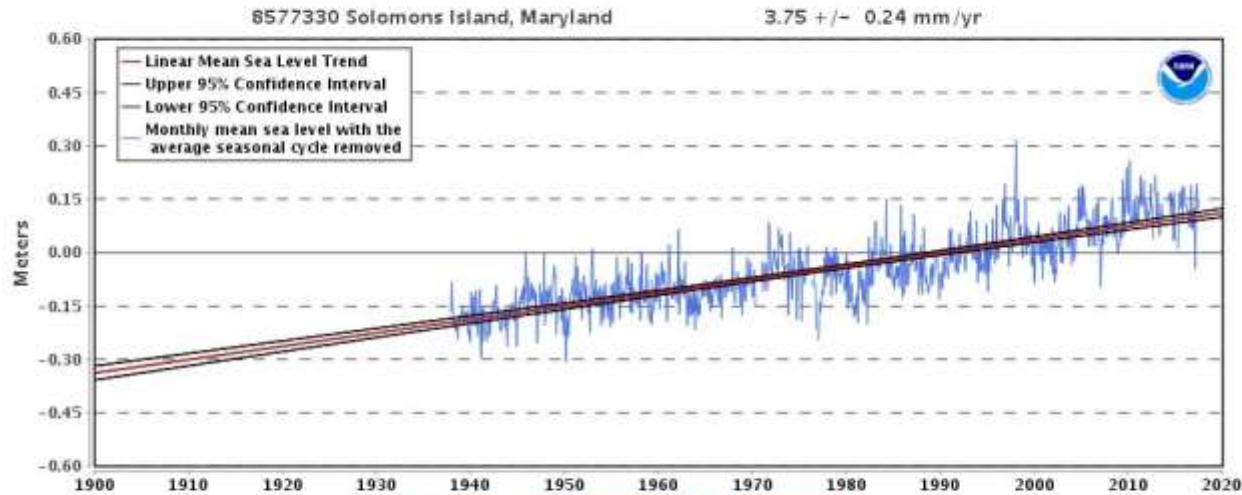






# BEST AVAILABLE SEA LEVEL DATA

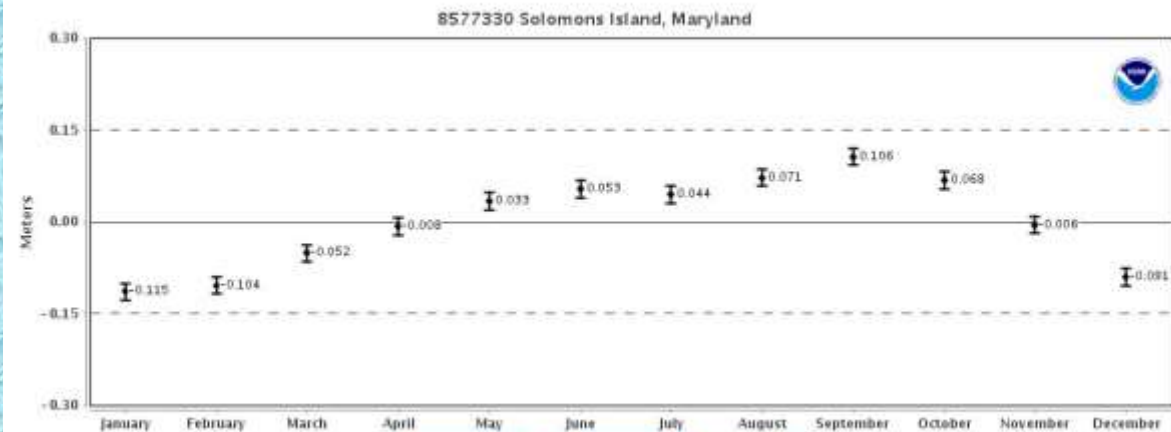
Mean Sea Level Trend  
8577330 Solomons Island, Maryland



[EXPORT TO TEXT](#) | [EXPORT TO CSV](#) | [SAVE IMAGE](#)

The mean sea level trend is 3.75 millimeters/year with a 95% confidence interval of +/- 0.24 mm/yr based on monthly mean sea level data from 1937 to 2016 which is equivalent to a change of 1.23 feet in 100 years.

