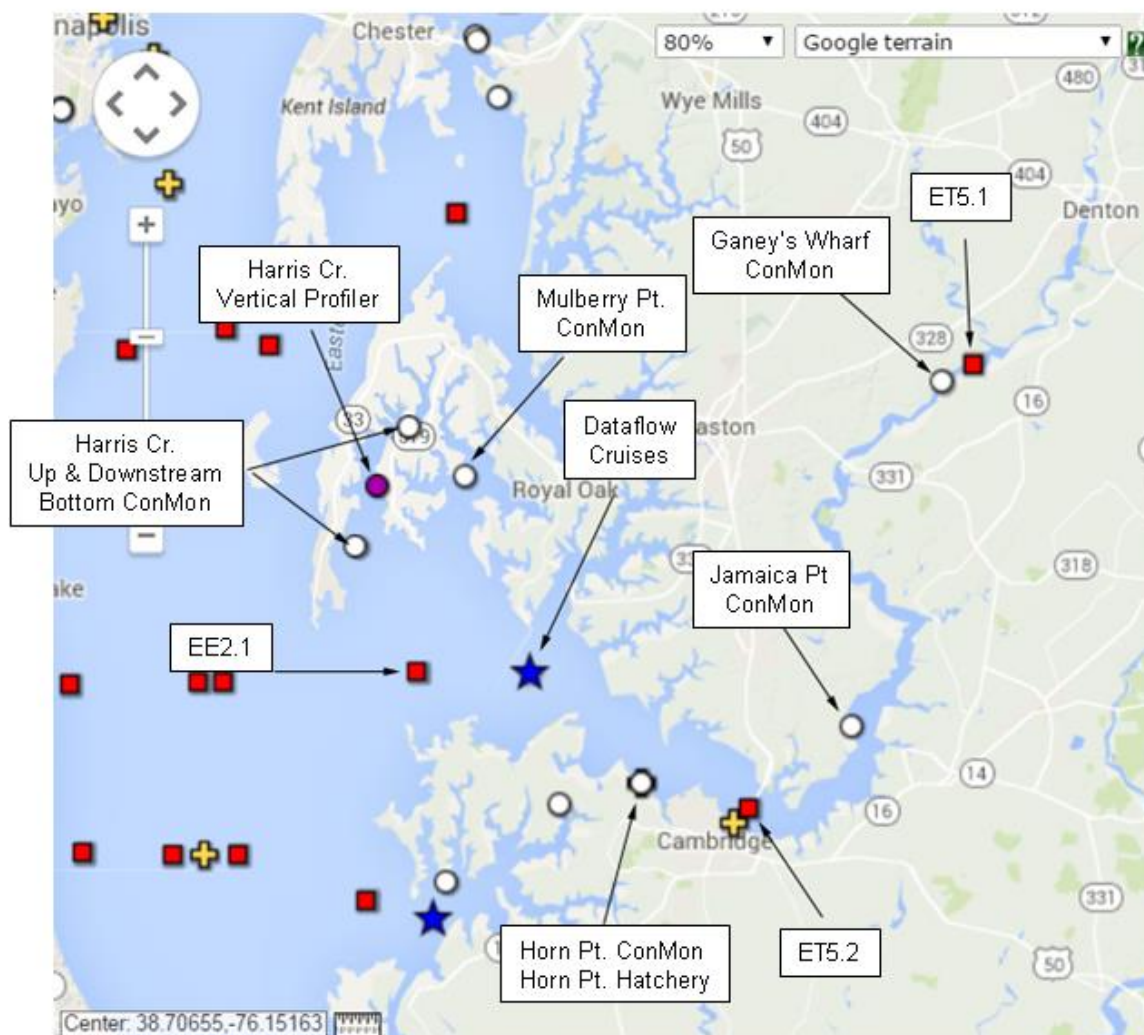


Choptank Monitoring Snapshot

Summary of MD DNR Tidal Choptank River Water Quality Data



DNR Harris Creek Sites

- Upstream (0.3m off bottom)
(Sept 13-Jan14; Apr14 – Dec14; Apr15)
- Downstream (0.3m off bottom)
(Sept 13-Jan14; Apr14 – Dec14; Apr15)
*Wtemp, salin, cond, chl, turb, pH, depth every 15 minutes
Biweekly profiles, nutrients, chl, sediment, & alkalinity*
- Vertical Profiler (Depths 1,2,3,4,4+)
June 26, 2012 – January 22, 2013
April 30, 2013 – December 19, 2013
March 27, 2014 – December 16, 2014
*Wtemp, salin, cond, chl, turb, pH, every hour
Biweekly profiles, nutrients, chl, sediment, & alkalinity*

DNR Long-Term Sites (1985-Present)

- EE2.1; ET5.2; ET5.1
Monthly WQ profiles; Sediment, Nutrient, Chl samples at surface & depth

DNR ConMon Sites (~Apr-Oct 2006-08)

- Ganey's Wharf, Jamaica Pt.; Horn Pt.
- Mulberry Pt.
1-meter below surface;
*Wtemp, salin, cond, chl, turb, pH, every 15 minutes
Bi-weekly profiles, surface nutrients, chl, sediment*

DNR Choptank Dataflow (Apr-Oct 2006-08)

Monthly cruises throughout extent of river and creeks with a four second sample rate of surface waters. 10 calibration sites with profiles, nutrient, sediment, chl samples

Other Efforts

- Horn Pt. Hatchery ConMon
<http://www.umces.edu/hpl/choptank-river-horn-point>
(wtemp, cond, chl, salin.)
- Green Eyes Chop River Bridge ConMon (?)
- NOAA site 8571892 (*Met, Water Level, Wtemp*)
- Gooses Reef (Surface/Bottom WQ; Met)

