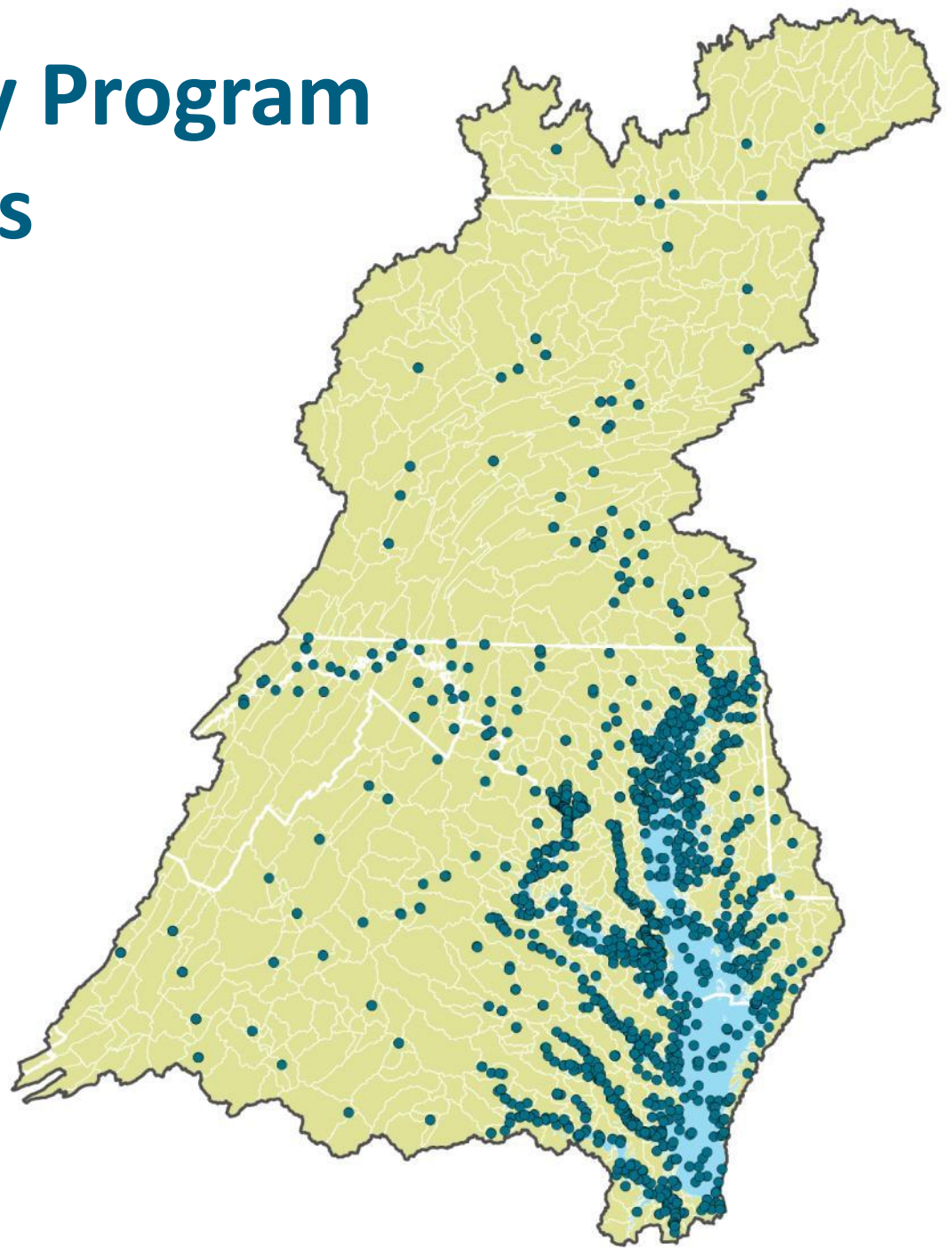




Project Update: Citizen and Nontraditional Monitoring – ACB CB96334901

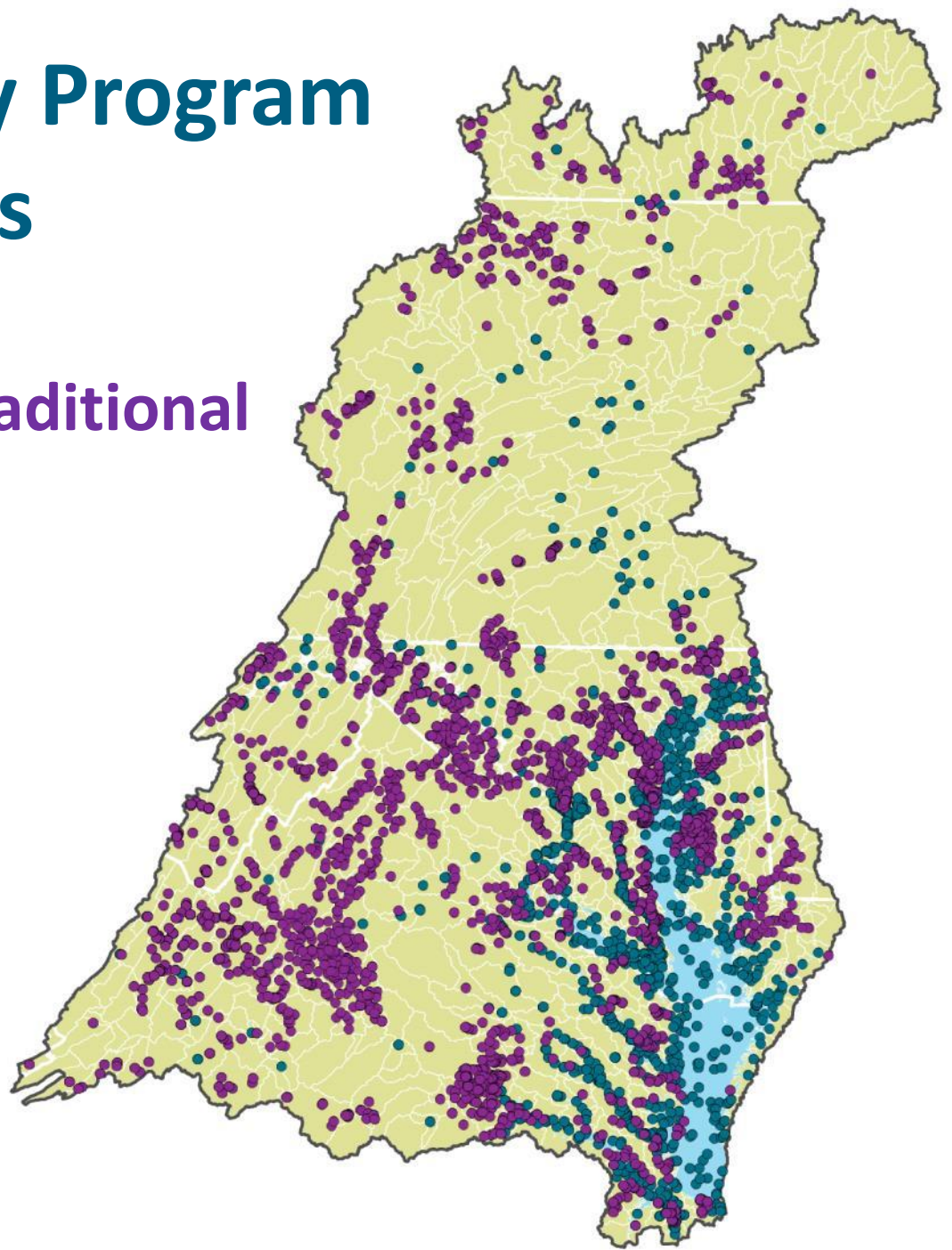
Liz Chudoba – Program Manager, Alliance for the Chesapeake Bay
Emily Bialowas – Program Coordinator, Izaak Walton League of America
Peter Tango- USGS