Average Seasonal Cycle  
8577330 Solomons Island, Maryland



[EXPORT TO TEXT](#) | [EXPORT TO CSV](#) | [SAVE IMAGE](#)



# *FINDINGS*

- NOAA Sea Level Data indicate average annual rate of increase in sea level is 3.75mm/year (0.012 feet/year) which corresponds to 0.51 feet for the 42-year period. Sea level rise alone would account for a loss of 5 feet at a 10% slope.
- MGS determined shoreline loss to be “slight” ( 0.1 to 2.0 feet/year) at 0.57 feet/year. SECI’s analysis indicates the rate of shoreline recession along the westerly facing shore to be slight to negligible (-0.1 to 0.1 feet /year) with the average along the shoreline < 0.15 feet/year and evidence of accretion on the southerly point.
- FEMA NFHL digital data indicate the shoreline is not subject to velocity wave action, but inundation due to the 100YR Flood is indicated for all resources below elevation 4.0 NAD 83.



# ***FINDINGS***

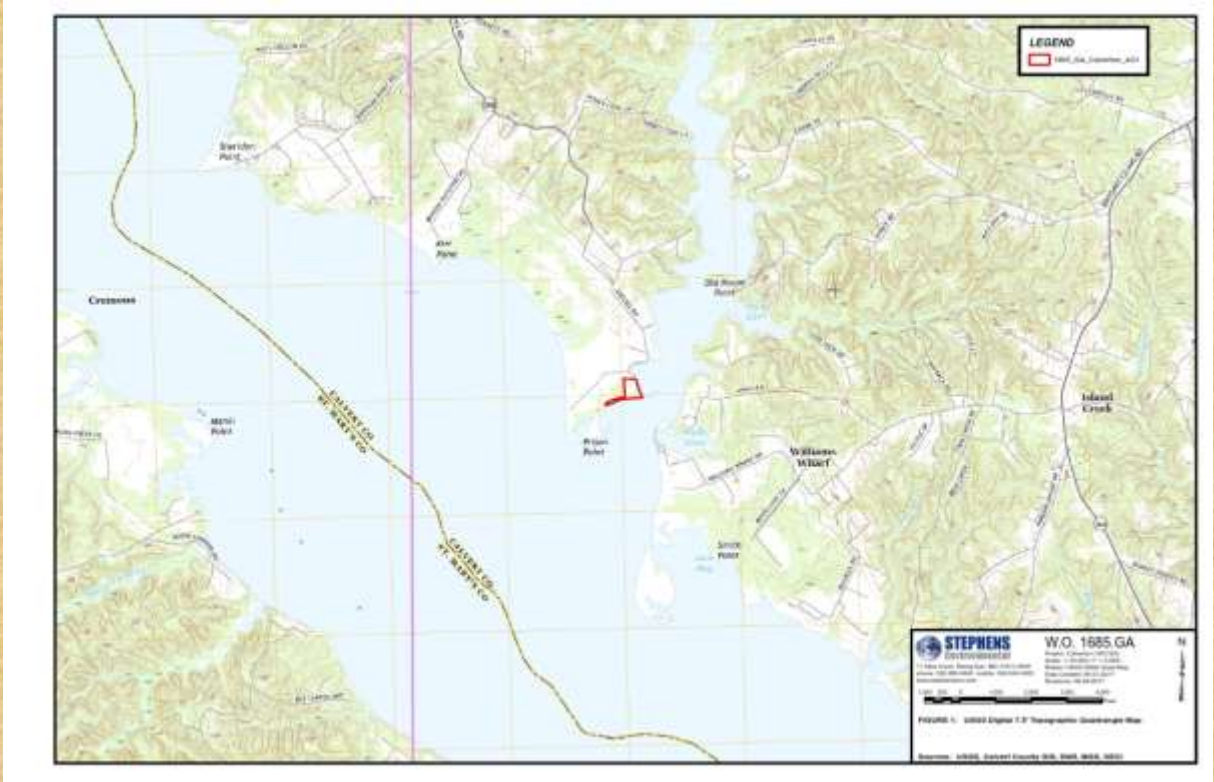
- The unconsolidated sediments comprising shallow soils in the primary resource area exhibit relatively high hydraulic conductivity and are susceptible to daily tidal influence. Groundwater is also shallow, and seepage is in part influenced by the presence of the Marlboro Clay
- Forest Conservation has had little impact on relatively negligible shoreline loss.
- Longshore transport is predominantly southerly.

