



CMC

Chesapeake Monitoring Cooperative

**Chesapeake Monitoring Cooperative:
Technical Assistance is on the Way!**

Chesapeake Monitoring Cooperative

A partnership that aims to provide **technical, logistical, and outreach support** for the integration of volunteer-based and nontraditional water quality and benthic macroinvertebrate monitoring data into the Chesapeake Bay Program (CBP) partnership.

Cooperative Agreement

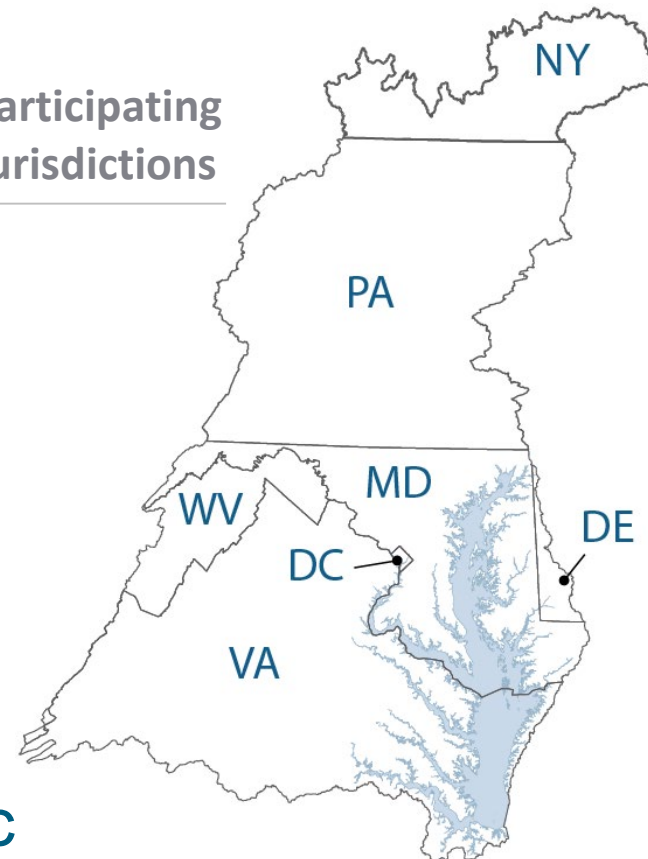


CMC development team partners & service providers



University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

Participating Jurisdictions



Meet the CMC Team



Liz Chudoba (ACB)
Project Manager



Emily Bialowas (IWLA)
Project Coordinator



Danielle Donkersloot
(IWLA)



Julie Vastine
(ALLARM)



Helen Schlimm
(ALLARM)

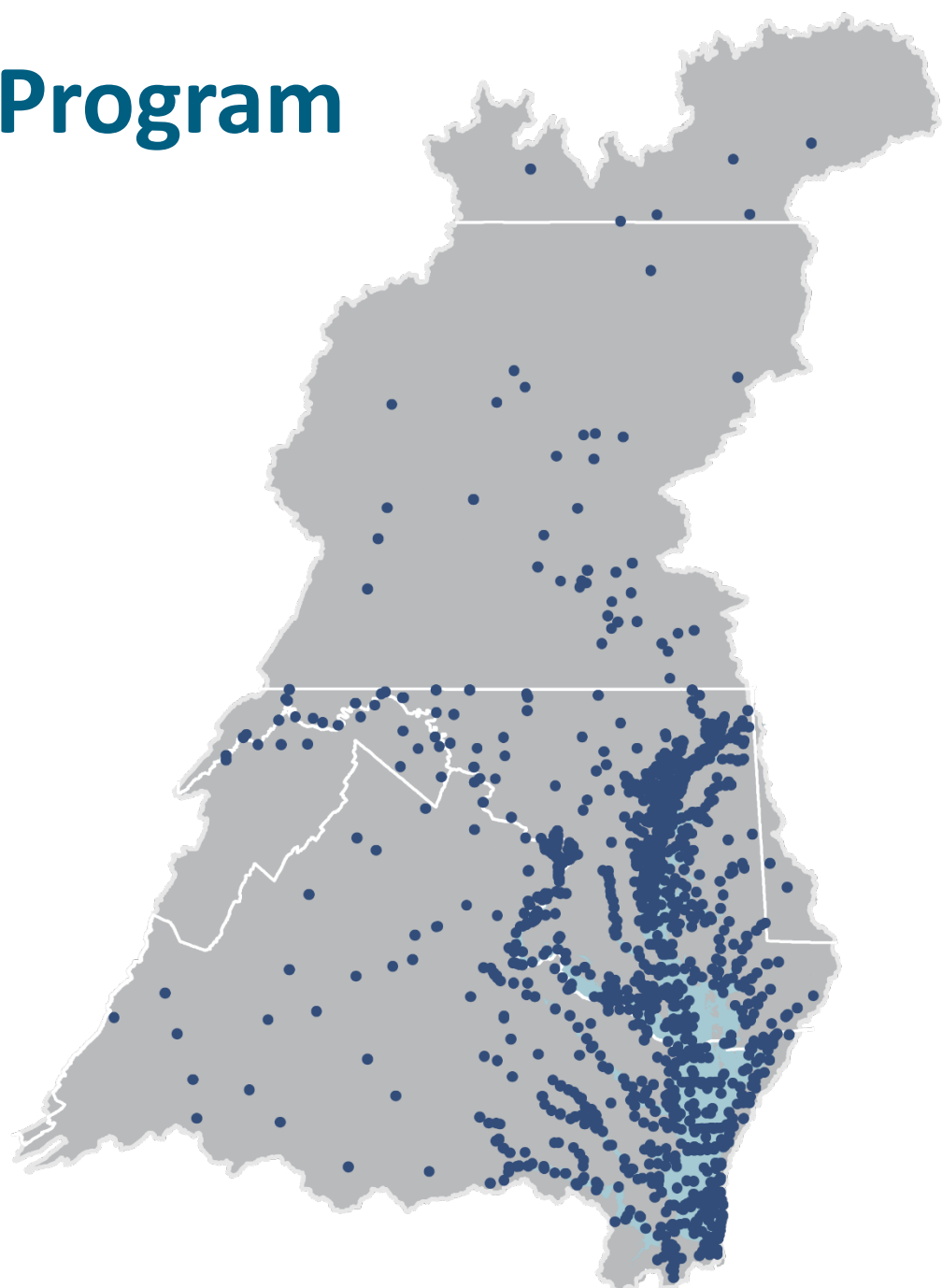


Caroline Donovan
(UMCES)