Chesapeake Bay Program Monitoring Sites



Chesapeake Bay Program Monitoring Sites

Plus Chesapeake Bay
Volunteer and Nontraditional
Monitoring Sites



Needs of the Chesapeake monitoring community



Photos courtesy of the Chesapeake Bay Program

Quality Assurance

Comparability

Technical Support

Share Data

Collaboration

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

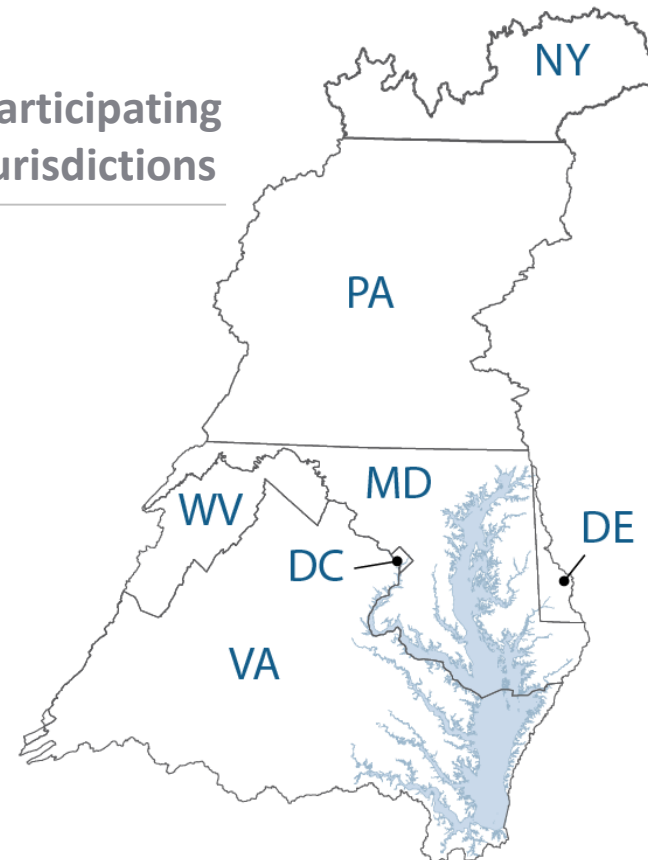


CMC development team partners & service providers



University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

Participating Jurisdictions



The CMC Team



Tidal Tier III data integration
and data interpretation.

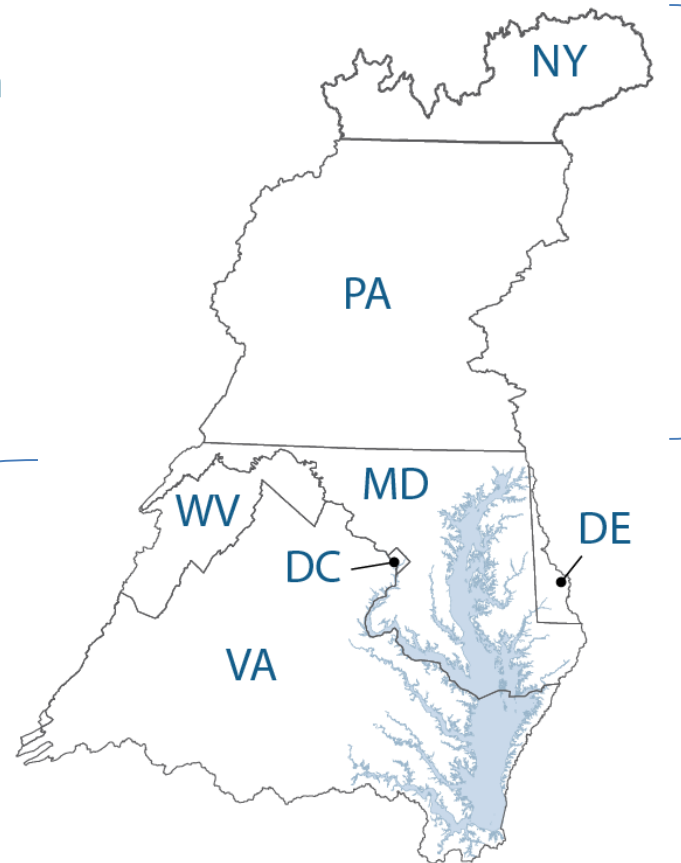
Benthic
macroinvertebrate
and water quality
monitoring training
and QA



Benthic
macroinvertebrate
monitoring training
and QA



Water quality
monitoring training
and QA



The CMC Team



Liz Chudoba (ACB)
Project Manager



Emily Bialowas (IWLA)
Project Coordinator



Nissa Dean (ACB)



Danielle Donkersloot (IWLA)



Julie Vastine (ALLARM)



Jinnie Monismith (ALLARM)



Caroline Donovan (UMCES)



Alex Fries (UMCES)

Types of Data

1. Tidal Water Quality
2. Non-Tidal Water Quality
3. Benthic Macroinvertebrate



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 in:
Tidal streams (Tier 1 & 2)
Nontidal streams (Tier 1 & 2)

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

Tier 3 water quality data:
Candidates will be nominated by
the CMC and subsequently audited
by the Data Integrity Workgroup.

Standard Operating Procedures

Standard Operating Procedures for Tidal Monitoring

Integration of Citizen-based and Nontraditional Monitoring into the Chesapeake Bay Program Partnership

Prepared by:

Alliance for the Chesapeake Bay

In cooperation with
Maryland Department of Environmental Science, Alliance for Aquatic Resource Monitoring, and the Izaak Walton League of America



ian.umces.edu



May 2017

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

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

These are a compilation of the most commonly used methods throughout the watershed. They are not a comprehensive list of every method available.