# CALVERTON

## GOOGLE IMAGE GENERAL LOCATION MAP



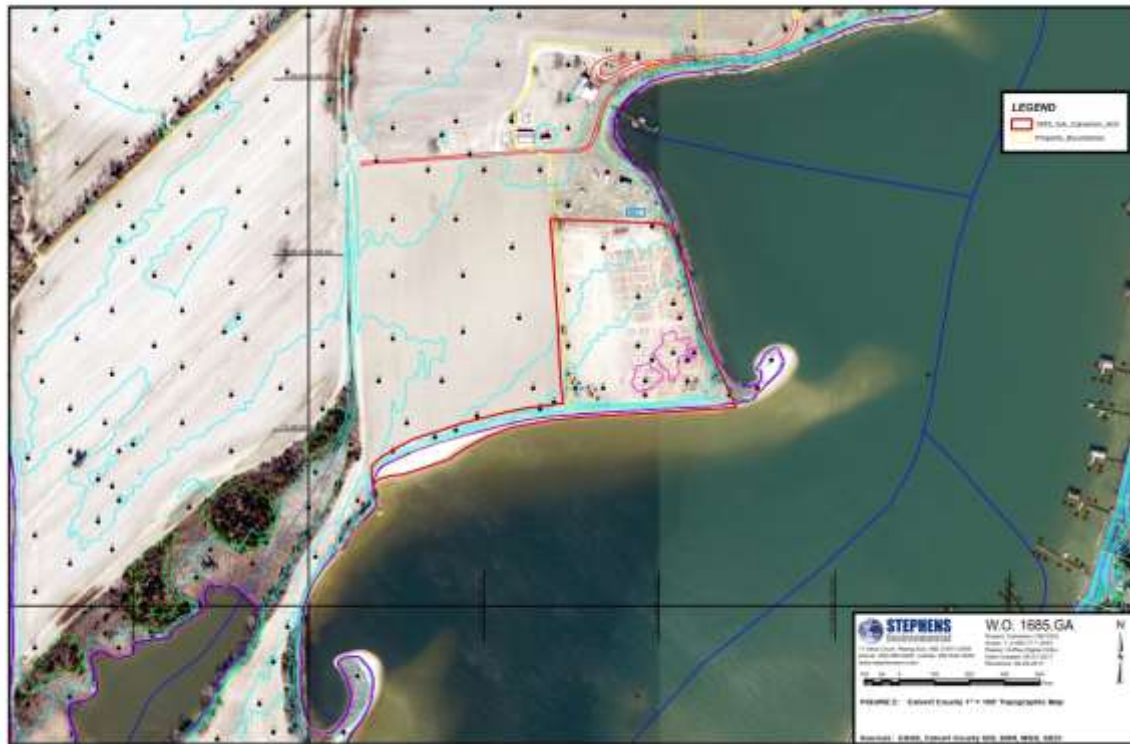
## USGS TOPOGRAPHIC QUADRANGLE MAP





# MORE MAPS

Calvert County Topography and Planimetrics



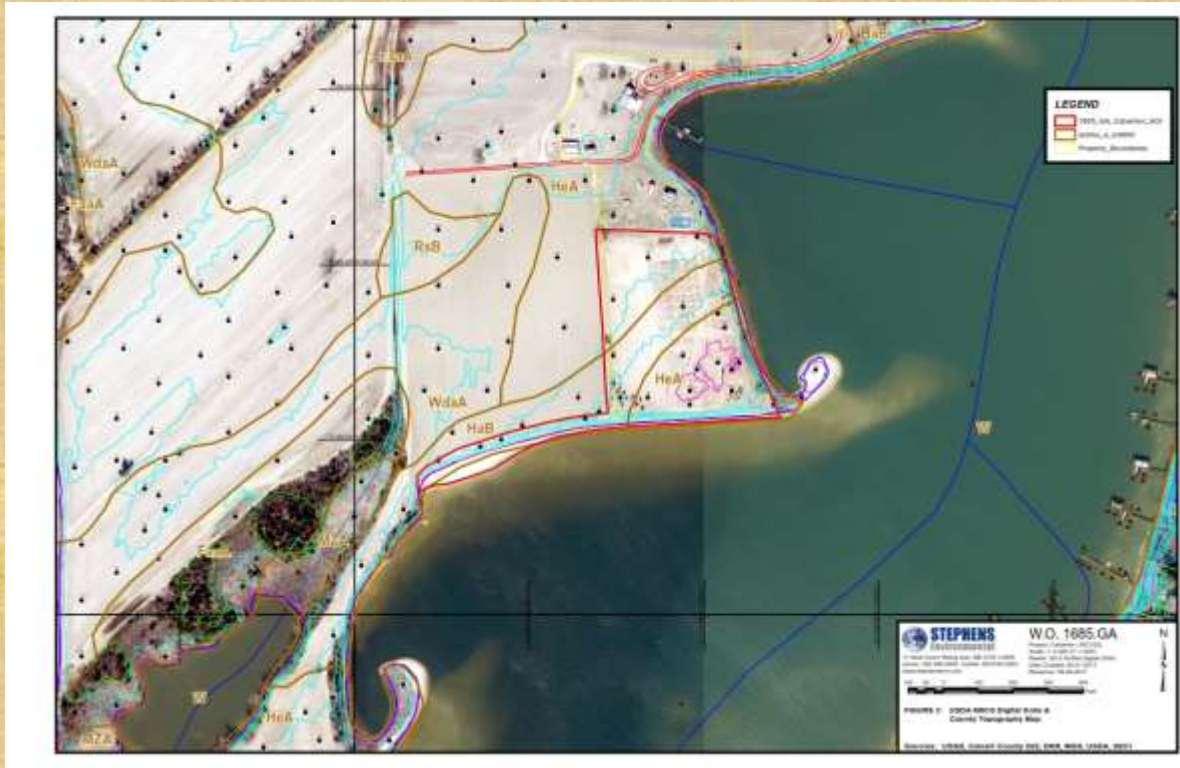
Enlarged View of AOI with Topo



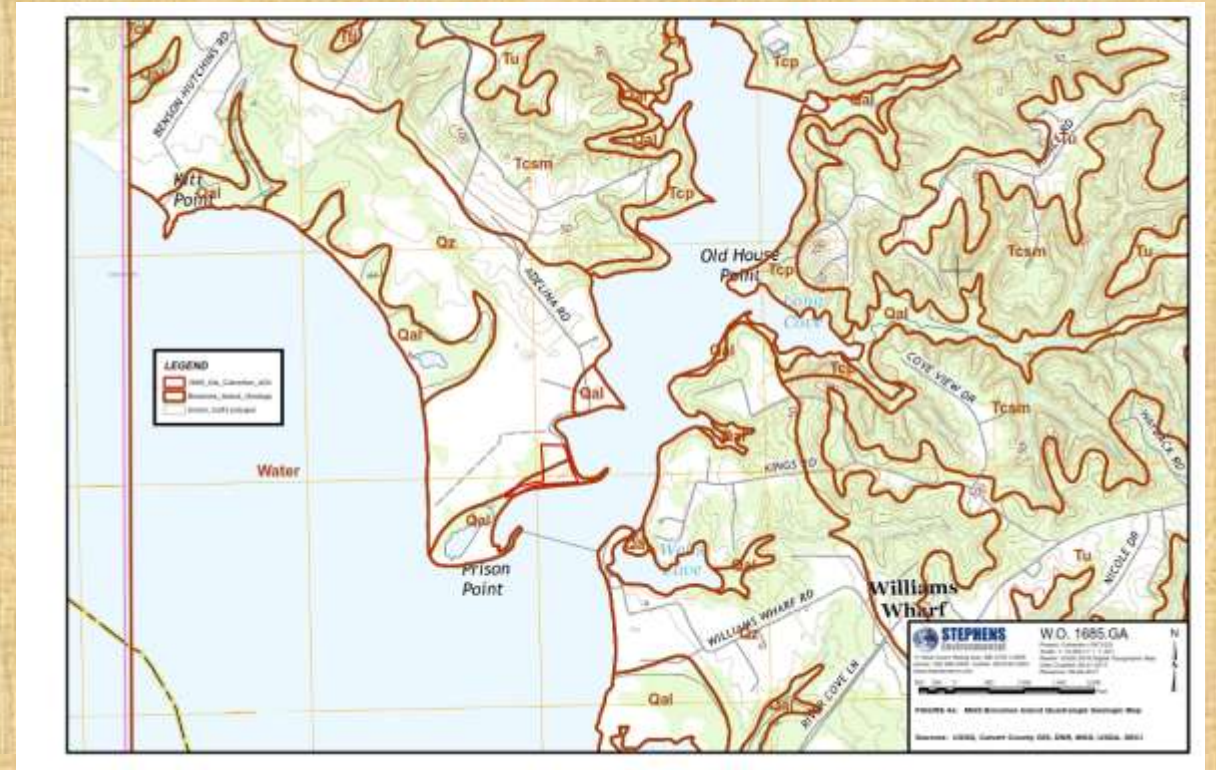