Chesapeake Bay Program Monitoring Sites

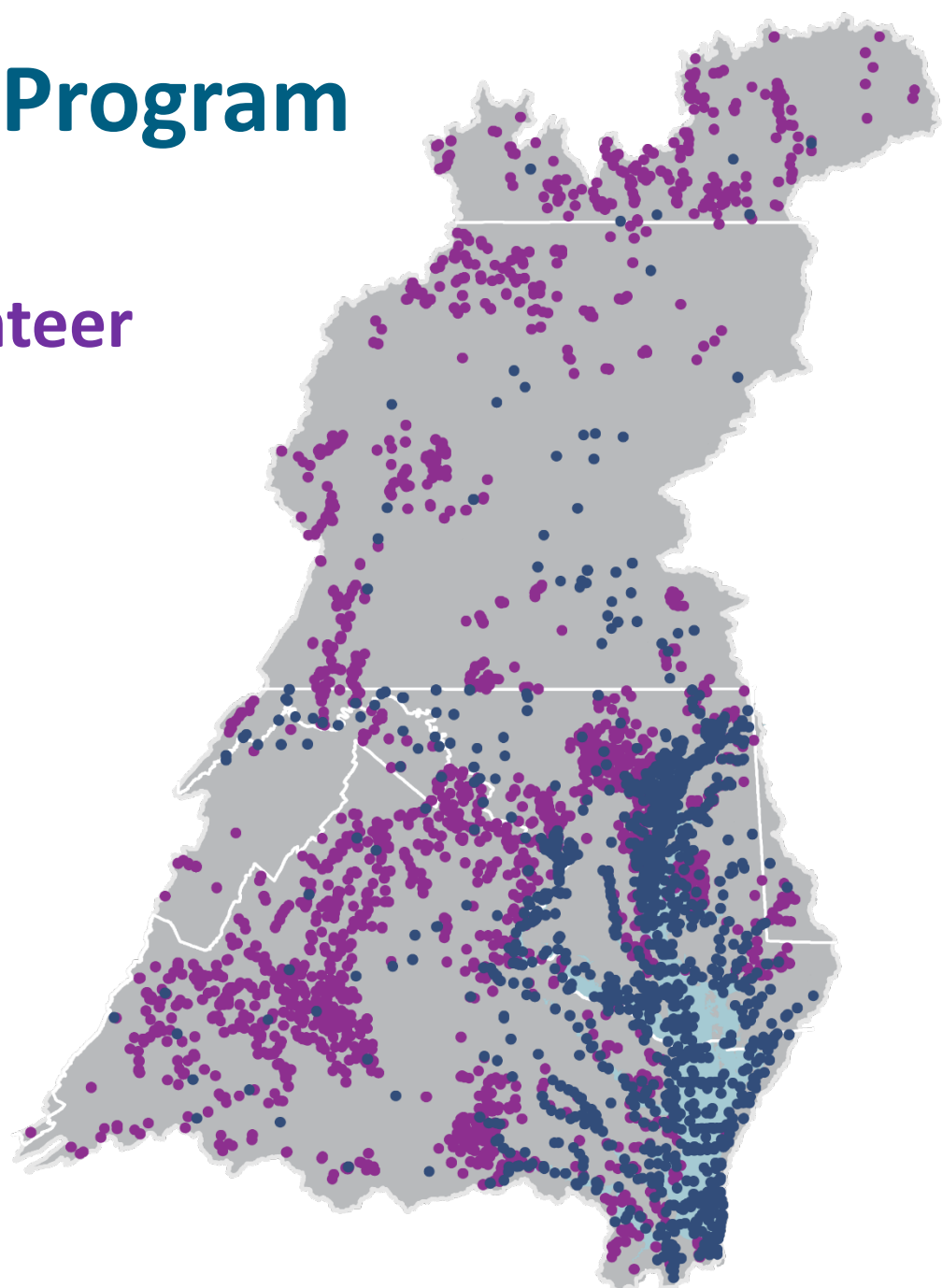
Coverage Includes

- Tidal water quality
- Benthic
- Non-tidal network



Chesapeake Bay Program Monitoring Sites

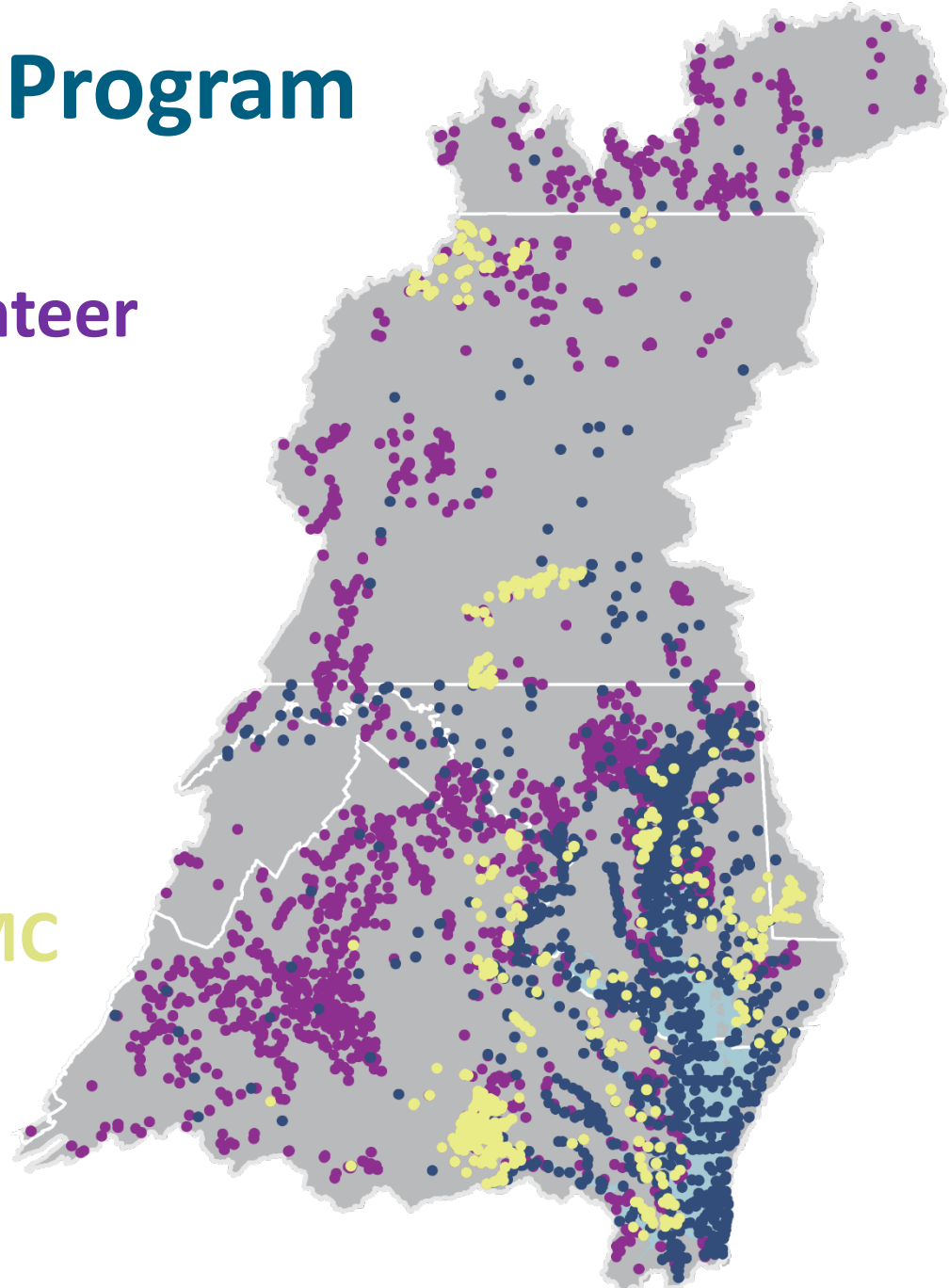
Chesapeake Bay Volunteer
and Nontraditional
Monitoring Sites



Chesapeake Bay Program Monitoring Sites

Chesapeake Bay Volunteer
and Nontraditional
Monitoring Sites

Chesapeake Bay
Volunteer and
Nontraditional
Monitoring Sites
Integrated into the CMC