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 coordinates

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

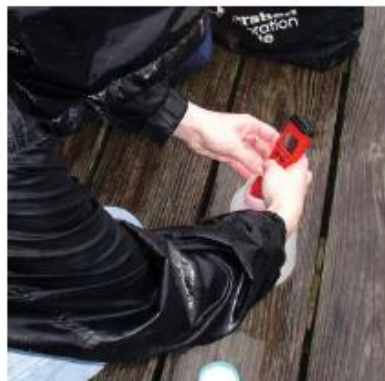
Check your thermometer or probe for optimal operation.

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

NOTE

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

Each method will have a few with your monitoring coordin

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

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Purple hollow circles represent samples, including wading in If you are sampling from the waterway and apply those co

TOOLS



Probe



Sampling pole



Direct collection



Seco

GATHERING MATERIALS A

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

CHECKING YOUR EQUIPM

Check your thermometer or pr optimal operation.

Traditional armored glass therm

1. Check the column and confir separated.

Digital thermometer & probe:

1. Look for any bends in the me exposed wires.
2. Check the battery life.
3. Make sure all openings are s

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

NOTE

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

Each method will have a few with your monitoring coordin

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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.

Indicator Factsheets

BACTERIA

CHLOROPHYLL

CONDUCTIVITY & SALINITY

SILICATE

TOTAL WATER DEPTH

NITROGEN

pH

PHOSPHORUS

DISSOLVED OXYGEN

AIR & WATER TEMPERATURE

WATER CLARITY & TURBIDITY

What is silicate?

Silicate is a measure of the (dissolved) silica in the water. Silicate minerals on the land off the land and into local

How is silicate measured?

The amount of dissolved in the water is measured. To measure silicate, a water bottle and sent to a lab spectrophotometer.

What can silicate tell us about the Bay?

Some types of microalgae dissolved silica as a structural cell walls. Microalgae blooms can be dominated by diatoms and radiolarians. Diatoms are fueled by excess nutrients and phosphorus. Diatoms are available in the water column. When large amounts of decomposition process oxygen conditions, which organisms, such as macro

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 DNH).



Top: Collecting a water sample ("Chesapeake Bay" logo)

What is nitrogen?

Nitrogen is an essential element for life. Bacteria and plants use atmospheric nitrogen to grow. Plants use nitrogen to produce proteins and

What is pH?

pH is a measure of the acidity or basicity of a solution. It provides a measure of the concentration of hydrogen ions in a solution. A pH of 7 is neutral, below 7 is acidic, and above 7 is basic. pH is an important factor in determining the solubility of many substances and the rate of chemical reactions.

What is phosphorus?

Phosphorus is an essential element for life. It is used by plants and animals to produce energy and to build bones and teeth. Phosphorus is also a key component of many biological molecules, including DNA and RNA.

What is dissolved oxygen?

Dissolved oxygen is the amount of oxygen gas that is dissolved in water. It is essential for the survival of most aquatic organisms. Dissolved oxygen levels can be affected by many factors, including temperature, salinity, and the amount of photosynthesis occurring in the water.

How is temperature measured?

Dissolved oxygen is measured using a probe that is lowered into the water. The probe measures the amount of oxygen gas that is dissolved in the water. The measurement is then converted to a percentage of saturation.

What can air and water temperature tell us about the Bay?

Air and water temperature are important factors in determining the physical characteristics of an ecosystem. Temperature affects the rate of chemical reactions and the solubility of many substances. It also affects the behavior of many organisms, including the timing of reproduction and migration.

Dissolved oxygen is measured using a probe that is lowered into the water. The probe measures the amount of oxygen gas that is dissolved in the water. The measurement is then converted to a percentage of saturation.

What are air and water temperature?

Temperature is a measure of the average kinetic energy of the particles in a substance. It is a key factor in determining the physical characteristics of an ecosystem. Temperature affects the rate of chemical reactions and the solubility of many substances. It also affects the behavior of many organisms, including the timing of reproduction and migration.

How is temperature measured?

Air and water temperature are measured using a thermometer. The thermometer is lowered into the water and the temperature is read. The measurement is then converted to a percentage of saturation.

What can air and water temperature tell us about the Bay?

Temperature is a key factor in determining the physical characteristics of an ecosystem. Temperature affects the rate of chemical reactions and the solubility of many substances. It also affects the behavior of many organisms, including the timing of reproduction and migration.

