RiverTrends Methods Manual

CMC
Chesapeake Monitoring Cooperative

Version 2

September 2019

ALLIANCE for the Chesapeake Bay

University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

Produced by the Chesapeake Monitoring Cooperative

Working together to understand the health of our waters

September 30, 2016

The development of this manual was supported through a cooperative agreement with the EPA Chesapeake Bay Program (#CB-963349).

Contributors

This document was created through a collaborative effort of three organizations: The Alliance for the Chesapeake Bay, Alliance for Aquatic Resource Monitoring, and the University of Maryland Center for Environmental Science. The authors want to thank Mary Ellen Ley and James Beckley for their expert reviews of these protocols.

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Acknowledgments

Much of this manual was adapted with permission from the following sources:

River Trends Volunteer Water Quality Monitoring Manual. (2012). The Alliance for the Chesapeake Bay

Virginia Citizen Water Quality Monitoring Program Methods Manual. (2007). Virginia Department of Environmental Quality

EcoCheck. (2011). Sampling and data analysis protocols for Mid-Atlantic tidal tributary indicators. Wicks EC, Andreychek, ML, Kelsey RH, Powell SL (eds). IAN Press, Cambridge, Maryland, USA.

EcoCheck. (2013). Sampling and data analysis protocols for Mid-Atlantic non-tidal stream indicators. Wicks EC, Fries AS, Kelsey RH, (eds). IAN Press, Cambridge, Maryland, USA.

Chemical Monitoring Manual, (2010). Alliance for Aquatic Resource Monitoring

U.S. EPA. 1997. Volunteer Stream Monitoring: A Methods Manual. EPA 841-B-97-003.

U.S. EPA. 1996. Recommended Guidelines for Sampling and Analyses in the Chesapeake Bay Monitoring Program. EPA 903-R-96-006.

Photo Credits

Photos on the cover were taken by Will Parson of the Chesapeake Bay Program.

Introduction

We rely heavily on the Chesapeake Bay and all its tributaries for our drinking water, food sources, recreation, and navigation. Since the initiation of the Chesapeake Bay Program in 1983 the communities in the watershed have been working towards improving the health of these waters. A significant portion of that work is tracking our progress through water quality monitoring. There are many sources of water quality data – including data collected by volunteers, local governments, conservations districts, and nongovernmental groups such as academia and watershed organizations that are not currently being used by the Chesapeake Bay Program to track Bay health and determine success of restoration efforts.

The Alliance for the Chesapeake Bay (ACB), Izaak Walton League of America (IWLA), Dickinson College's Alliance for Aquatic Resource Monitoring (ALLARM), and the University of Maryland Center for Environmental Science Integration and Application Network (IAN), have partnered to create the Chesapeake Monitoring Cooperative (CMC). The CMC will provide technical, logistical, and outreach support for the integration of citizen-based and non-traditional water quality and macroinvertebrate monitoring data into the Chesapeake Bay Program (CBP) partnership.

Credit: Peter Bergstrom

This is the first effort to integrate citizen science water quality data, to inform policy management and water quality assessments, into a federal program. Not only will these data be available to the CBP through the development of a Chesapeake Data Explorer, but will be accessible to the public, local governments, universities, and others. The contributions of data by volunteer and non-traditional monitoring groups to the CMC and CBP monitoring network will provide valuable information that supports shared decision-making, adaptive management, and measuring progress towards the 2014 Chesapeake Bay Watershed Agreement.

Goals of the Chesapeake Monitoring Cooperative

- To build a cooperative network of volunteer and non-traditional monitoring groups that shares their water quality data with their local communities, the public, and the Chesapeake Bay Program.
- Provide technical assistance and support to monitoring groups and individuals to collect, analyze, and communicate about water quality data.
- Build relationships between the Chesapeake Bay Program Partnership and the non-traditional and volunteer water quality monitoring community.
- Provide the infrastructure and support to make all water quality data of known quality available to the Chesapeake Watershed community and integrate data into the CBP partnership's monitoring database.
- Develop consistent monitoring and training protocols, technical guidance, data gathering tools, quality assurance mechanisms, and data analysis and communication tools.
- Provide training and technical support to monitoring groups in order to ensure provision of consistent, high quality data to the Chesapeake Bay Program.