Cooperative Oxford Laboratory

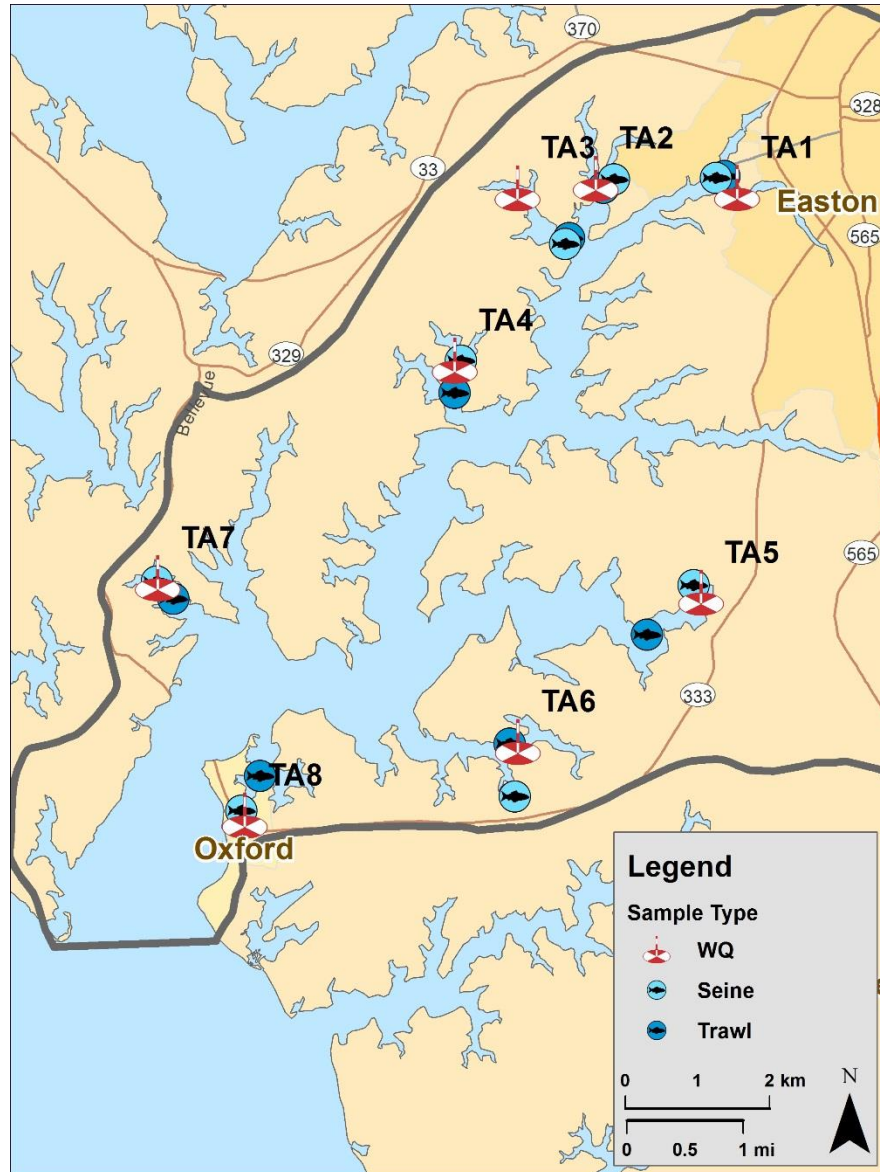
Parameters/Frequency Measured:

- At the water quality sites, physical (YSI) and chemical (nutrients) are measured seasonally (May, July, Sep).
 - Florida AMU and Horn Point Analytics Labs assay the nutrient and/or chlorophyll-a samples.
- Fish community composition occurs every 2 weeks from late Jun/Jul thru the end of Oct (trawl & seine).

Time Period of Collection: The project duration is 2015-2018 with samples being collected for 3 years, 2015-2017.