Needs of the Chesapeake monitoring community



Photos courtesy of the Chesapeake Bay Program

Quality Assurance

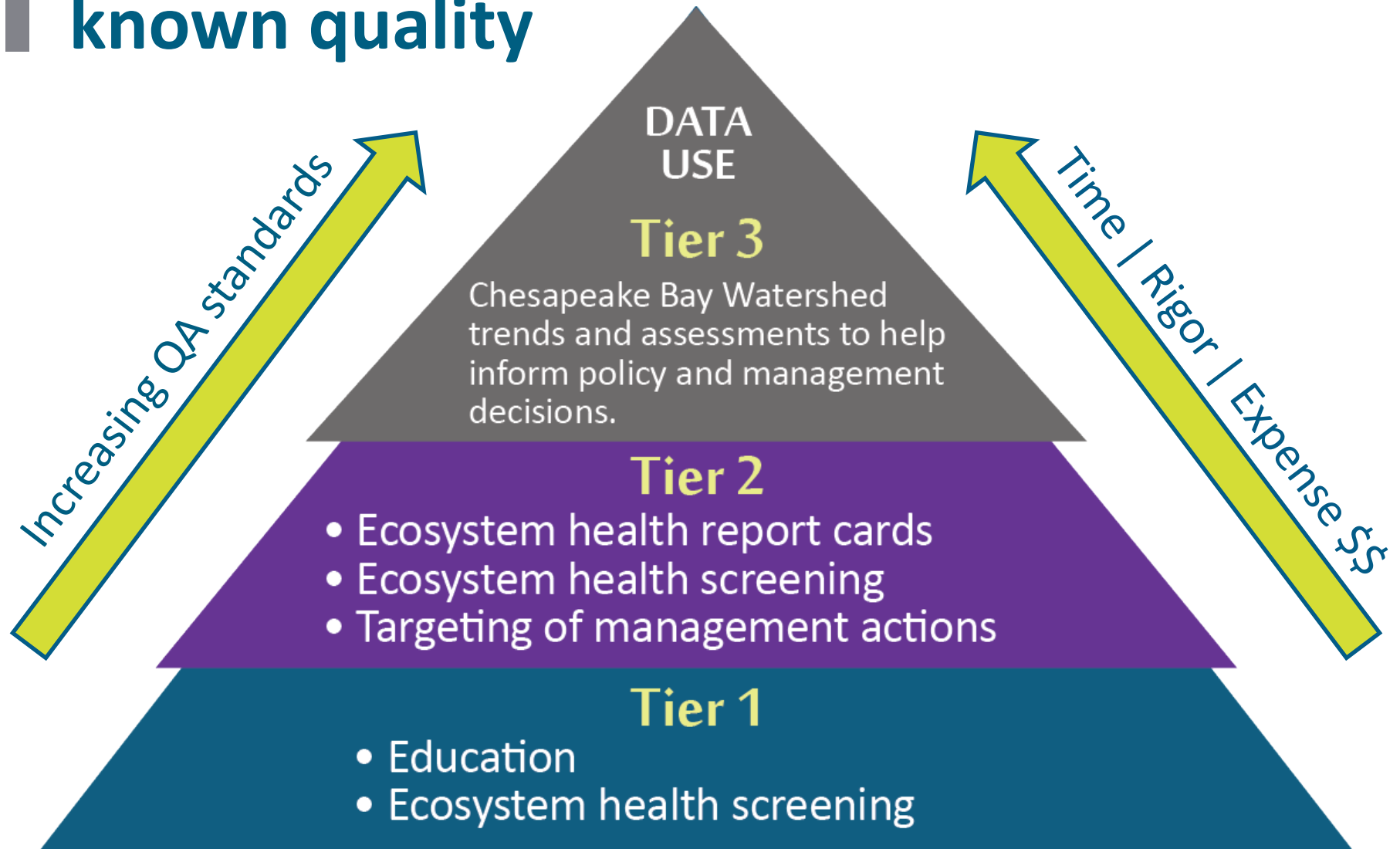
Comparability

Technical Support

Share Data

Collaboration

Quality Assurance: to classify data of known quality



Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING

AMONG

The State of Delaware, the District of Columbia, the State of Maryland, the State of New York, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, the State of West Virginia, the Interstate Commission on the Potomac River Basin, the Susquehanna River Basin Commission, the Metropolitan Washington Council of Governments, the United States Environmental Protection Agency, the United States Geological Survey, and the Chesapeake Bay Commission.

REGARDING

Using Citizen and Non-traditional Partner Monitoring Data to Assess Water Quality and Living Resource Status and Our Progress Toward Restoration of a Healthy Chesapeake Bay and Watershed

WHEREAS, the health of the Chesapeake Bay and its watershed depends on individual and community-based stewardship by the more than 18 million people who call this watershed home;

WHEREAS, the Chesapeake Bay Program is a leader in leveraging resources through a partnership approach;

WHEREAS, individuals, watershed groups, schools, local governments, and other organizations volunteer their time and talents by participating in environmental monitoring programs; and this *citizen science* represents a unique opportunity for advancing our knowledge while supporting education and community service;

WHEREAS, the cost of monitoring and assessment of tidal and non-tidal waters as well as other ecosystems in the Chesapeake Bay watershed exceeds the capabilities of individual partners and surpasses current funding within the jurisdictions, it is essential that all data sources of known quality be integrated into our monitoring networks;

WHEREAS, data resulting from volunteer and nontraditional partner monitoring, and citizen science efforts can inform impact assessments of local conservation actions as well as decisions that support targeting of management practices that will restore and sustain the health of habitats, living resources and communities across the Bay watershed;

WHEREAS, the Chesapeake Monitoring Cooperative (CMC) has created a framework to facilitate the collection and integration of volunteer and nontraditional partner monitoring efforts into the U.S. Environmental Protection Agency's Chesapeake Bay Program that represents a unique

collaboration and network of monitoring groups across all six states and the District of Columbia;

NOW, THEREFORE, we, the undersigned representatives of the District, state, interstate, and federal entities with responsibility for monitoring the waters and resources of the Chesapeake Bay and its watershed agree that we will:

- Work cooperatively with the CMC and the Chesapeake Bay Program partnership to support and sustain a network of citizen science and non-traditional monitoring partners.
- Work to support an open-access clearinghouse of quality-assured environmental data generated by citizen scientists and nontraditional partners integrate this data into monitoring networks for educational, management, targeting and regulatory assessment applications.
- Promote the collection of water quality, benthic macroinvertebrate, and other monitoring data by non-traditional partners, such as, local and regional organizations, agencies, and/or educational institutions.
- Develop and adopt methods for data integration into regional monitoring and assessment strategies.
- Collaborate with the CMC in training of volunteer and non-traditional partner monitoring efforts.
- Support and actively contribute to the review and implementation of standard protocols and quality assurance programs to produce data of known and documented quality across all seven watershed jurisdictions.