Credit: Will Parson/Chesapeake Bay Program

Purpose of this manual

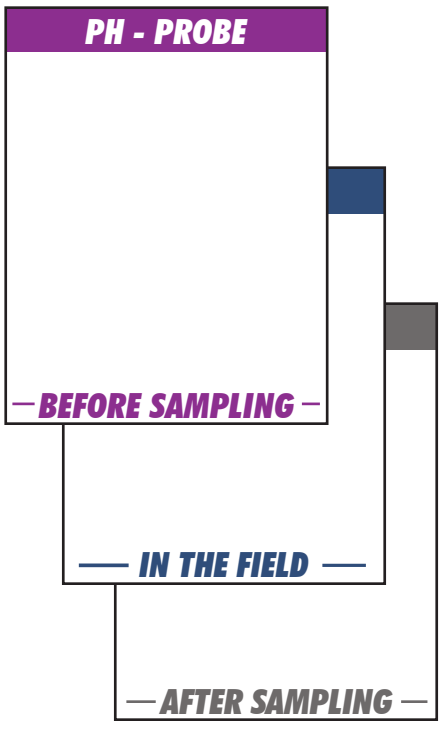
This manual was developed to support the wide variety of monitoring programs and research questions that communities have throughout the Chesapeake Bay watershed. The manual is intended to support the work of the Chesapeake Monitoring Cooperative and supplies methodology for a large number of popularly used protocols and parameters in order to provide a menu of options to volunteers and monitoring groups.

This manual in no way can cover all the protocols and parameters that are used by volunteer water quality monitoring programs, nor does it suggest that a monitoring group should adopt each and every one of these parameters. Monitors that are coordinating with the Chesapeake Monitoring Cooperative are encouraged to have a conversation with their monitoring coordinator about which protocols and parameters will be most helpful in understanding their questions about water quality in their community. A thoroughly thought out monitoring plan makes for sound science!

How this manual is organized

This manual is designed to be modular; this means that you can pull it apart into only the pieces that you need and it should still function as helpful step-by-step directions to successfully collect sound water quality data. Sections are numbered on the bottom to help you keep the pieces assembled in order.

The manual is broken into two main sections: introductory materials that help you understand what you need and how to prep before getting out into the field, and the methods themselves. Each method is broken into three sections: before sampling, in the field, and after sampling. These method sections are marked by purple, navy, and gray footers, respectively. If you want to narrow down the amount of paper that you take with you in the field, you can pull out all the sheets for your methods that have a navy header and footer labeled “in the field”.



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

Field safety tips

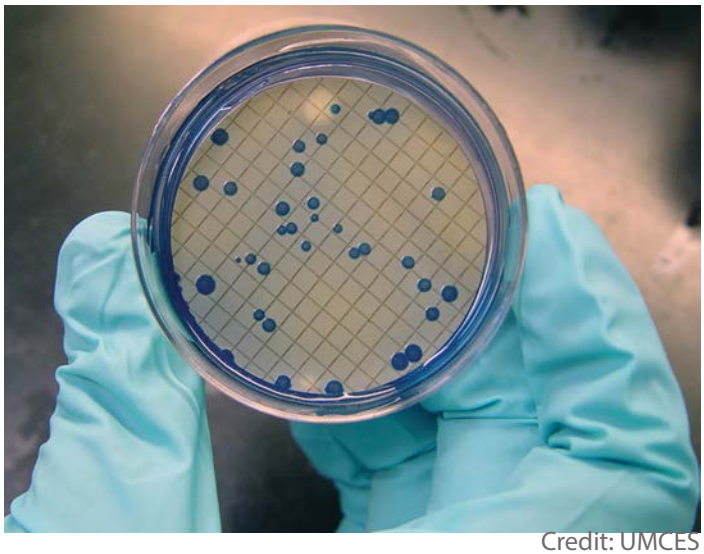
SAFETY CONSIDERATIONS WHEN VISITING YOUR MONITORING SITE

CMC recommends that you visit your monitoring site(s) with a partner, or at a minimum, notify someone when you leave your house (and return) from monitoring. You should always put safety considerations first, and should never monitor when you feel ill, during inclement weather (especially snowy/icy conditions), or under high-flow conditions. Take caution when entering and exiting the waterway and wear waders or close-toed shoes. It is good practice to have a first aid kit available to attend to cuts and scrapes.