Seasonal temperature changes in the Chesapeake Bay (MD DNH)

What are water clarity and turbidity?

Water clarity is a measure of how much light penetrates through the water column. Turbidity is a measure of the cloudiness of the water. These factors are important in determining the physical characteristics of an ecosystem. Water clarity and turbidity are affected by many factors, including sedimentation, phytoplankton, and the amount of photosynthesis occurring in the water.

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 (JTU) 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 and 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. Roth, 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).



Top: Collecting a water sample ("Chesapeake Bay" logo)



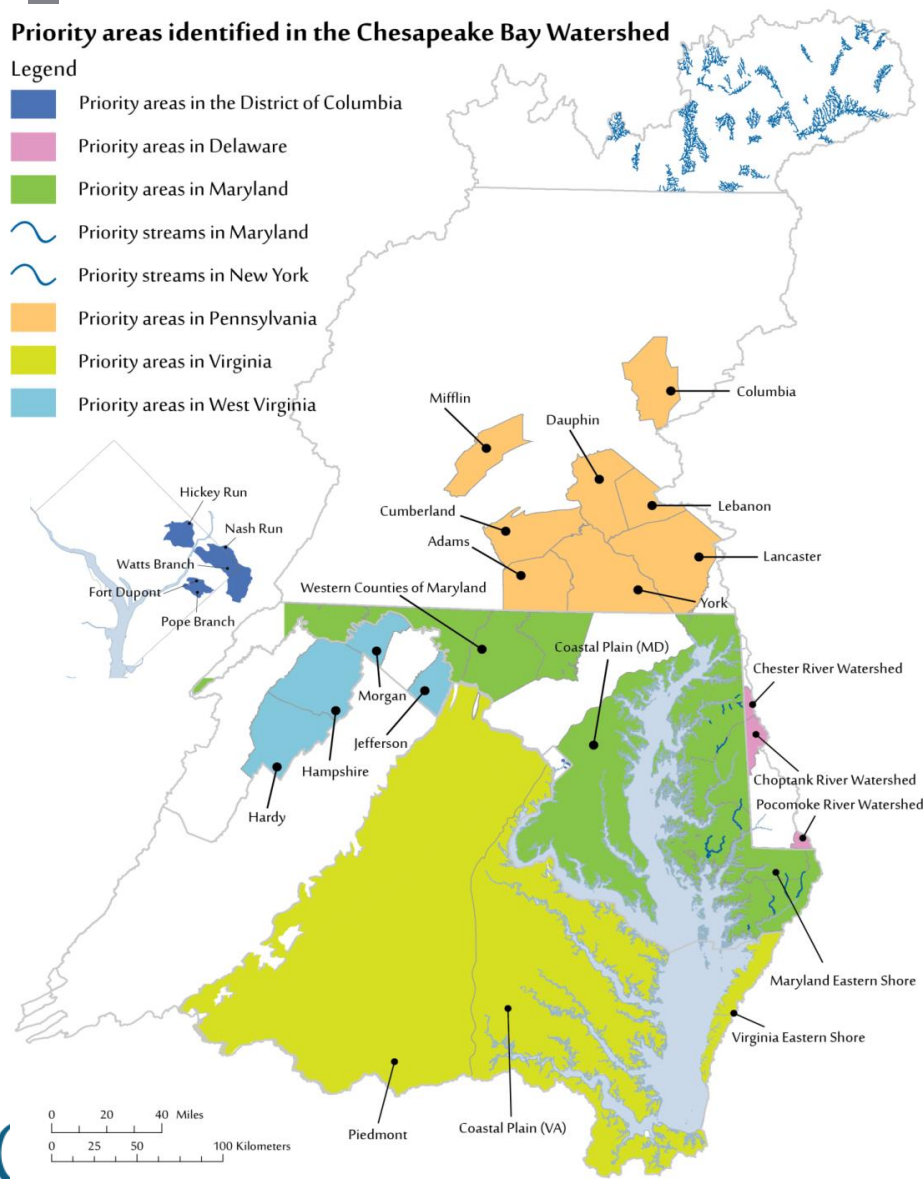
Top: Collecting a water sample ("Chesapeake Bay" logo)

Prioritization Report

Priority areas identified in the Chesapeake Bay Watershed

Legend

- Priority areas in the District of Columbia
- Priority areas in Delaware
- Priority areas in Maryland
- Priority streams in Maryland
- Priority streams in New York
- Priority areas in Pennsylvania
- Priority areas in Virginia
- Priority areas in West Virginia