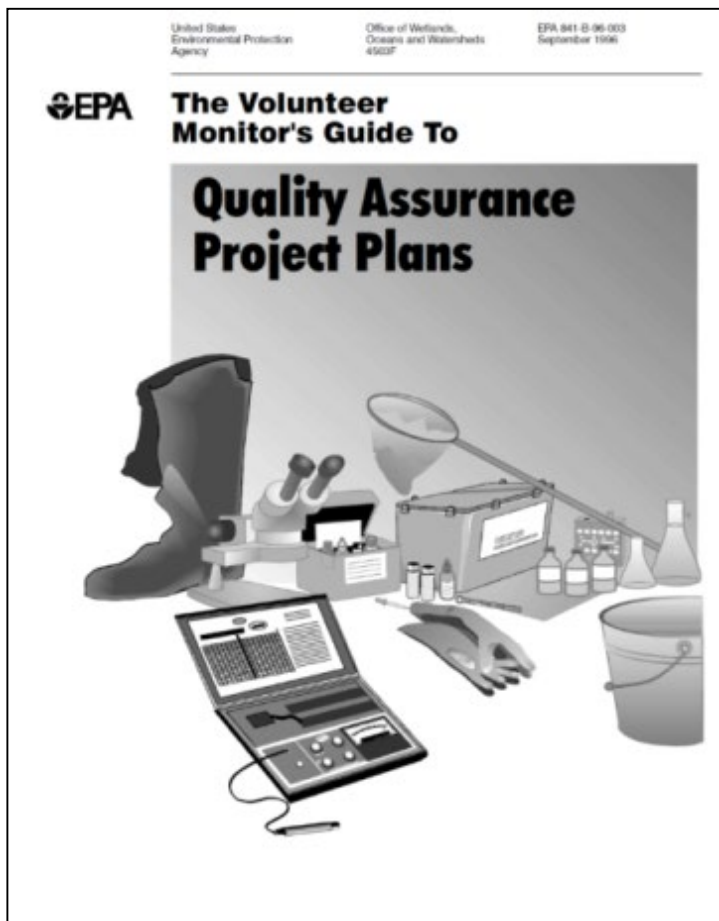
Purpose is to forge a deeper understanding of and commitment to the use of citizen-based and other non-tradition partners' monitoring data in individual partners and shared partnership decision making.

Technical Support **Resources**

- Quality Assurance Project Plans – Tier 1 & 2
- Standard Operating Procedures (SOPs) – Tier 1 & 2
- User-friendly Methods Manuals
- Indicator Fact Sheets
- Prioritization Report: How volunteer and nontraditional monitoring can help fill data gaps in the Chesapeake Bay Watershed

Let's take a quick look!

Quality Assurance Project Plans



Water Quality Monitoring:
Tidal streams (Tier 1 & 2)
Nontidal streams (Tier 1 & 2)

Benthic Macroinvertebrate Monitoring:
Nontidal wadable streams (Tier 1 & 2)

Approved by EPA



User-friendly Method Manuals

TIDAL METHODS MANUAL



NON-TIDAL METHODS MANUAL



NONTIDAL BENTHIC MACROINVERTEBRATE METHODS MANUAL

LOWER WATERSHED



User-friendly Method Manuals

How the manual is organized

NOTE

There are notes highlighted in yellow (like this one) to remind you of important things such as safety, replicates, and best practices. Be sure to read these and take note of their contents.

Each method will have a few options for how to approach sampling. You will need to work with your monitoring coordinator to define which one works for your monitoring plan.

In order to help you pin point what piece of a method you will be using, there are visual buttons to help you quickly find what you need.

Blue circular buttons represent the tool that you will use to collect your sample, including directly in the waterway, a bucket, a probe, or with a sampling pole.

Purple hollow circles represent the platforms from which you will be collecting your samples, including wading in the waterway, from a boat, from a bridge, and from a dock. If you are sampling from the shore, try to take note of the method for wading into the waterway and apply those concepts to your sampling.

TOOLS



Probe



Sampling pole



Bucket



Direct collection



Secchi disk

PLATFORMS



Boat



Dock



Bridge



Wade in

User-friendly Method Manuals

How

NOTE

There are notes highlighted such as safety, replicates, and their contents.

Each method will have a few with your monitoring coordinator.

In order to help you pin point buttons to help you quickly find

Blue circular buttons represent directly in the waterway, a button

Purple hollow circles represent samples, including wading in the waterway and apply those colors

TOOLS



Probe



Sampling pole



Direct collection



Secondary

TEMPERATURE

GATHERING MATERIALS AND EQUIPMENT LIST

- Armored glass thermometer, digital thermistor, or probe
- Tape measurer with weight at end (for depth profile sampling only)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

Check your thermometer or probe for optimal operation.

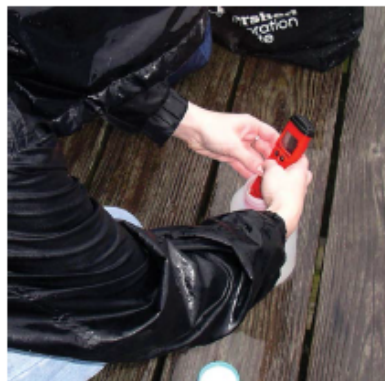
Traditional armored glass thermometer:

1. Check the column and confirm it is not separated.

2. Look for cracks or breaks in the glass.

Digital thermometer & probe:

1. Look for any bends in the metal or exposed wires.
2. Check the battery life.
3. Make sure all openings are sealed tight.



Credit: Peter Bergstrom

CALIBRATION

You do not need to calibrate your thermometer before going into the field. But do not forget to have it checked once a year by your monitoring coordinator.

BEFORE SAMPLING

User-friendly Method Manuals

How

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TOOLS



Probe



Sampling pole



Direct collection



Seco

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CALIBRATION

You do not need to calibrate yo forget to have it checked once

BE

TEMPERATURE

Air temperature

1. Locate a place near your site out of the direct sun.
2. Wait a few minutes to allow the thermometer to equilibrate (the value should not change in 10 seconds).
3. Record air temperature to the nearest 0.5 °C for the armored thermometer or the readout listed on the digital thermistor or probe on your data sheet.

NOTE

Always measure air temperature before water temperature!

A wet thermometer can alter your air temperature readings.

Water temperature

A. FROM A BOAT, DOCK, OR BRIDGE



I. Surface sampling with a probe, armored glass thermometer, or digital thermistor

1. Place your probe 0.5 m beneath the surface of the water if sampling in Maryland or 1.0 m beneath the surface if sampling in Virginia.
2. Wait for the probe to stabilize.
3. Record your temperature reading and the depth at which it was measured.

User-friendly Method Manuals

How

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Water temperature

A. FROM A BOAT, DOCK, O



I. Surface sampling thermistor

1. Place your pro Maryland or 1
2. Wait for the p
3. Record your te

TEMPERATURE

AFTER SAMPLE CALIBRATION CHECK

You do not need to perform a calibration check after sampling.

EQUIPMENT CLEANING AND STORAGE

1. Dry off all equipment.
2. Replace any protective caps.
3. Store armored glass thermometers upright to reduce column separation.
4. Store equipment in a cool dry place.

AFTER SAMPLING

Indicator Fact Sheets

BACTERIA

What is it?
Bacteria and other organisms are affected by temperature and currents.

How is it measured?
The bacteria water occurs in techniques to a lab, bacteria counted, come from to human bacteria.

What can it tell us?
Bacteria animals naturally humans broken illness in rainfall, in the Bay health of more info.

Top: High tide is closed off growing m.

Top: Sampling collects chlorophyll of varying ca.

CHLOROPHYLL

What is it?
Chlorophyll convert sunlight into energy through photosynthesis. The several predominant and saltwater measure of.

How is it measured?
Chlorophyll sample collected by lab analysis, spectrophotometer, chromatography of pigment chlorophyll.

What can it tell us?
Chlorophyll Bay. Algae of tidal ecology. Excess algae cause eutrophication, which is a concentration of fuel plants, algae level of chlorophyll available. Chlorophyll conclusion local water.

Top: Conductivity (a measure of the interactions between ions) is affected by salinity (A. Jones).

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CONDUCTIVITY & SALINITY

What are conductivity and salinity?
Conductivity is a measure of the ability of water to conduct an electrical current. Salinity is the amount of dissolved salts in water. All organisms need a certain level of salinity to survive.

How are they measured?
Conductivity (just conductivity probe) and salinity (salinity probe) are used. In order to get accurate readings, the probe must be calibrated and the water must be stirred.