SAFETY CONSIDERATIONS WHEN TESTING YOUR WATER SAMPLES

Before you begin testing your water sample, read through all of the instructions first to familiarize yourself with the procedures and to note any precautions that should be taken. Some of the reagents found in the water quality kits are classified as toxic, hazardous materials, and extra caution should be taken when using the reagents, including:

- Avoid contact with all reagents and your skin, eyes, nose, and mouth.
- Wear safety glasses and latex/nitrile gloves for extra protection.
- Do not breathe in any dust, mist, or vapors.
- Wash your hands immediately after testing your water sample.
- Do not eat, drink, or smoke while testing your water sample.
- Do not dispose of reagents or waste on the ground or in the waterway. If permitted, pour the waste down your sink while flushing with cold tap water. Hazardous waste generated from some kits must be collected and given to your monitoring coordinator for proper disposal.
- If an accident or spill occurs while testing your sample, follow the first aid and clean-up procedures listed in the directions.



Credit: UMCES

Field safety tips

SAFETY CONSIDERATIONS WHEN CLEANING YOUR EQUIPMENT

When cleaning your equipment, use only warm tap water and rince approximately three times. If your glassware starts to look discolored, you can soad it in white vinegar before rinsing with warm tap water. Cleaning your equipment after each use is very important. Dirty glassware can affect the results significantly, which defeats the quality assurance measures built into the monitoring program.

SAFETY CONSIDERATIONS WHEN STORING YOUR EQUIPMENT

Use the following best practices when storing your monitoring equipment and supplies:

- Store equipment in a dry, cool, well-ventilated place away from combustible materials and out of reach from children and pets.
- Keep reagent containers tightly closed.

Credit:WillParson/ChesapeakeBayProgram

Credit: UMCES

Best practices for monitoring

BEFORE GOING OUT INTO THE FIELD

a. Samples should be taken on a monthly basis unless you are told otherwise by the Program Coordinator. Choose a regular sampling day (ex. the second thursday of each month) and try to sample on that same day each month. If it is not possible to sample on the same day each month, try to sample within 2 days (either side) of your regular day. Also, try to sample at the same time of day each time you go out.

b. Always check your equipment before heading out into the field. Look for wear and tear that might affect the quality of your measurements. Make sure batteries are charged or carry a backup with you.

c. Perform your calibration and standardization checks before you go out into the field.

d. If you are not accessing a site that is public be sure to get a signed landowner permission form and mail a copy to your monitoring coordinator. Contact the Program Coordinator for the form.

IN THE FIELD

a. Sample with a buddy. It's always better to have an extra pair of hands and another person to help out in a hard or dangerous situation.

b. Always sample from the same location. If you do move your site please let your monitoring coordinator know so that the site information can be updated.

c. Take replicate readings for all parameters except for dissolved oxgyen (always replicated) twice a year in March and October!

d. Collect your samples in the following order:

   i. Bacteria/Lab grab samples
   ii. Air temperature
   iii. Water temperature
   iv. Dissolved oxygen
   v. pH
   vi. Salinity
   vii. Water clarity

Continued on next page...

Best practices for monitoring

e. Record all data collected on your field datasheet provided by the Alliance. Keep a copy of the data collected for your records and to provide a backup copy should the original be lost.

f. The "Comments" section can be used to record general observations about the site especially changes due to erosion, recent notable weather, and any problems you had with the sampling procedures or equipment. The comments are very helpful to your monitoring coordinator when trouble shooting data anomalies.

g. Be sure to keep all samples that need to be kept cool in a cooler with ice. Use regular ice and put it into ziplock bags if needed, don't use ice packs. Be careful not to completely submerge samples under the ice, make sure the cap is above the ice.

AT THE LAB OR AT HOME

a. Process your samples in a timely manner. Follow the holding times chart on page 1-12 to know how long you have to process your sample after collecting.

b. Shake your sample up, if specified, before dispensing into your testing containers to make sure it is well mixed and representative of the sample you collected.

i. Use the test tube caps or stoppers, not your fingers, to cover test tubes during shaking or mixing.

c. Some kits contain chemicals, wipe up any reagent spills, liquid or powder, as soon as they occur. Rinse area with a wet sponge, and then dry.

d. Clean your equipment and glassware with warm water before and after use. Do not use soap unless otherwise specified! If glassware becomes discolored, you can soak in white vinegar before rinsing with warm water.

e. Avoid prolonged exposure of equipment and reagents to direct sunlight. Protect them from extremely high temperatures or from freezing.

OVERALL

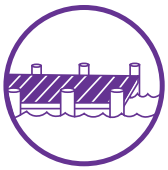
a. Stay certified. Keep your monitoring certification up to date.