Watershed-wide

- Trout Unlimited

New York & Pennsylvania

- ALLARM
- God's Country Water Dogs
- Water Resource Monitoring Project
- Western PA Conservancy
- Lancaster County Conservancy and Lancaster County Conservation District
- Evergreen Conservancy
- Community Science Institute
- Watershed Alliance of Adams County
- Clearfield Creek Watershed Association
- Water Assessments by Volunteer Evaluators
- Lititz Watershed Alliance/Warwick Township

Maryland

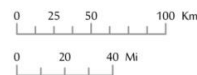
- Savage River Watershed Association
- ALLARM
- Audubon Naturalist Society
- Rock Creek Conservancy
- Blue Water Baltimore
- National Aquarium
- Anne Arundel Community College
- Magothy River Association
- Back Creek Conservancy
- WestRhode Riverkeeper
- Calvert County
- Alliance for the Chesapeake Bay

West Virginia

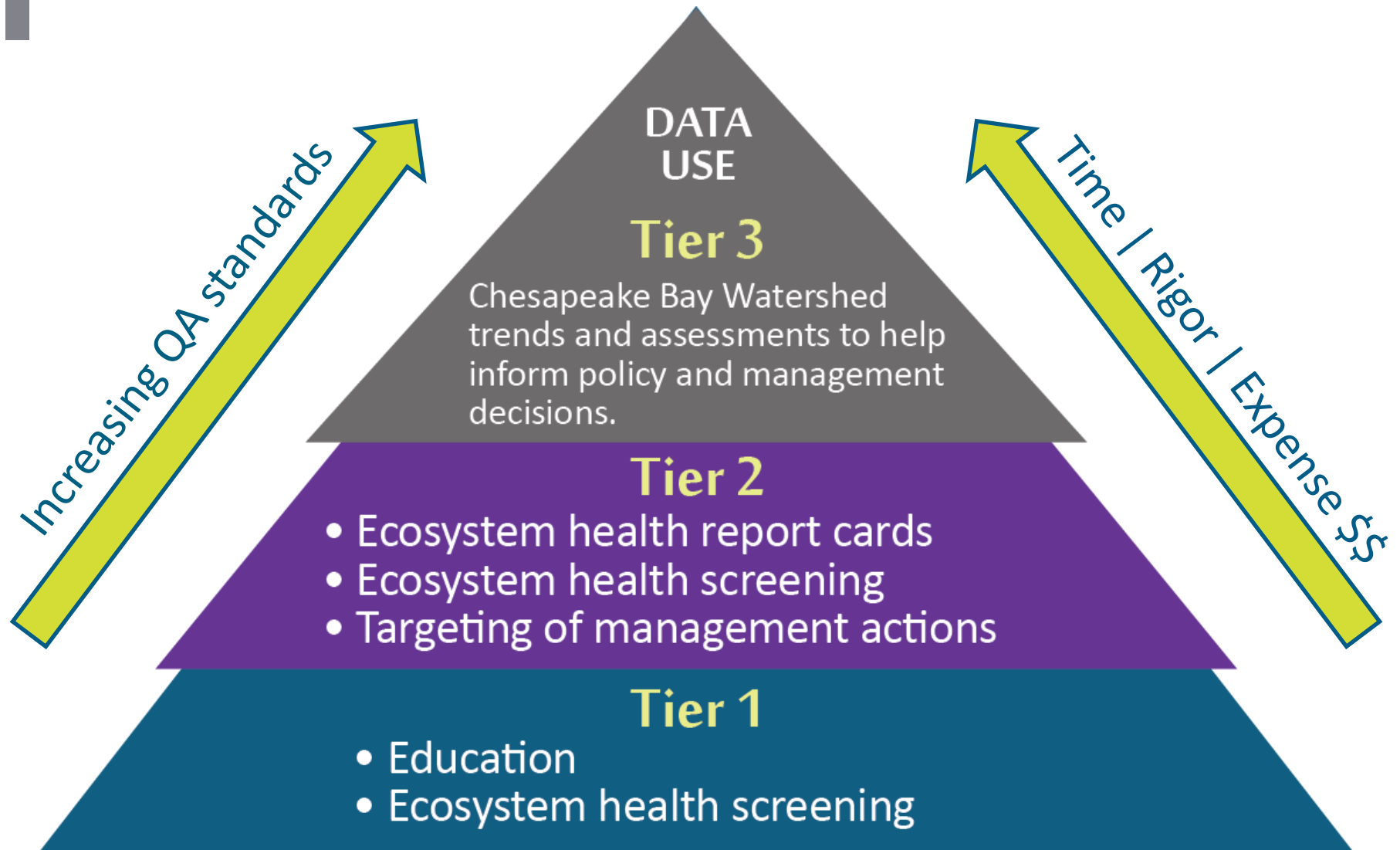
- WV Save our Streams

Virginia

- Cowpasture River Preservation Association
- Page County Friends of the Shenandoah
- Friends of the Middle River
- Rivanna Conservation Alliance
- Friends of Shenandoah River
- University of Virginia's Shenandoah Watershed Study
- Shenandoah Valley Soil and Water Conservation District
- Friends of Accotink Creek
- Blue Ridge Watershed Coalition
- Loudoun Watershed Watch
- John Marshall Soil & Water Conservation District
- Culpeper Soil and Water Conservation District
- Longwood University Water Quality Monitoring Program
- Friends of Goochland Parks
- Prince William Soil & Water Conservation District
- Virginia Save our Streams
- Alliance for the Chesapeake Bay
- James River Association
- Chesterfield WaterTrends
- Virginia DEQ Citizen Science Monitoring



Tiered Framework



Online Toolkit

Application for Assistance

[Apply online](#)

[Ap](#)

Resources

Past Presentations

[The Importance of Building Environmental Intelligence](#)

(June 21, 2017)

[CMC Prioritization Workshop Introduction](#)