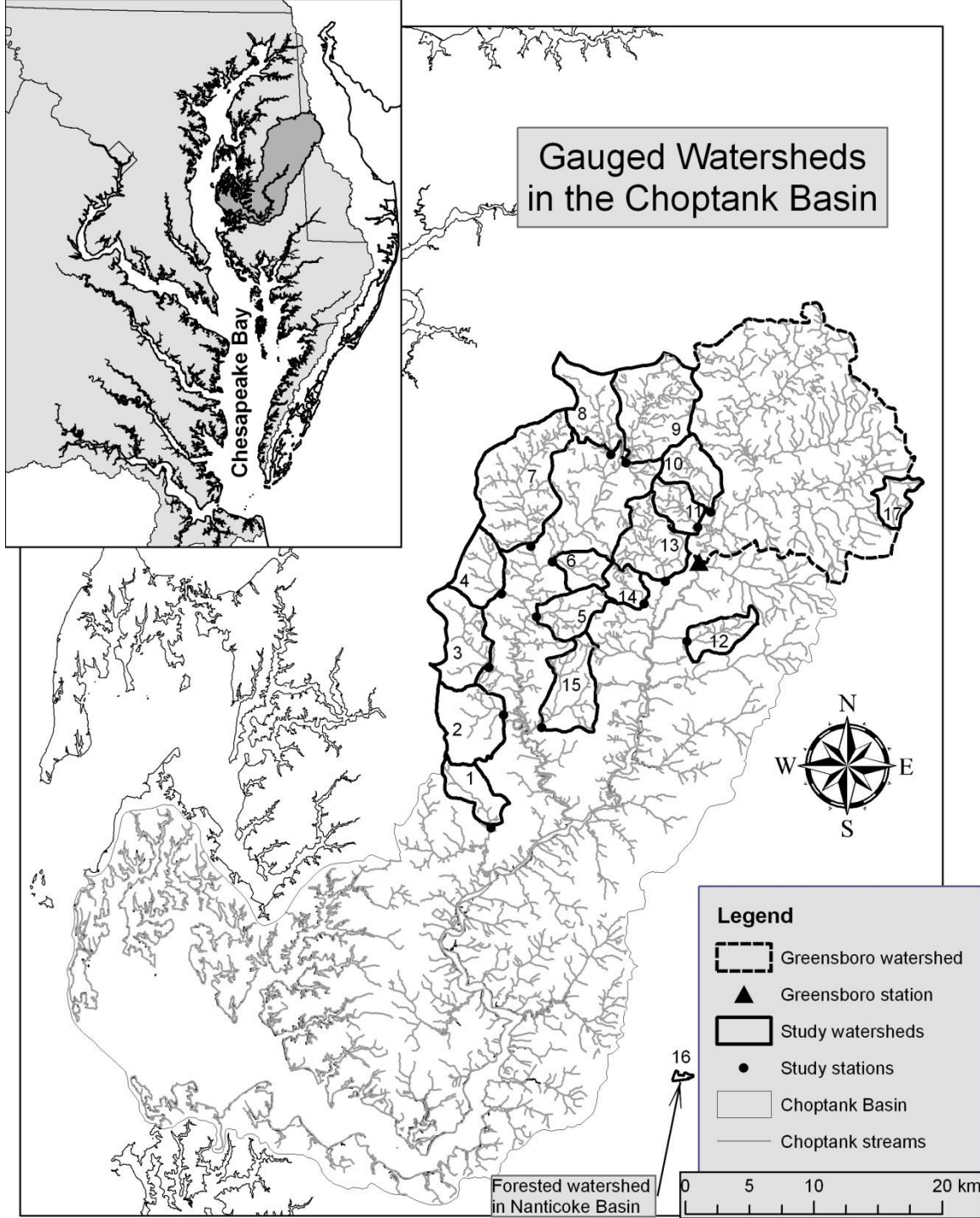
Additional Notes:

- In 2015 only, we also collected sediments from each station in August to measure the Benthic-Index of Biotic Integrity (B-IBI) following Chesapeake Bay methodology (Versar is running the samples).
- Sediments were also collected for contaminants and toxicity (MicroTox), CCEHBR is running the samples.



University of Maryland Center for Environmental Science: Tom Fisher

- Parameters Measured: for 16 watersheds we measure stream stage and temperature (30 min), discharge (30 min), monthly baseflow chemistry (pH, cond, NH₄, NO₂+NO₃, TN, PO₄, TP). For 4 of those 16 watersheds, we measure vwm storm chemistry (same as baseflow) 8 x per year.
- Frequency Measured:
- Time Period of Collection: 2003-present
- Instrumentation Used: Solinst loggers, autoanalyzer, ISCO autosamplers