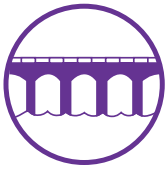
b. Have fun!

Sampling Methods

Water samples should be collected from the middle of the waterway/tributary at a point where the water is the deepest and the flow is the fastest – do not sample stagnant water. The collection can be done by wading into the waterway or standing on a bridge or dock. If you cannot reach the water a bucket or sampling pole may be used to collect the sample. If safety is an issue samples can be obtained from the streambank, care should be taken to sample from an area that will most closely represent the entire stream.

The sample method is chosen on a site by site basis. Use the same method each time you visit your site.





DOCK OR BRIDGE

a. Sample in the center of the main flow, or as close as you can get to the center from a dock.

b. Sample from the upstream site of the dock or bridge where contamination is least likely to occur. If sampling on a dock, be sure to avoid sampling close to any boats or other sources of contamination.

c. Always pour rinses downstream or away from where you are sampling.

d. If sampling with a bucket, lower bucket into the water or throw the bucket out as far as possible in the main channel, and try not to disturb the bottom. Rinse three times, pouring contents downstream. On the fourth time, fill bucket to 3/4 full.

WADING

a. Wade into the middle of the channel and then proceed upstream to allow the flow of water to push any disturbed sediment downstream of where you will be collecting the sample. Try your best to not disturb the sediment on the stream bottom as this can affect your sampling results.

b. Always pour rinses downstream of where you are standing or on the stream bank.

c. If sampling with a bucket, rinse the bucket three times, pouring contents downstream of where you are standing. Fill bucket 3/4 full and take it back to the bank to analyze samples.

Sample Holding Times

When you collect a sample it must be processed and analyzed within a certain time window in order for it to be a valid sample. All samples should be kept cool in a cooler with ice or an ice-pack or in a refrigerator prior to processing. Use the following chart as a reference for the different holding times for each parameter.

Water Quality Parameter	Maximum Sample Holding Time
Bacteria (coliscan)	24 hours
Dissolved oxygen (Winkler Titration)	Fix immediately; Titrate within 8 hours
pH	Analyze immediately
Salinity	28 days
Water clarity	Analyze immediately
Water temperature	Analyze immediately
Bacteria (Lab)	24 hours
Nutrients (Lab)	48 hours

Data entry and management

As a RiverTrends monitor you are required to electronically enter the water quality data that you collect to the Chesapeake Data Explorer. If you do not have access to a computer or the internet and are unable to submit your data electronically, you may mail your data sheets to your monitoring coordinator for them to submit on your behalf.

Your monitoring coordinator needs to double check the data entered for any errors. We are all human and we make mistakes, so a strong part of RiverTrends is that we have incorporated a system of checks to make sure that the data made available on the Data Explorer is of the highest possible quality. By mailing your data sheets to your monitoring coordinator, we are able to check for data entry and potential equipment errors, as well as archive the sheets in a secure location.

Follow these steps to make sure your data are entered and checked so that you can share your data with the larger Chesapeake community:

1. Collect your water quality data and record it on your field data sheet. Be sure to fill out your field sheet in its entirety.
2. Enter your data on the Chesapeake Data Explorer (www.cmc.vims.edu). You will need to create an account in order to upload data.
3. Review your entered data to make sure it matches your field data sheet.
4. Submit your electronic data.
5. Mail your field data sheet to your monitoring coordinator for review and quality control check using the provided pre-labeled and stamped envelopes. If you need to use other envelopes, please mail to the following address:

   Alliance for the Chesapeake Bay
   C/O CMC Coordinator
   612 Hull St. Suite 101C
   Richmond, VA 23224

6. After your data has been quality checked it will be made available on the Data Explorer to the larger Chesapeake community.
7. Explore your data on the homepage of the Data Explorer!

LAB GRAB SAMPLES

GATHERING MATERIALS AND EQUIPMENT LIST

- Sampling pole (if needed)
- 500-mL polypropylene sample bottles or bottles provided by your lab
- Chain of custody form (COC)
- Labels for your sample bottles
- Permanent marker
- Cooler with ice (do not use ice packs)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

1. Coordinate with your lab to pick up your sample bottles and ice from the lab (use regular ice in ziplock bags if needed, not ice packs)
2. Make sure you have the appropriate number and type of sample bottles
3. Pre-label each bottle with the following:
    a. Station ID
    b. Date of sample collection (add time after collection)
    c. Collector's initials
    d. Sample depth in meters
    e. Parameter name and/or group code
    f. Container number
    g. Preservative used if applicable
4. Sample containers should be inspected and any torn, punctured or cracked sample containers discarded.