What can conductivity and salinity tell us?
Conductivity changes into ions when it is dissolved. How specific types of ions can cause shifts in the region. Increase the pH of the water plants and fish.

Top: Conductivity (a measure of the interactions between ions) is affected by salinity (A. Jones).

What is salinity?
Salinity is the amount of dissolved salts in water. The concentration of salt in water, measured in parts per thousand (ppt).

How is it measured?
Salinity is measured by using a salinity probe or a refractometer.

What can salinity tell us?
Salinity is a measure of the amount of dissolved salts in water. Salinity is important for the health of many organisms, including fish and plants.

Top: Salinity (a measure of the amount of dissolved salts in water) is important for the health of many organisms, including fish and plants (A. Jones).

SILICATE TOTAL WATER DEPTH

What is silicate?
Silicate is a dissolved mineral in water. It is a major component of many minerals and is important for the health of many organisms.

How is it measured?
The amount of silicate in water is measured by using a spectrophotometer.

What can silicate tell us?
Some types of dissolved silicate are used by organisms to build their cell walls. Silicate is also a nutrient for many organisms, including diatoms and some algae.

Top: Collecting water samples (A. Jones).

What is total water depth?

Measuring the depth of the water helps characterize a site. A site can be shallow, deep, or within a navigational channel. Tides affect total water depth, so the total depth of a site can change depending on when it is sampled. Knowing the depth is an important first step before taking any measurements. Total water depth is needed to determine where to start measuring dissolved oxygen using a probe—you do not want the probe to hit the bottom, which can disturb sediments and lead to incorrect measurements.

How is total water depth measured?

Total water depth is measured by lowering a weighted line into the water and reading the depth marking on the line when it hits bottom.

What can total water depth tell us about the Bay?

Total water depth of sampling sites is part of the physical characteristics of an ecosystem. Shallow sites respond differently to changing conditions than deeper sites. Total depth can help determine if sedimentation is a problem. Sediment runoff from farms, roads, and residential and commercial development can affect total water depth over time. The sediment settles to the bottom of tidal creeks, slowly filling in shallow waterways, smothering shellfish and seagrass, and leading to low oxygen conditions. Sedimentation can be tracked by measuring total water depth over time. Adjusting for tidal changes must occur to determine if total water depth is decreasing or increasing.



Total water depth is measured by lowering a weighted line into the water and recording the depth markings on the line (MD DNR).

NITROGEN

What is it?
Nitrogen is a major component of Earth's atmosphere. Bacteria and other organisms grow. Plants and animals need nitrogen to survive.

How is it measured?
pH is a measure of the acidity or basicity of a solution. It is measured on a scale from 0 to 14, with 7 being neutral. Values below 7 are acidic, and values above 7 are basic.

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pH

PHOSPHORUS

DISSOLVED OXYGEN

What is dissolved oxygen?
Dissolved oxygen is the amount of oxygen gas that is dissolved in water. It is a critical component of the aquatic environment and is needed for the survival of many organisms.

How is it measured?
Dissolved oxygen is measured by using a dissolved oxygen probe or a Winkler titration.

What can dissolved oxygen tell us?
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Dissolved oxygen can be measured by using a dissolved oxygen probe or a Winkler titration.

Seasonal temperature chart (bottom, C. Donovan) affects water temperature can be Chesapeake Bay Program.

AIR & WATER TEMPERATURE

What are air and water temperature?

Temperature measures the average kinetic energy of the particles in a substance. Both air and water temperature are important for the health of many organisms.

How is temperature measured?
Air and water temperature are measured by using a thermometer.

What can air and water temperature tell us?
Temperature affects the physical characteristics of a substance. It is a critical component of the aquatic environment and is needed for the survival of many organisms.

What can air and water temperature tell us about the Bay?
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Seasonal temperature chart (bottom, C. Donovan) affects water temperature can be Chesapeake Bay Program.

WATER CLARITY & TURBIDITY

What are water clarity & turbidity?

Water clarity is a measure of how much light penetrates through the water column. Sediment, plankton, and other organic materials can become suspended in the water. These floating particles make the water less clear and block light from traveling through water. Turbidity is a measure of the cloudiness of the water itself.

How are they measured?

Water clarity (m) is measured in the field using a Secchi disk attached to a drop line. A transparency tube can be used to measure clarity when a sample site has a current that is too fast or a depth that is too shallow for a Secchi disk to function properly. Turbidity (NTU) is measured in the field, with a kit, by comparing the cloudiness of a water sample to a standardized amount of turbid water.

What can water clarity & turbidity tell us about the Bay?

Clear water is critical for the growth and survival of aquatic species. Aquatic grasses and other plants grow best in clear water because sunlight can pass through the water column to deeper depths and support photosynthesis. Fish, crabs, and other aquatic organisms also rely on clear water to see the environment, catch prey, and breathe.

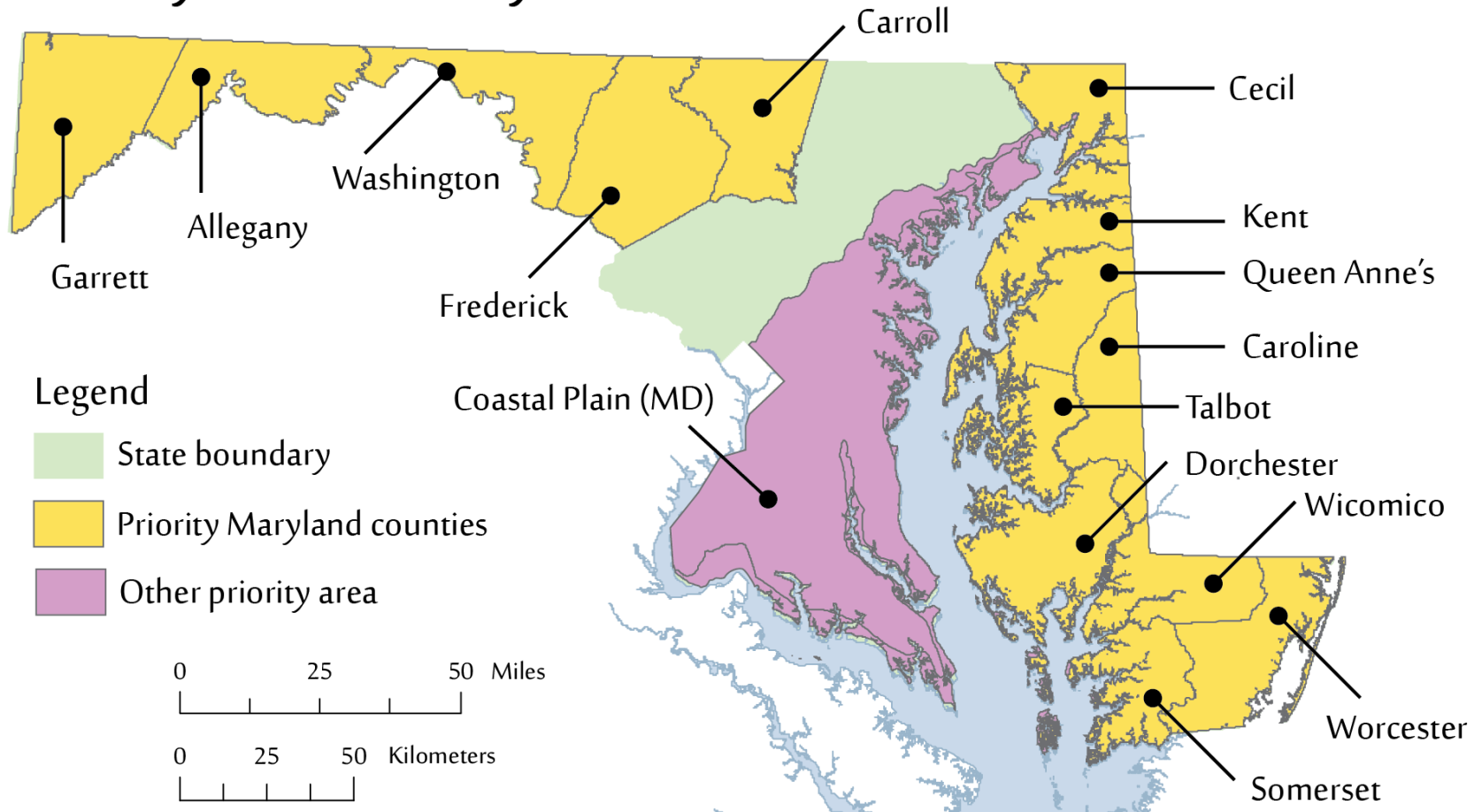
Poor water clarity and high turbidity are usually caused by a combination of excess suspended sediments in the water, due to runoff from land, and growth of phytoplankton, which is fueled by nutrients.