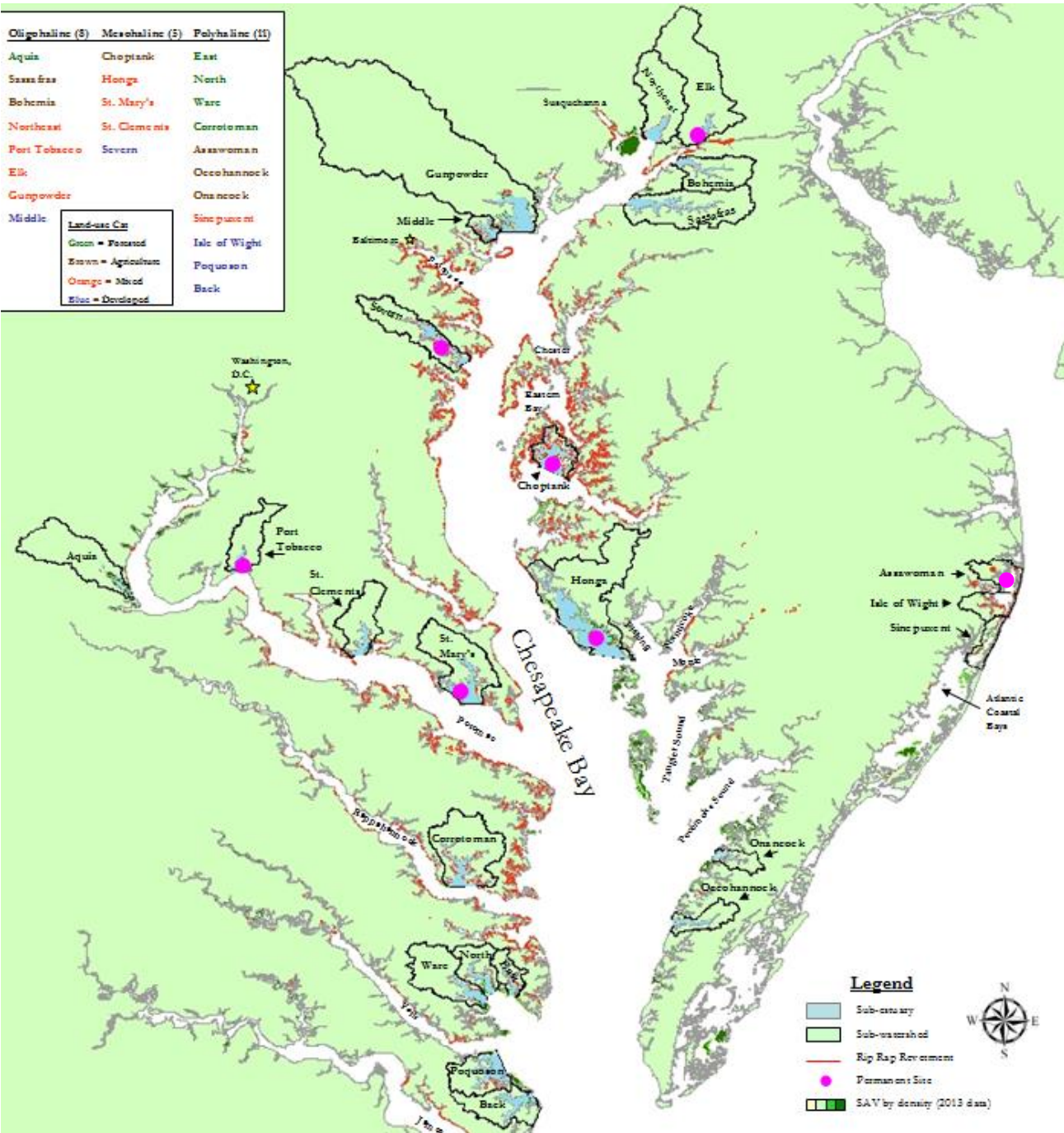




Greensboro is a USGS site, and Watersheds 1-15 are agriculturally Dominated (60-80%). 16 is 99% forest.

Maryland DNR, Resource Assessment Service, SAV group – Bay wide SAV transects

- Parameters Measured: Presence/Absence, Total SAV %cover, Total Macroalgae % cover, species specific % cover, canopy height, SAV bed starting position relative to shore and end of bed extent from shore
- How do you measure those parameters? In 0.25m² quadrats evenly spaced along transects that run the length of the SAV bed. Paired transects at each site.
- Frequency Measured: 1 x Annually
- Time Period of Collection: During species specific period of peak biomass (Lower bay in May/June, mid bay in July/August, upper bay in September/October)
- Instrumentation Used: SCUBA gear, transect tape

Oligohaline (5)	Mesohaline (5)	Polyhaline (11)
Aquia	Choptank	East
Sassafras	Honga	North
Bohemia	St. Mary's	Ware
Northeast	St. Clements	Corrotoman
Port Tobacco	Severn	Assawoman
Elk		Oceohannock
Gunpowder		Onancock
Middle	Land-use Class	Sinepuxent
	Green = Forested	Isle of Wight
	Brown = Agricultural	Poquoson
	Orange = Mixed	Back
	Blue = Developed	



 Permanent site surveyed annually.
 All other sites only surveyed once in last six years.

- Permanent site surveyed annually:
- Elk River
 - Severn River
 - Choptank River
 - Honga River
 - Port Tobacco River
 - St. Mary's River
 - Assawoman Bay

Legend

-  Sub-estuary
-  Sub-watershed
-  Rip Rap Revetment
-  Permanent Site
-  SAV by density (2013 data)



US Fish and Wildlife Service

- Parameters Measured: Presence/absence; individual species; depth, secchi depth and salinity collected at each site.
- How do you measure those parameters: Random point data via rake collection; rake results based on modified Braun-Blanquet Scale.
- Frequency Measured: 3 x season (May, July, and September)
- Time Period of Collection: Spring, Summer, and Fall
- Instrumentation Used: We have used snorkeling, underwater video, and unmanned aerial vehicle video for general documentation not direct measurement. Secchi disk and refractometer (salinity). Depths are recorded at each sampling point by vessel's depth finder, with a depth finder and a pole depth measurement taken at every 10th sampling point

SAV Monitoring



Chesapeake Bay

2

3

4

5

6

Dogwood Harbor

Location

Acreage

- | | |
|--------------------|-----|
| 1. Poplar Harbor | 282 |
| 2. Harbor Cove | 45 |
| 3. Lowes Point | 24 |
| 4. Ferry Cove | 26 |
| 5. Front Creek | 4 |
| 6. Tilghman Island | 5 |

Data Source: Chris Guy
U.S. Fish & Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD. 21401