NOTE

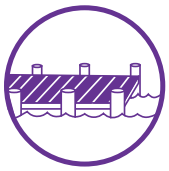
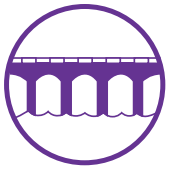
Samples will not be analyzed if this information is missing. If more than one container is needed for a parameter (such as a duplicate sample), each container collected for that parameter must have a label with identical information in addition to an indication of 1 of 3, 2 of 3, 3 of 3, etc., as required. Split samples should be designated as S1 and S2.

BEFORE SAMPLING

LAB GRAB SAMPLES

Bacteria and Nutrient bottles with preservative

A. FROM A DOCK, BRIDGE, OR WADING


I. Collecting directly in the waterway

1. Uncap the bottle, keeping it upright until collecting your sample, be mindful of the acid or preservative in the bottle.
2. Facing upstream, swoop the bottle away from you, collecting a sample that fills the bottle 3/4 full or to the shoulder of the bottle. Do not over fill the bottle allowing sample to fall out (this could release acid into the environment). **DO NOT rinse the sample bottle**.
3. Cap your bottle and label the bottle with the collection time.
4. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
5. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

NOTE

Nutrient sample bottles contain a small amount of sulfuric acid as a preservative. When sampling it is important to fill the bottle to the needed level and not pour out the preservative or excess sample from the bottle.

LAB GRAB SAMPLES

II. Collecting with a sampling pole

1. Attach the sample bottle to the sampling pole, making sure that the clamp is tight.
2. Facing upstream, un-cap the sample bottle and extend the pole and bottle.
3. Dip the bottle into the water and fill the bottle up 3/4 full or to the shoulder. Try to be careful to not overfill the bottle and release acid or preservative into the environment. **DO NOT rinse the sample bottle**.
4. Cap and label the bottle with the collection time.
5. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
6. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

NOTE

If sampling from the bank, the sampling point in the waterway should have a low to medium flow and not be in eddies or stagnant water.

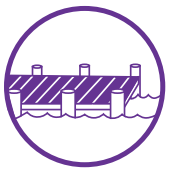
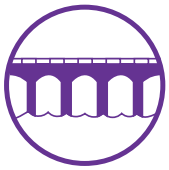
III. Collecting with a bucket

1. Lower the bottle into the bucket and allow to fill up to 3/4 full or to the shoulder. Try to be careful to not overfill the bottle and release acid or preservative into the environment. **DO NOT rinse the sample bottle**.
2. Cap and label the bottle with the collection time.
3. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
4. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

LAB GRAB SAMPLES

Nutrient bottles without preservatives

A. FROM A DOCK, BRIDGE, OR WADING


I. Collecting directly in the waterway

1. Facing upstream, submerge the bottle with the cap on to the depth of 0.3m (about one forearm's length). Remove the cap and fill the bottle. Once filled, replace the cap. Toss the water sample downstream of you.
2. Repeat step 1, three more times. On the fourth collection cap the bottle and keep the sample.
3. Record the time of sample collection on the bottle.
4. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
5. On the field datasheet and Chain of Custody form, record the time, date, collection depth, and any other information about the water sampling event.

LAB GRAB SAMPLES

II. Collecting with a sampling pole

1. Attach the sample bottle to the sampling pole, making sure that the clamp is tight.
2. Facing upstream, un-cap the sample bottle and extend the pole and bottle.
3. Dip the bottle into the water and rinse three times pouring out the water downstream of the sample location.
4. Take the sample on the fourth time from approximately 0.3m, fill the bottle up 3/4 full or to the shoulder.
5. Cap and label the bottle with the collection time.
6. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
7. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

NOTE

If sampling from the bank, the sampling point in the waterway should have a low to medium flow and not be in eddies or stagnant water.

III. Collecting with a bucket

1. Lower the bottle into the bucket and rinse three times pouring the water outside of the bucket.
2. On the fourth time, allow to fill up to 3/4 full or to the shoulder.
3. Cap and label the bottle with the collection time.
4. Immediately place the sample on ice. The lid should not be immersed under the ice, in case ice water leaks into the sample bottle, diluting the concentration of the sample.
5. On the field datasheet and the Chain of Custody form, record the time, date, and any other information about the water sampling event.