A Secchi disk on a drop line (top) and a transparency tube (bottom) can be used to measure water clarity (M. Rath, UMCES). Middle: A Secchi disk is lowered into the water until the depth where the black and white disk can not be seen (A. Jones).

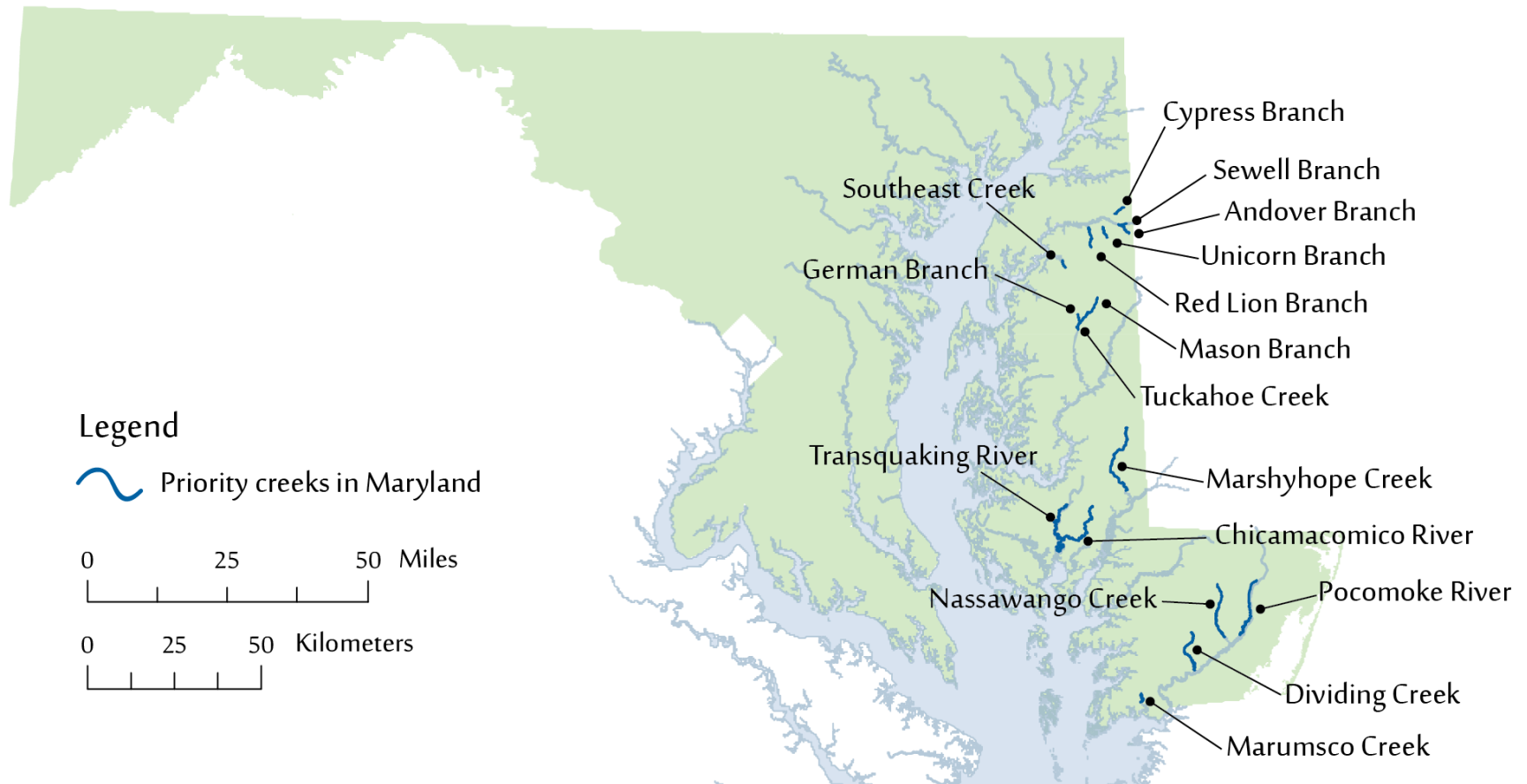
Prioritization Report

Priority Areas in Maryland



Prioritization Report

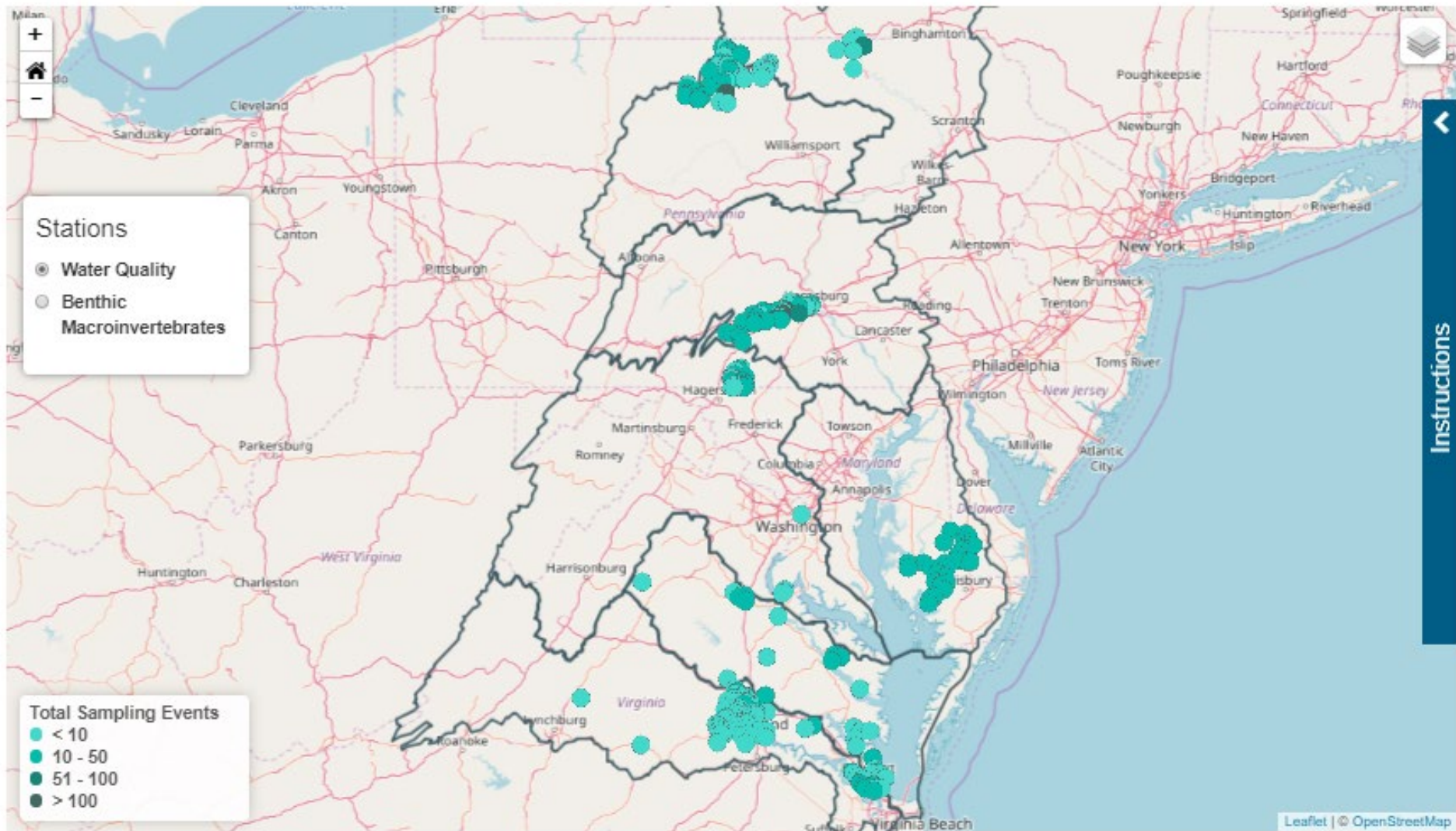
Priority Creeks in Maryland Identified by MDE