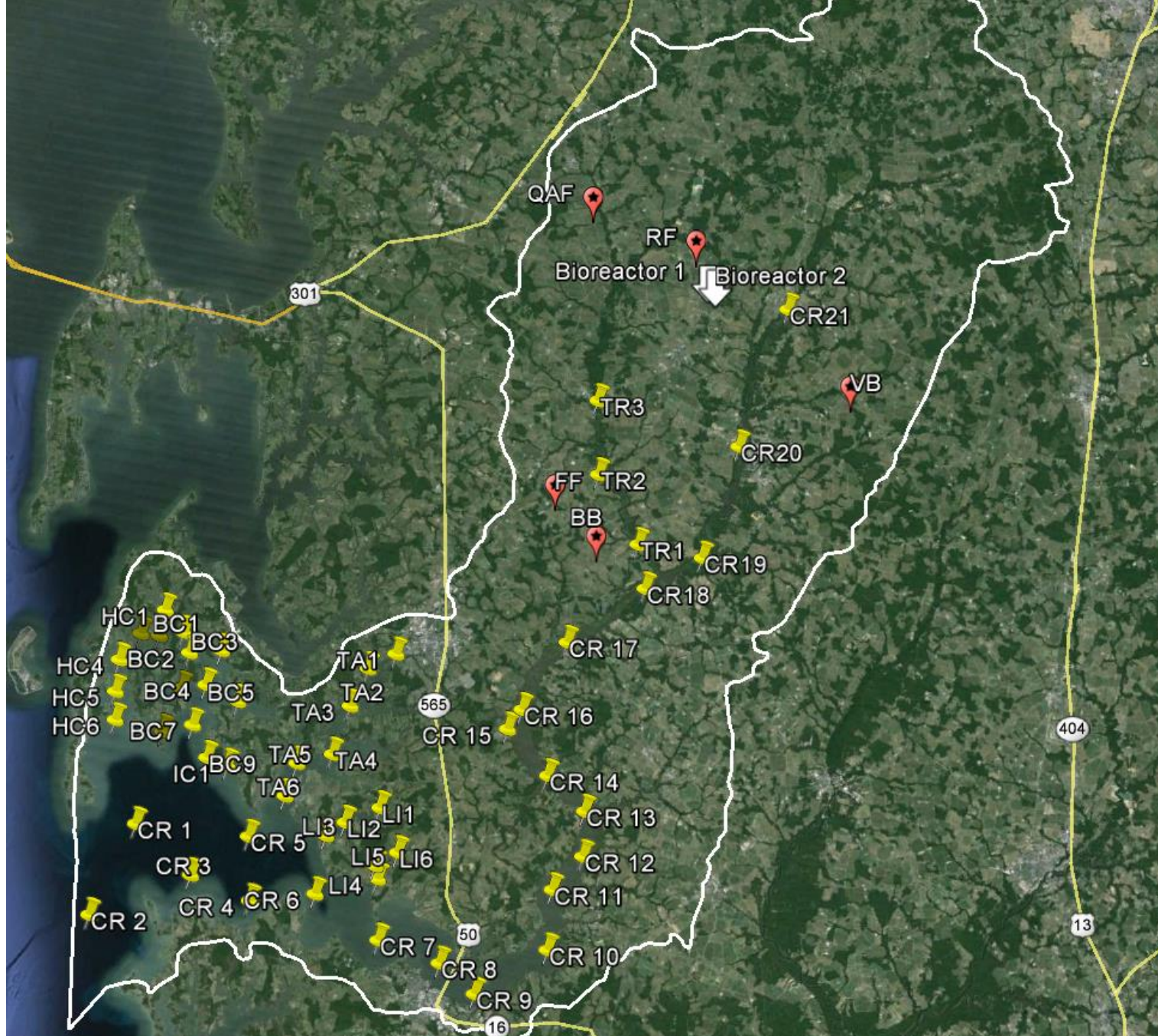


0 0.5 1 2

Kilometers

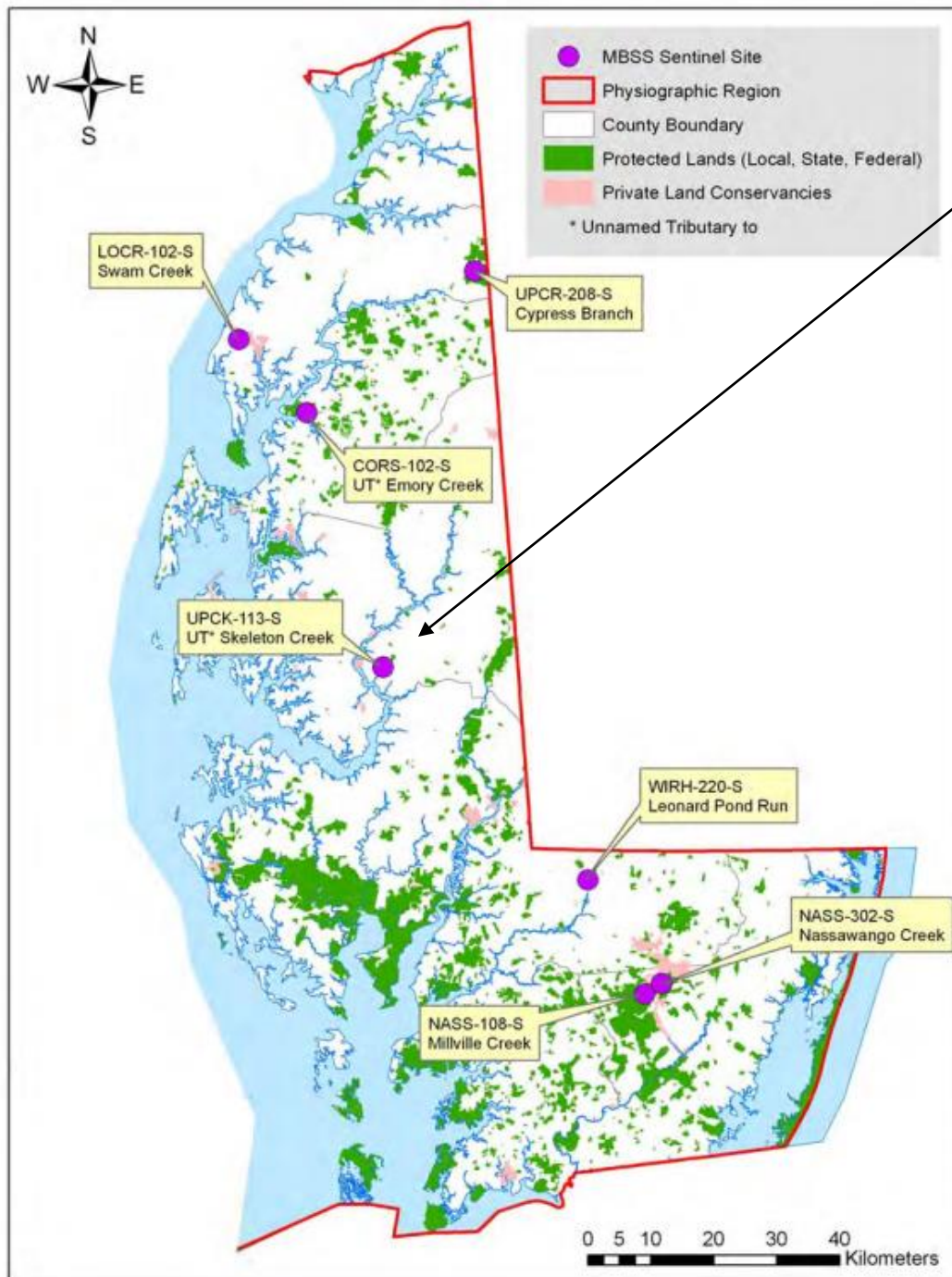
Midshore Riverkeeper Conservancy

- Parameters Measured: TN, TP, NO₃, PO₄, NH₄, DO, pH, ORP, SPC, Salinity, Water Clarity, Temperature, Discharge
- Frequency Measured: Monthly to Daily
- Time Period of Collection: 2012-2016
- Instrumentation Used: YSI-Pro Plus, Sontek FlowTracker, pressure transducers



15.11 mi

MD DNR – MBSS Sentinel Site in the Choptank Watershed (UPCK-113-S)



Parameters Measured:

Biology (benthics, fish, amphibians, crayfish, mussels, invasive plants)