IN THE FIELD

LAB GRAB SAMPLES

AFTER SAMPLE PROCEDURES

1. After collecting the sample, make sure the lids are secured tightly to prevent contamination from water seepage in or out of the container. Containers with loose fasteners should be replaced or taped to prevent loss of sample containers during transport.
2. It is essential that the actual sampling site match the labeling information. Always check the labeling information against the actual site. Samples not labeled properly may be rejected by the laboratory.
3. Double check your chain of custody form matches your sample bottles and is fully filled out.
4. If the laboratory provides temperature bottles that they use to determine sample temperature upon arrival at the lab, make sure that every cooler used to ship samples to the lab contains one of these bottles.
5. Drop off your samples at the laboratory with your signed chain of custody form within the proper holding times.

BACTERIA - COLISCAN EASYGEL

GATHERING MATERIALS AND EQUIPMENT LIST

- Coliscan Easygel Kit:
  - 30 mL sterile sample bottle
  - Coliscan Easygel media
  - Pretreated Coliscan petri dish
  - 1ml pipette
- Cooler or insulated bag with ice
- Bucket (if using)
- Sampling pole (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Check to make sure your sample bottles have remained closed and uncontaminated.
- Prepare a cooler with ice to keep the samples cool during transport.
- Pre-label your sample bottles with your site ID, date, and replicate number (if applicable).
- Take media bottle(s) out of the freezer to thaw.

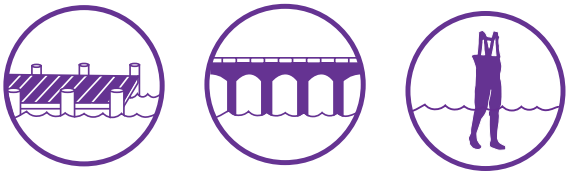
BEFORE SAMPLING

BACTERIA - COLISCAN EASYGEL

NOTE

Make sure you place your sample on ice directly after collecting the sample. You can use a small cooler or insulated bag. Fill your cooler with regular ice, do not use frozen ice packs as they do not cool the sample fast enough. You can place the ice in a zip-lock bag if needed. Make sure the sample is not submerged under the ice and be careful to not freeze your sample.

A. FROM A DOCK, BRIDGE OR WADING



If wading into the stream, always walk to the middle of the channel and then proceed a few steps upstream to collect your sample to avoid contamination from any disturbed sediment. Always collect samples upstream of where you are standing either in the waterway or on a bridge or dock!

I. Collecting directly in the waterway

1. Un-cap the sterile and pre-labeled bottle without touching the inside of the lid or bottle.
2. Using a U motion dip the bottle into the water down and away from yourself to the depth of about 0.3 m allowing the bottle to fill ¾ full.
3. Cap the bottle and place sample on ice in cooler immediately (cooler temperature should be 1°C to 4°C).

NOTE

If wading into the water to collect your sample, wade in first before un-caping your bottle.

II. Collecting with a bucket

1. Throw the bucket out as far as possible in the main channel, and try not to disturb the bottom.
2. Rinse the bucket three times with sample water collected downstream of your sampling location. Fill the bucket with the sample water to 3/4 full.
3. Un-cap the sterile and pre-labeled bottle without touching the inside of the lid or bottle.
4. Using a U motion dip the bottle into the bucket and away from yourself allowing the bottle to fill ¾ full.
5. Cap the bottle and place sample on ice in cooler immediately (cooler temperature should be 1°C to 4°C). Do not freeze your sample.

III. Collecting with a sampling pole

1. Secure your sterile pre-labeled sample bottle to the end of the pole.
2. Un-cap the bottle without touching the inside of the lid or bottle.
3. Extend the pole outward and dip at approximately 0.3 m below the surface filling the bottle to 3/4 full.
4. Cap the bottle and place sample on ice in cooler immediately (cooler temperature should be 1°C to 4°C.

BACTERIA - COLISCAN EASYGEL

BACTERIA SAMPLE PLATING

Write the site designation, sample #, date, and time on the bottom of the Petri dish lid with a permanent marker. It is best to use small lettering on the outer rim of the dish.