# MORE MAPS

Calvert County Topography and Planimetrics with NRCS Soils



USGS Broom Island Quad Geologic Map Units





# MORE MAPS

## FEMA Flood Zones



## MGS CUSP Data



# MORE MAPS

MGS CUSP DATA with Calvert County Topography

Digitized Shoreline & Bank Comparison Map





# MORE MAPS

Digitized Shoreline & Bank Comparison Map  
With 2015 NAIP Imagery

Digitized Shoreline & Bank Comparison Map  
with 1993 CIR DOQQ Imagery



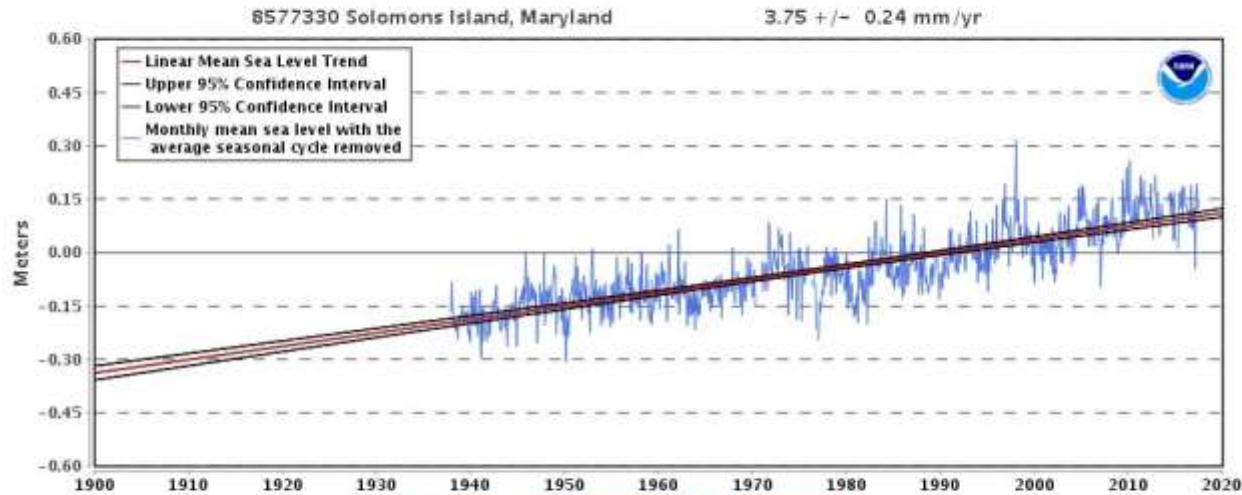


# Field Survey Map with Digitized Shoreline and Bank, 24-FEB-2013 High Resolution Imagery



# BEST AVAILABLE SEA LEVEL DATA

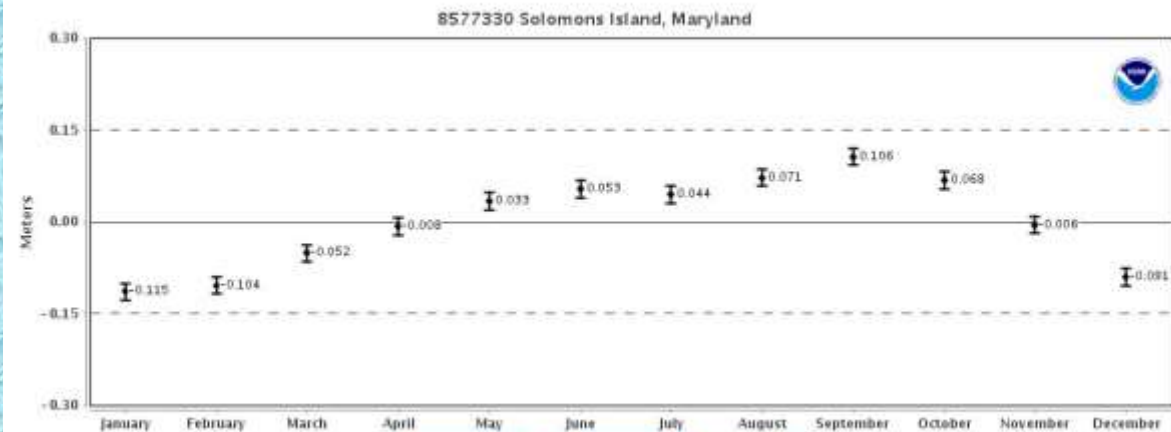
Mean Sea Level Trend  
8577330 Solomons Island, Maryland