Chemistry (annual grab for nutrients, conductivity, pH, ANC, DOC, Chloride and several other ions)

Physical (continuous temperature, geomorphology, physical habitat assessment, discharge)

Land Cover (land cover draining to the site taken from NLCD)

Frequency Measured: Annual for most parameters. Temperature every 20 minutes. Land Use when available.

Time Period of Collection:

Since 2000

Instrumentation Used: Many – depending on parameter.

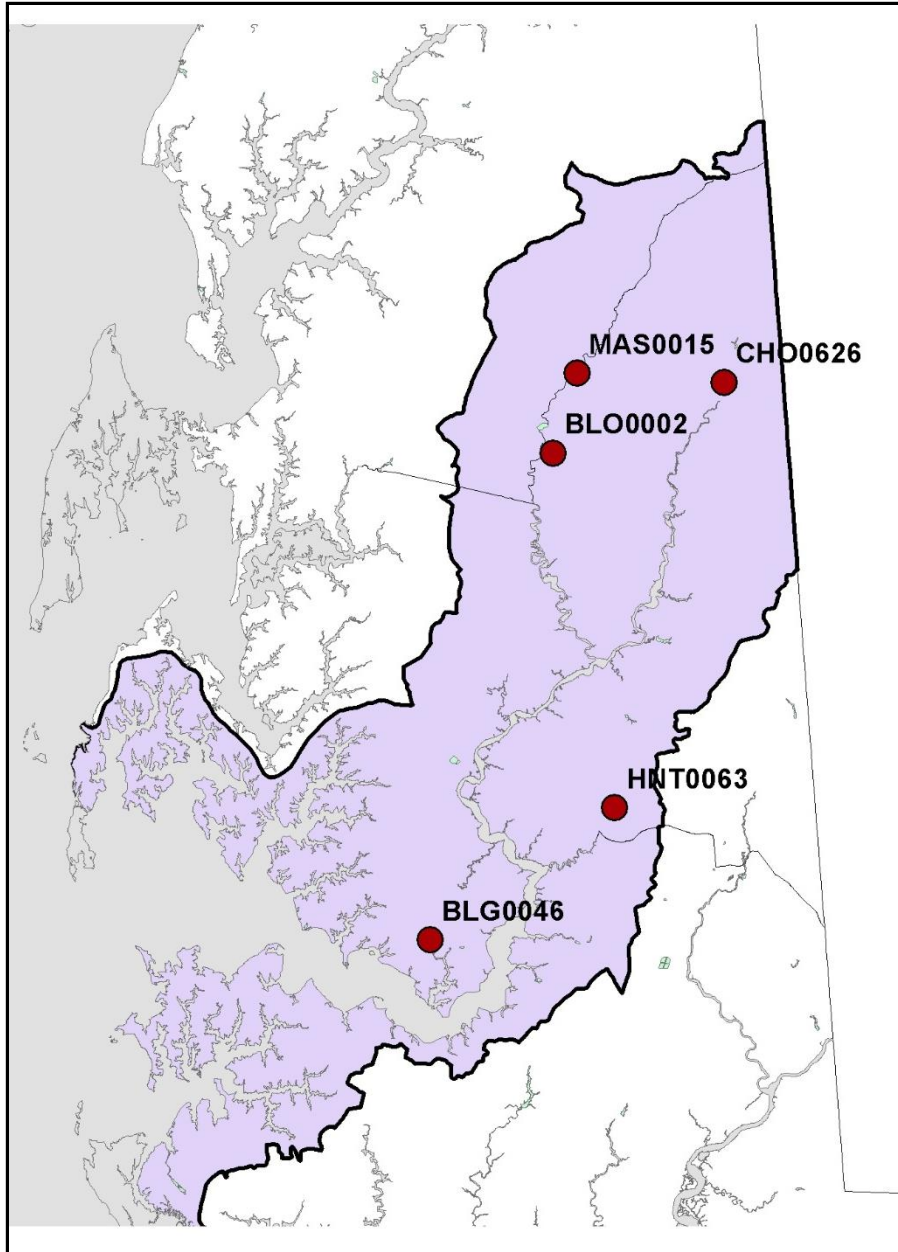
Geographic Coordinates:

38.72408000,-75.96062000

Link to Report:

<http://dnr2.maryland.gov/streams/Publications/2014/SentinelSiteReportWEB.pdf>

MD DNR Core Trend Monitoring Sites



Parameters Measured and Frequency:

A. Benthic macroinvertebrate community

BLO0002 - every 2 years since 2003

BLG0046 - every 2 years since 2003

CHO0626 - yearly since 1976

HNT0063 - every 2 years since 2003

MAS0015 - every 5 years since 2003

B. Water chemistry (nutrients, conductivity, DO, pH, TSS, turbidity)

CHO0626 – monthly

Instruments Used:

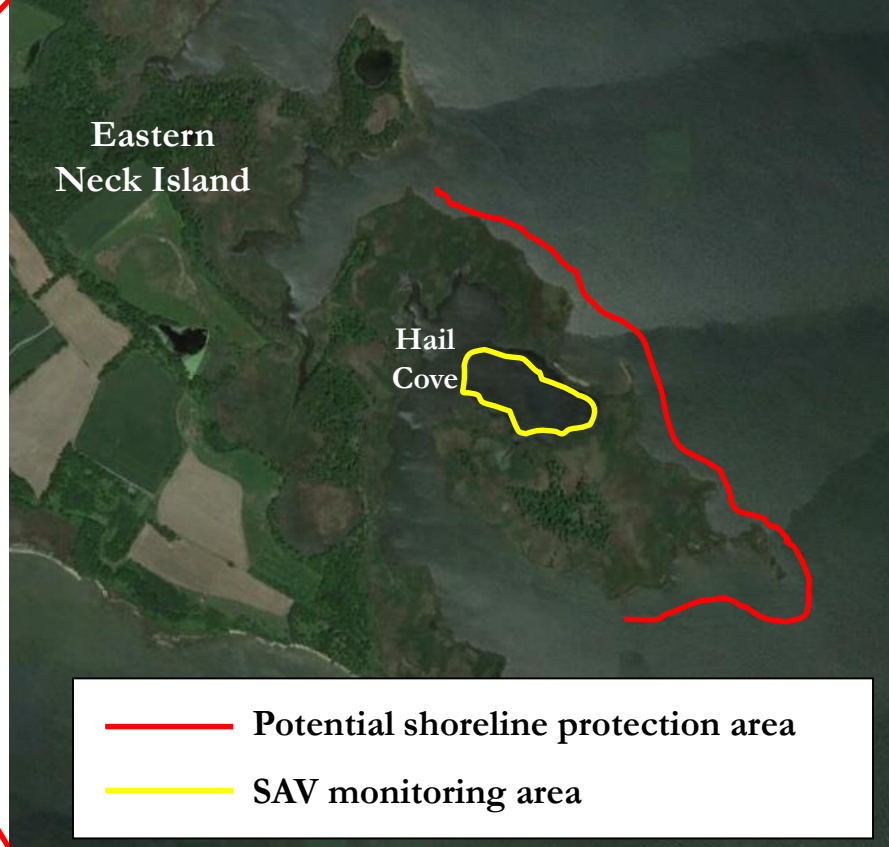
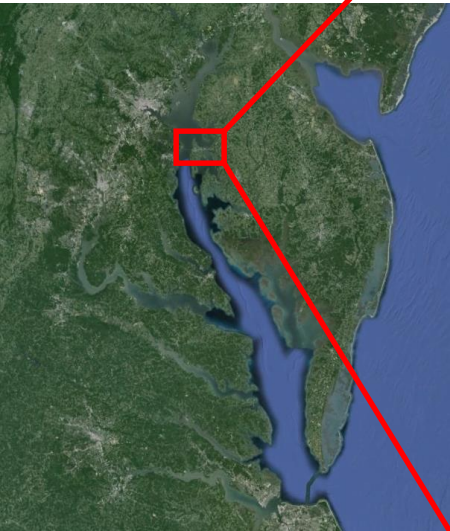
Benthic community - D-net, surber sampler



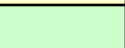


Water chemistry – field meter, grab samples to analytical laboratory

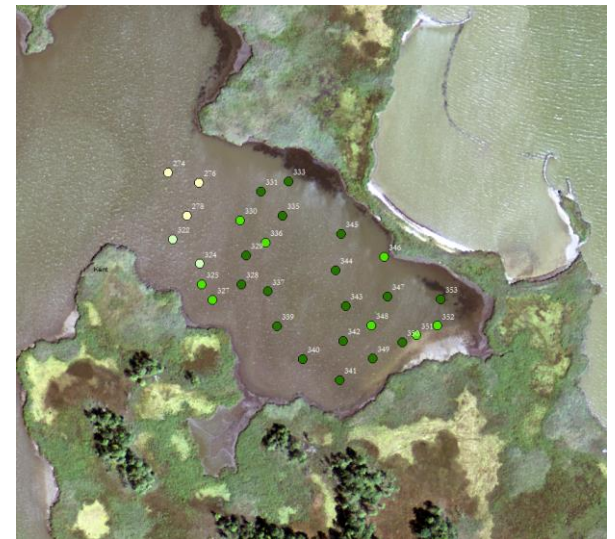
Outside of Choptank
Area

Maryland DNR, Resource Assessment Service, SAV group –Eastern Neck SAV

- Parameters Measured: Presence/Absence, Total SAV %cover, Total Macroalgae % cover, species specific % cover, random point lat/long
- How do you measure those parameters? Random points throughout cove, data surveyed in 0.25 m² quadrat
- Frequency Measured: 1 x Annually
- Time Period of Collection: July/August
- Instrumentation Used: Snorkel gear, handheld Garmin GPS, 0.25 m² quadrat, underwater paper