1. Use proper technique to keep pipette sterile: open pipette packet bulb-side first so that you do not contaminate the tip.
2. Gently mix the water sample in the bottle.
3. Pipette the desired volume (1.0 – 5.0 milliliters) of sample water directly into Coliscan media bottle and recap the bottle. ****Start by pipetting 3mL of sample. If you don't see any colonies, during the next sampling event pipette 4 or 5mL. If you see too many colonies to count, during the next sampling event pipette 1 or 2mL.****
4. Gently mix (do not shake) bottle of Coliscan media containing the sample water, and then pour the entire contents into a Petri dish. Only open the Petri dish long enough to pour in the sample.
5. Gently swirl Petri dish so the Coliscan media covers the entire bottom.
6. Allow the media to solidify for approximately 60 minutes prior to incubation. (Amount of time will vary based on room temperature.)
7. Put plates in incubator upside down (media on the top) and try to maintain at 37°C (98.6°F) for 24 hours.
8. If no incubator is available, place the dish in a safe warm place out of direct sunlight, such as on top of a fridge or a water heater. Incubate for 48 hours.
9. Record the average incubator temperature on the datasheet, as well as, the number of hours that the plates were in the incubator or in ambient conditions.

NOTE

As soon as plates are removed from incubator, they must be scored.

AFTER SAMPLING

BACTERIA - COLISCAN EASYGEL

BACTERIA SAMPLE COUNTING

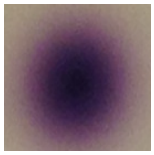
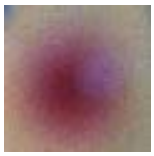
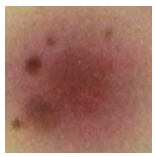
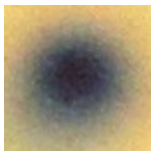
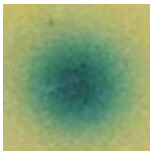
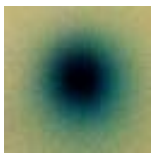
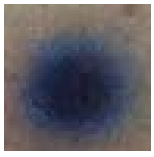
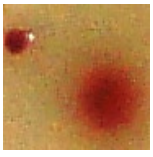
1. Place the Petri dishes on a white background or in natural sunlight. Count the number of dark blue (NOT TEAL) to purple (NOT PINK) colored colonies larger than pinprick size on each plate. Do not pay attention to halos around the dots, but only the center color.
2. Refer to the color guide on the following pages to help you identify colonies.
3. Record the number of colonies in the column labeled “Total # of purple or dark blue colonies on plate” on the data form.
4. Calculate the number of E. coli per 100 milliliters of water by following the instructions on the datasheet and record.
5. Calculate the average number of E. coli per plate and record on the datasheet. This is the value you will report in the on-line database. Refer to the identification guide on the next page.

EQUIPMENT CLEANING AND STORAGE

1. Throw used pipettes in the trash or recycling bin.
2. Rinse empty Coliscan bottles 2-3 times with tap water and dispose of in the trash can or recycling bin. (If media bottles are not rinsed, pathogens could grow in the remaining media.)
3. Place the plates in a zip-lock bag and add bleach or rubbing alcohol to each Petri dish to completely cover the solid media and seal the bag. Allow dishes to stand for at least 10 minutes to ensure all bacteria have been killed.
4. Dispose of the zip-lock bag in the trash.

AFTER SAMPLING

BACTERIA - COLISCAN EASYGEL

E. coli		Not *E. coli*	
	Purple, with purple halo		White
	Purple, no halo		Pink, no halo
	Purple with pink halo		Pink with pink halo
	Blue with purple or pink halo		Pinpoints* (If after incubation period)
	Blue or dark blue, no halo		Teal green, no halo
	Dark blue with teal halo		Teal with teal halo
	Dark blue with blue halo		Red

*Do not count pinpoints if the plate is dominated by larger colonies. Pinpoints may be counted if they make up >50% of colonies. If possible, incubate a few additional hours to see if colonies will grow larger.

Courtesy of James Beckley, QA Coordinator of the Dept. of Environmental Quality, Richmond, VA

AFTER SAMPLING

TEMPERATURE

GATHERING MATERIALS AND EQUIPMENT LIST

- Armored glass thermometer, digital thermistor, or probe
- Bucket (if using)

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

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 reading in Celcius to the nearest 0.1 °C on your datasheet.

NOTE

Always measure air temperature before water temperature! A wet thermometer can alter your air temperature readings.

NOTE

You can hang your thermometer in a shady place or have your partner hold the thermometer and let equilibrate while taking your lab or bacteria samples.