[EXPORT TO TEXT](#) | [EXPORT TO CSV](#) | [SAVE IMAGE](#)

The mean sea level trend is 3.75 millimeters/year with a 95% confidence interval of +/- 0.24 mm/yr based on monthly mean sea level data from 1937 to 2016 which is equivalent to a change of 1.23 feet in 100 years.

Average Seasonal Cycle  
8577330 Solomons Island, Maryland



[EXPORT TO TEXT](#) | [EXPORT TO CSV](#) | [SAVE IMAGE](#)



**View from the beach near TP 102  
looking westerly toward TP 103**



**Close-up of a recent bank collapse due in  
part to undermining of the bank by wave  
action on non-cohesive sands and gravels**





**Close-up of the bank showing surface horizon with abundant shells, a “lunch pit”, brownish silty sand subsoil and underlying non-cohesive sands and gravels 08-14-2018**



**View of the beach near TP-103, cut bank not present**



**View from TP 103 after observations looking southwesterly and showing landform change to marshy, low profile bank and marsh without a defines beach**



**View Looking southerly from TP-103**





**View from TP-103 area looking easterly  
along the beach**



**Setting permanent survey quality GPS  
control in protected area of the property**



**View from the beach near TP 102  
looking westerly as the tide makes low**



**View from the same location looking  
easterly toward the point**





**View showing coarse sandy material in the swash and subtidal zone with ripple marks well developed, near TP-102**



**View from the beach looking westerly showing how discrete topography was gathered conventionally by following the various stands of tide. Low water line currently being collected**





**View showing the “lunch pit” previously inspected during the 08-14-2018 initial reconnaissance. Note significant collapse has occurred**



**View of Profile #1 bank cut adjacent to the lunch pit. Drywall square is 48” long**





**View showing the stratigraphy exposed from 48" to 96" in Profile #1. Sediments consist primarily of non-cohesive, moderately well sorted and normal graded pebbly to coarse sand to fine sand cross-beds, oxidized**



**Overall View of Profile #1 bank cut adjacent to the lunch pit. Drywall square is 48" long**





**View from the beach near TP-103 looking toward the westernmost part of the study area where the landform and geology changes**



**HA-1 completed in the beach near the western limits of the study area**





**View from the beach near HA-2 looking toward the westernmost part of the study area where the landform and geology changes, Note the Robot is set up over TP-103.**



**HA-2 completed in the beach near the western limits of the study area**





**Close-up of HA-3. Note the soils are sandy and lightly colored. Note also the spartina, which is a good indication of ordinary high water.**



**View of the intertidal zone as the tide rises.**





**Surveying the toe of bank.**



**Another profile near the property corner**





# Field Survey Map with Digitized Shoreline and Bank, 24-FEB-2013 High Resolution Imagery



# *CUSP-Based Shoreline Recession Estimates*

ST-10_EPR_FT	CLASS	LOCATION
-0.656168 ft.	Slight	100' w property line
-0.62336 ft.	Slight	@ property line
-2.001312 ft.	LOW	@ CP 103 (E)
-0.524934 ft.	Slight	@ CP 102
-2.3950 ft.	LOW	@ CP 103 (W)
-1.115486 ft.	Slight	S hilt of spit
-1.279528 ft.	Slight	N duck blind
-0.656168 ft.	Slight	4 trans. pts. E of CP 103
-4.625984	Moderate	5 trans. pts. E of CP 102

# *SECI Top of Bank Recession Estimates*

Location Top of Bank (TOB)	Total loss in Feet	Average Annual Change (in feet)
@ CP 103	55'	-0.846
+ 100'	54'	-0.83
+ 250'	55'	-0.84
@ Property Line	65'	-1.0
150' west CP 102	68'	-1.04
30' west CP 102	68'	-1.04
East end of 2017 TOB	49'	-0.75