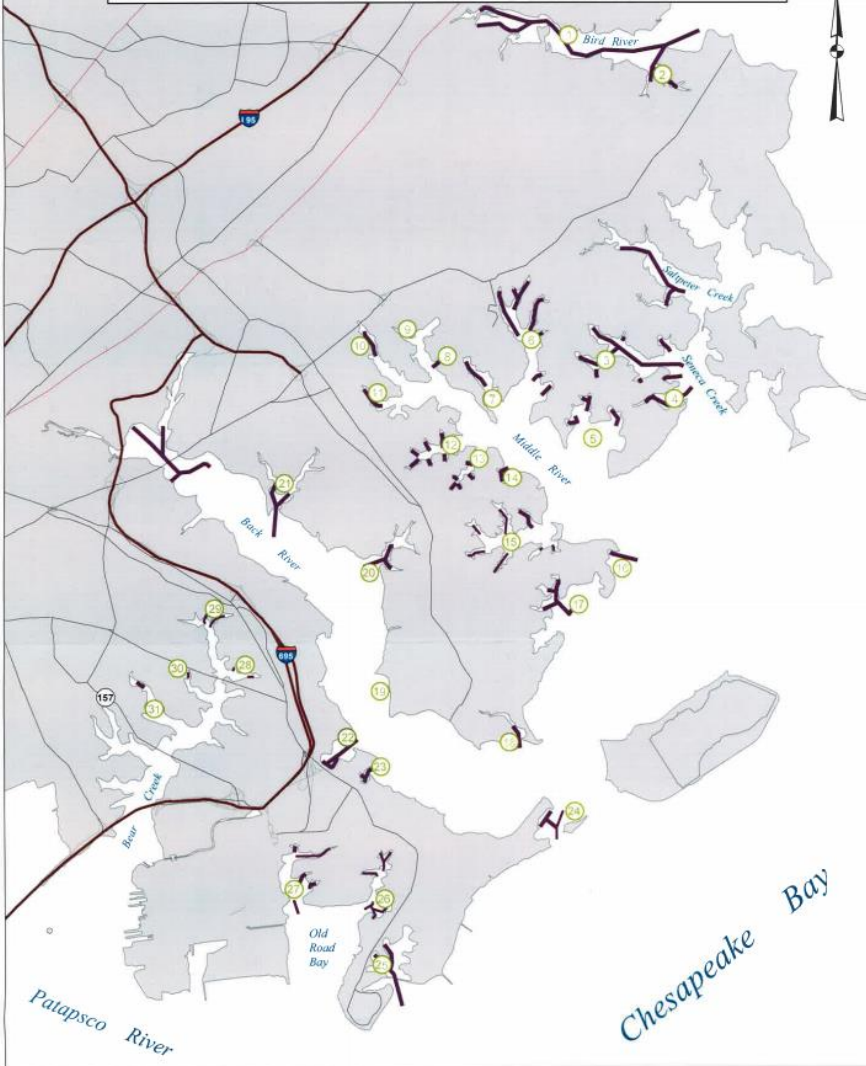
SAV Density	
no SAV	
>10% cover	
10% - 39% cover	
40% - 69% cover	
70% - 100% cover	



Baltimore County Department of Environmental Protection and Sustainability

- Parameters Measured: We measure the boundaries of SAV beds and individual species density.
- How do you measure those parameters? Our consultant uses rake collection in random grid patterns, as well as observing for floating pieces of SAV.
- Frequency Measured: 2 x per year
- Time Period of Collection: Surveys are conducted once in the spring (May 1-June 15) and once in the summer (July 15-Sept 30) of each year.
- Instrumentation Used: Pontoon boat, long handled rakes, Trimble GEO XH handheld GNSS receiver with integrated decimeter accuracy and Floodlight shadow reduction technology.

BALTIMORE COUNTY SAV SURVEYS 2010 + SURVEY LOCATION MAP

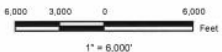


Reference Table of Surveyed Creeks

- | | |
|-----------------------|--------------------------|
| 1. Bird River | 17. Browns Cove |
| 2. Railroad Creek | 18. Longs Creek |
| 3. Seneca Creek | 19. Essex Skypark |
| 4. Goose Harbor | 20. Muddy Gut |
| 5. Galloway Creek | 21. Duck and Deep Creeks |
| 6. Frog Mortar Creek | 22. Greenhill Cove |
| 7. Starsbury Creek | 23. Lynch Point Cove |
| 8. Chestnut Cove | 24. Pleasure Island |
| 9. Dark Head Creek | 25. Shallow Creek |
| 10. Middle River Main | 26. North Point Creek |
| 11. Hopkins Creek | 27. Jones Creek |
| 12. Norman Creek | 28. Schoolhouse Cove |
| 13. Hogpen Creek | 29. Tabasco Cove |
| 14. Greyhound Cove | 30. Chink Creek |
| 15. Sue Creek | 31. Lynch Cove |
| 16. Breezy Point | |



BayLand
Consultants & Designers, Inc.
"Integrating Engineering and Environment"
1455 New Ridge Road, Suite T Phone: (410) 694-9401
Hanover, Maryland 21076 Fax: (410) 694-9405
Website: www.baylandinc.com



- 1 - 31 Surveyed Creek (See Reference Table)
- County Dredging Projects

Dredging Channels from Shoreline Enhancement Feasibility Study April 1998, BayLand Consultants & Designers, Inc. and from recent Baltimore County dredging design projects by BayLand Consultants & Designers, Inc. Shoreline provided by 2007 Baltimore County GIS Services. Roads provided by ES&I, Maryland Roads. Mapped by BayLand Consultants & Designers, Inc. Plot Date: December 2015