(October 13, 2016)

[Data to Decisions Combined Presentations](#)

[Overview :
Prioriti:
\(0c](#)

[Why th
Program is
-
\(0c](#)

[How to Be](#)

Publications

[What is the Chesapeake Monitoring Cooperative?](#)

[Prioritiz:
volunteer
monitorin
gaps in th
1](#)

Quality Assurance Project Plans

[Integrating Citizen-based and Nontraditional Monitoring into the Chesapeake Bay Program Partnership: Benthic Macroinvertebrate Monitoring in Wadeable Streams \(Tiers I & II\)](#)

[Integrating Citizen-based and Nontraditional Monitoring into the Chesapeake Bay Program Partnership: Water Quality Monitoring in Non-Tidal Streams \(Tiers I & II\)](#)

[Integrating Citizen-based and Nontraditional Monitoring into the Chesapeake Bay Program Partnership: Water Quality Monitoring in Tidal Streams \(Tiers I & II\)](#)

Standard Operative Procedures

[Standard Operating Procedures for Non-tidal Monitoring](#)

[Standard Operating Procedures for Tidal Monitoring](#)

Methods Manuals

[Nontidal Benthic Macroinvertebrate](#)

[Macroinvertebrate Monitoring Methods Manual](#)

[Non-Tidal Methods Manual](#)

[Tidal Methods Manual](#)

Indicator Fact Sheets

[Bacteria](#)

[Chlorophyll](#)

[Conductivity & TDS](#)

[Dissolved Oxygen](#)

[Nitrogen](#)

[pH](#)

[Phosphorus](#)

[Salinity](#)

[Silicate](#)

[Temperature](#)

[Total Water Depth](#)

[Water Clarity & Turbidity](#)

The CMC was formed for the integration of Citizen-based and Nontraditional Monitoring into the Chesapeake Bay Program partnership.

Do you want to join the Chesapeake Monitoring Co-op? Please email Liz Chudoba at lichudoba@allianceforthebay.org.

Chesapeake Data Explorer



Admin

Data ▾

Profile

Manage ▾

Upload Water Quality

Edit & Review Water Quality

Upload Macroinvertebrates

Submit Station

CMC Data Man

Good Evening, Elizabeth



STEPS TO BECOME A CMC PARTNER

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.