# *FINDINGS*

- The site is located on the westerly side of the tidal Battle Creek near the mouth and confluence with the Lower Patuxent River. The south-facing beach is susceptible to wind and wind generated waves including waves over one foot under conditions of normal and abnormally high tide and larger waves during storm surge events. The cove is protected from large waves that might come from the south west, west, northwest to north, but wind generated waves from the southeast can build and run up the beach impeded only by the bottom depth of the subtidal zone. The east-facing coastline of the site, not a focus of this investigation, appears minimally impacted by wave action and has not recessed much in the last 65 or more years.
- The dominant direction of long-shore transport appears to be easterly along the south-facing shoreline to the recurve spit. The spit has become substantially shorter in the last 65 years. If this spit disappears due to lack of sediment supply, the point will begin to erode and recession of the east-facing side of the site will accelerate.
- Revamped shoreline data supplied for this study appears consistent with our findings with respect to the quantity of coastline lost and the rates of recession. As such, we have a reliable predictive model to forecast shoreline loss.

# *FINDINGS*

- The rate of shoreline loss is deemed “slight” according to the MGS definition (0.1 to 2 feet/year).
- FEMA NFHL digital data indicates the shoreline is subject to velocity wave action (VE) ranging from 7 feet in the open water to 11 feet against the south-facing shore during the 1% Annual Chance Flood Event ( also known as the 100-YR Flood). Areas along the west end of the beach and parts of the neighbor’s field to the north are mapped as Zone AE, elevation 6. The uplands are mapped as Zone X, areas of minimal flood hazard.
- NOAA sea level/tide gauge data for the nearest tide gauge indicate that the average annual rate of increase in sea level is 3.75 mm/year (0.012 ft./yr) at a 95% confidence interval of +/- 0.24 mm. The data suggest sea level has risen 0.97 feet in the last 79 years and will likely continue to rise at this rate for the foreseeable future. The impact to this site due solely from sea level rise will likely be negligible compared to and indiscernible from impacts due storm surge, tides, velocity wave action and resultant mass wasting of the bank, but may be noticeable in the field on fixed structures.
- Mass wasting, that is, collapse of the upland bank/bluff along the coastline is facilitated mainly by undermining or eroding of non-cohesive granular soils exposed at the base of the bank along the high tide zone causing bank collapse. One mass of soil upwards of 1 to 1.5 cubic yards collapsed between our initial and follow-up visits.



# *FINDINGS*

- Based on this study of historic aerial photos and other sources, the average annual rate of recession of the bank appears to be in the range of 0.75 to 1.04 feet per year for the period 1952 to 2017. The highest total cumulative bank recession (over 68 feet) and rate of recession (up to 1.04 feet/yr) occurs in the middle of the beach. Any rate under -2.0 ft./yr is defined as “slight”.
- MGS data analysis indicates that individual transects along the south facing beach, particularly at the west end, have short term shoreline loss rates in the “Low” category. The south end of the spit has a shoreline loss rate of over 4 feet per year, which classifies as “Moderate”.
- Based on the River depth, steep run-up and long fetch up and down the River’s length, we would estimate wave heights intercepting the shoreline and banks at acute to oblique angles could exceed one to two feet normal under high tide and storm conditions, suggesting individual severe storms or hurricanes could cause noticeable and severe damage.



# *Overall Findings & Thoughts*

- CUSP data provided by MGS is reasonably reliable from a Statewide or even County wide basis, but the reliability of the underlying raw data sources, and old methods of digitization are generally inaccurate and unreliable for site specific assessments.
- Impacts to all three sites affecting the resources have occurred and continue to occur as a consequence of natural coastal processes and sea level rise.
- Resources and desktop techniques are available to obtain more accurate assessments of recent historical changes in coastal margins, and coupled with field surveys, can provide much more reliable information for site/resource management purposes. Reconnaissance level coastal vulnerability assessments can be effectively used to prioritize resources including funding Archaeological Investigations and resource protection strategies.

# *Overall Findings & Thoughts*

- River Farm's cultural resources are in no immediate danger of loss due to shoreline erosion/recession. It is likely to become submerged within the next 150 -200 years.
- Calverton's cultural resources have in part been lost due to shoreline erosion/recession that is estimated at least for the last 50 years or so to be approximately 1 foot per year, and that rate of loss is anticipated to continue into the foreseeable future. Little can be done to preserve the resource, except for the neighbor who has volunteered beach replenishment.
- Our recommendations for both sites including periodic monitoring and complete survey of the coastal margins. Piezometers might be warranted at River Farm. Post-storm inspections and possible emergency resource harvesting may be warranted as resources become exposed.



*QUESTIONS ?*