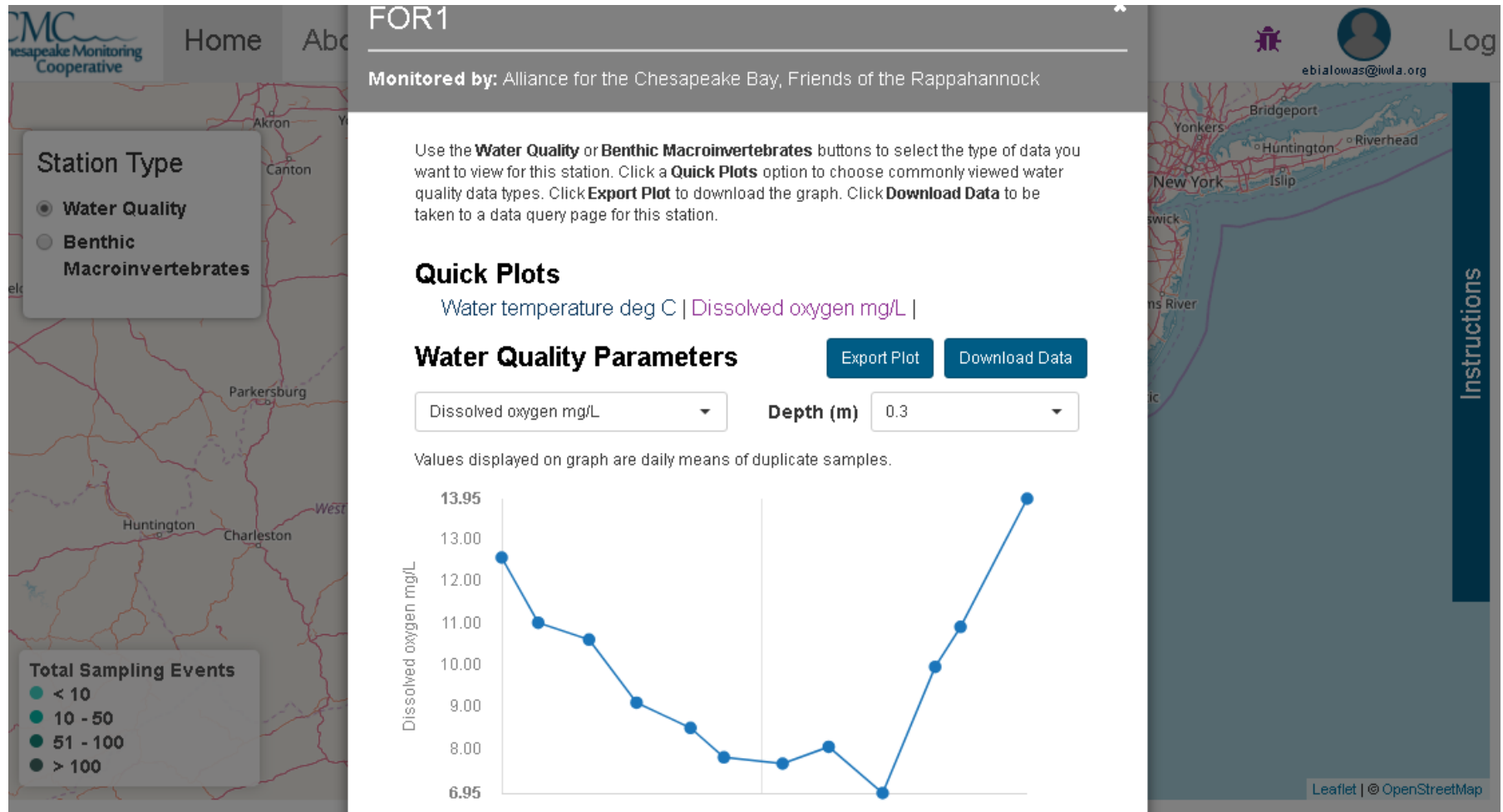
Technical Support **Services**

- Study Design Workshops
- Water Quality and Benthic Macroinvertebrate Monitoring Trainings, Certifications, and Re-certs
- Benthic Macroinvertebrate Order Level Identification
- Equipment and Equipment Suggestions
- QA trouble shooting
- Data Interpretation and Report Card Workshops
- Data Verification & Quality Control
- Support for Data Cleaning and Data Uploads

Share Data: Chesapeake Data Explorer



Share Data: Chesapeake Data Explorer



Share Data: Chesapeake Data Explorer

CMC Chesapeake Monitoring Cooperative

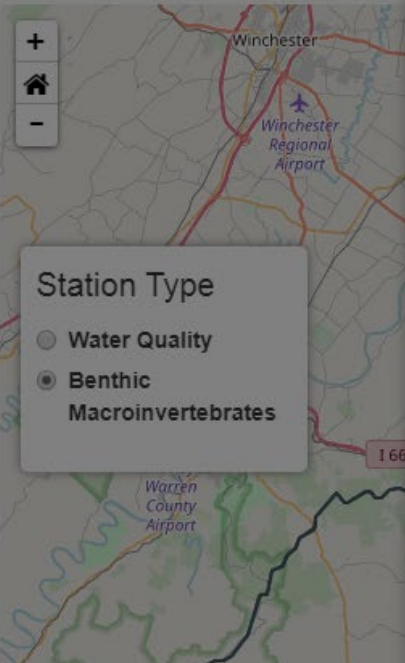
Home About

This is your gateway into data collected by a...
or to view Water Quality or Benthic Macroinvertebrates