To apply for assistance

Go to:
ChesapeakeMonitoringCoop.org

Application for Assistance

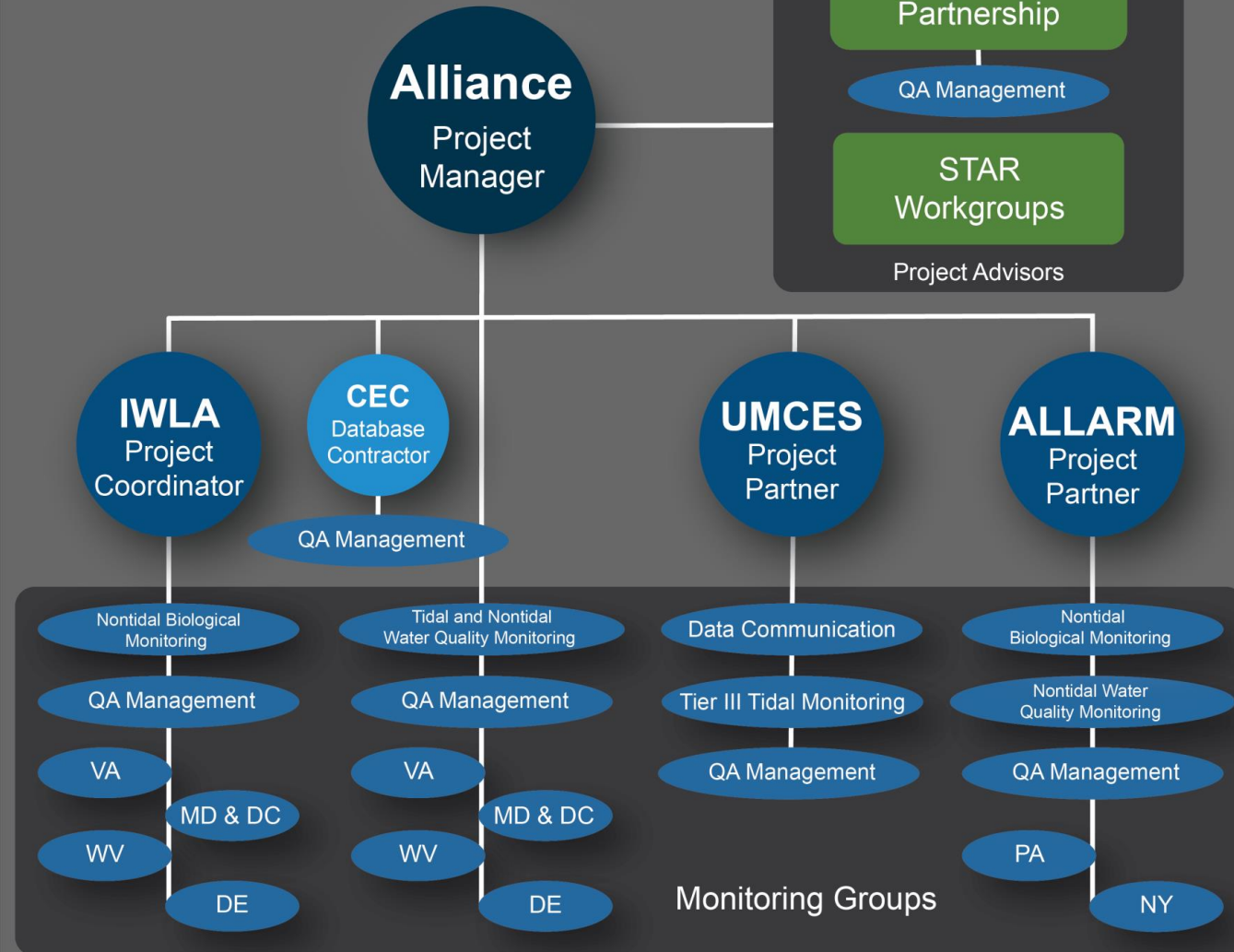
Apply online

Apply via mail

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.

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

Enter Data into Chesapeake Data Explorer

STEP 4

Minimum eligibility requirements:

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

Outreach and Engagement

- PA Watersheds Conference
- MD Streams Roundtable
- VA Water Monitoring Council
- Data to Decisions 2.0 Workshop
- Mid-Atlantic Water Monitoring Conference
- Chesapeake Bay Foundation's Environmental Education Conference
- National Monitoring Conference
- On Boarding Webinar

T=850

Where we are now

- Study Design Workshops
 - 6 completed
- Water Quality Monitoring Training
 - 9 completed as of October 19th
 - 2 scheduled by December 31st
- Macroinvertebrate Training
 - 8 completed as of October 19th
 - 3 schedule by December 31st
- Data Interpretation Workshops
 - To begin in 2018



Where we are now

Tier III Groups

- Nanticoke watershed alliance is the first approved Tier III Group.
- BlueWater Baltimore is next in line.
- Next up, South River Federation, West/Rhode Riverkeeper and possibly MDE shellfish sampling.



Coming Up

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.

Memorandum of Understanding
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.

A close-up photograph of a large blue catfish being held by a person. The fish has a broad, flat head, a large eye, and prominent whiskers. Its mouth is slightly open, showing a dark interior. The person holding the fish is wearing a light-colored shirt and green pants. The background is blurred, showing green foliage and a metal railing.

Questions?