Map Query

Station Type

- ☐ Water Quality
- ☒ Benthic Macroinvertebrates

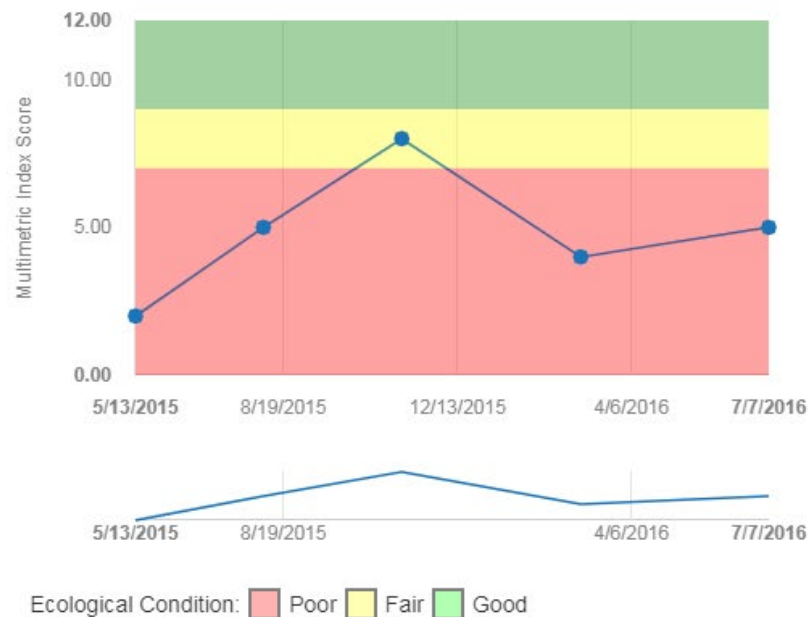


Use the **Water Quality** or **Benthic Macroinvertebrates** buttons to select the type of data you want to view for this station. Click a **Quick Plots** option to choose commonly viewed water quality data types. Click **Export Plot** to download the graph. Click **Download Data** to be taken to a data query page for this station.

Benthic Metrics

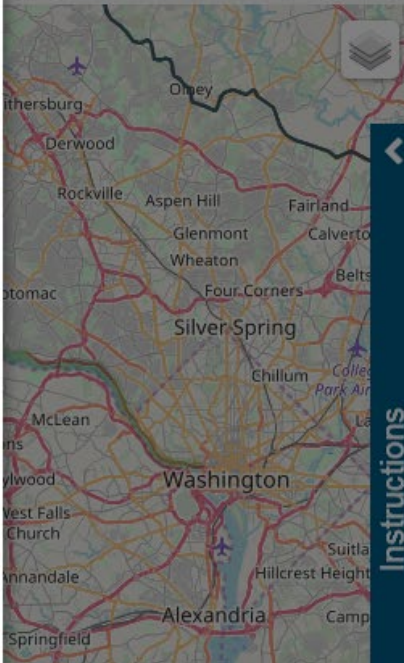
Export Plot

Download Data



ebislowas@wla.org Log off

Investigate information about the database
our database.



Instructions

STEPS TO BECOME A CMC PARTNER

Share Data: **Chesapeake Data Explorer**



Application for Assistance

To apply for assistance:

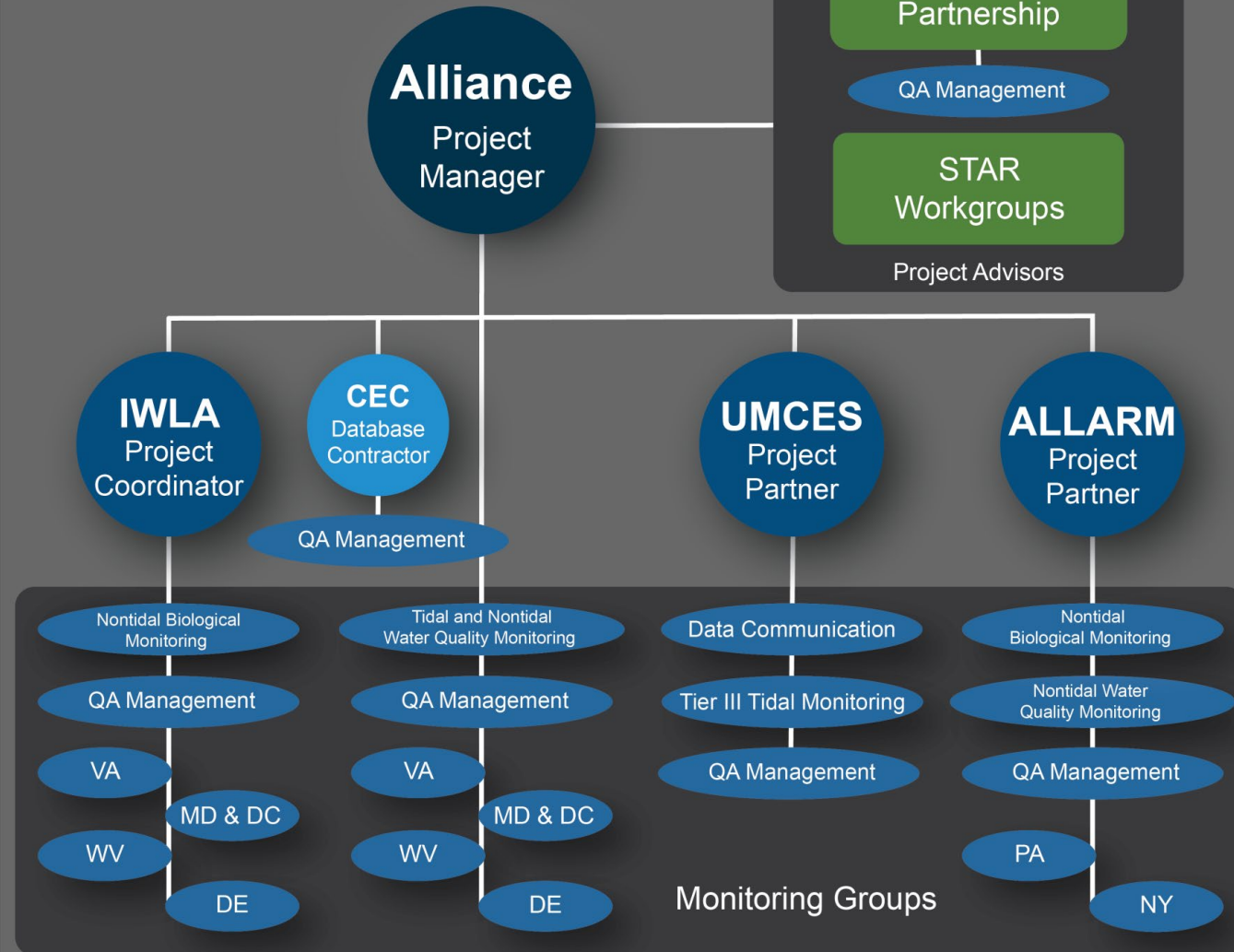
STEP 1

- 1) Complete the brief Application form.
 - i. Basic organizational and contact information
 - ii. Checklist of technical assistance needs
 - iii. Open-ended Q's about the purpose for technical assistance
 - iv. Identify service providers you've previously worked with
- 2) Email the completed form to Liz Chudoba at: lichudoba@allianceforthebay.org.

Connect with a CMC Service Provider

STEP 2

QA and Technical Support Services Organizational Chart



On Boarding

STEP 3

New Monitoring Groups – the CMC service provider works with each group to conduct a Study Design workshop, Training workshops and equipment selection.

OR

Existing Monitoring Groups – the CMC service provider works with each group to review current quality assurance and standard operating procedures to determine Tier level.

Enter Data into Chesapeake Data Explorer

STEP 4

Minimum eligibility requirements:

- GPS coordinates of your monitoring sites
- Documented methods
- Documented quality assurance procedures



Questions?