TEMPERATURE

Water temperature

A. FROM A DOCK, BRIDGE OR WADING

If wading into the stream, always walk to the middle of the channel and then proceed a few steps upstream to collect your sample to avoid contamination from any disturbed sediment. Always collect samples upstream of where you are standing either in the waterway or on a bridge or dock!

I. Collecting directly from the waterway

1. Place the tip of your thermometer beneath the surface of the water (approximately 0.3m). Do not submerge!
2. Wait for the thermometer to stabilize.
3. Record your reading in Celcius to the nearest 0.1 °C on your datasheet.

II. Collecting with a bucket

1. Throw the bucket out as far as possible in the main channel, and try not to disturb the bottom.
2. Rinse the bucket three times and pour rinses downstream of your sample location.
3. Fill the bucket with sample water to 3/4 full.
4. Hang or hold the thermometer in the bucket away from the sides or bottom of the bucket to minimize temperature drift. Do not submerge!
5. Wait for the thermometer to stabilize.
6. Record your reading in Celcius to the nearest 0.1 °C on your datasheet.

POST-SAMPLE 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.

DISSOLVED OXYGEN - WINKLER

GATHERING MATERIALS AND EQUIPMENT LIST

LaMotte Dissolved Oxygen Test Kit

- (2) Water sampling bottles – 60 mL glass
- (2) Titration tubes w/ caps
- Titrator syringe
- Manganous Sulfate solution
- Alkaline potassium iodide azide
- Sulfuric acid 1:1
- Sodium thiosulfate 0.025N
- Starch indicator solution
- Iodate Iodide standard solution (10 mg/L DO equivalents)
- Eye dropper
- Sample bucket (if needed)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

1. Check chemistry expiration dates, if chemicals are expired do not sample and contact your monitoring coordinator for replacements.
2. Check your sample bottle, titration tube, and titrator syringe are clean, dry, and not showing cracks and wear and tear.
3. Perform your sodium thiosulfate check (detailed below).

Credit: Alliance for the Chesapeake Bay

BEFORE SAMPLING

DISSOLVED OXYGEN - WINKLER

STANDARDIZATION

Sodium Thiosulfate Check

Prior to each sampling event (either the night before or the day of), you must run a test to make sure your Sodium Thiosulfate is still fresh and functional. Sodium Thiosulfate is fairly unstable and can degrade very suddenly, making it necessary to check it before each DO sampling. Perform this check at home before you go out. It is important to perform this check in a room temperature environment around 20°C.

1. Rinse the titrating tube (small glass vial with plastic lid with hole in it) with a small amount of Iodate-Iodide Standard Solution (in large amber bottle).
2. Pour into waste container.
3. Repeat step 1 and 2 two more times
4. Pour 20 ml of the Iodate-Iodide Standard Solution into the rinsed titrating tube. 20 ml is when the meniscus of the standard is right on top of the 20 line of the titrating tube. If excess solution is in the tube, remove it using the eyedropper and discard down the drain. Never insert the eye dropper or any other item into the amber bottle or discard excess solution back into the amber bottle as it will contaminate the solution making it inaccurate.
5. Add 8 drops of 50% Sulfuric Acid (hold the bottle vertical to ensure equal drop size) to the 20 ml of solution and mix by swirling. Then place plastic cap (with hole in it) onto titrating tube.
6. Fill titrating syringe to the “0” mark with Sodium Thiosulfate.
7. Titrate using the Sodium Thiosulfate.
8. When solution turns a pale yellow color, but not clear:
    i. Remove cap, leaving syringe in cap.
    ii. Add 8 drops Starch Solution (white bottle). Swirl titration sample gently to mix to a uniform blue color. Recap glass tube and continue titration process.

Credit: Alliance for the Chesapeake Bay

Continued on next page...

DISSOLVED OXYGEN - WINKLER

9. Continue slowly adding and mixing Sodium Thiosulfate until solution turns from blue to clear. When the solution starts to show clear water where the solution is being added, begin to add the Sodium Thiosulfate one drop at a time and mix well. The solution is nearing the endpoint and a very small amount of Sodium Thiosulfate will turn the water colorless

10. Just as the solution turns completely clear with no trace of blue by placing the titrating tube on or next to a white surface, stop titration and remove the syringe. Read the results on syringe.

11. Record your results on your field datasheet under the sodium thiosulfate check. If the result is within 9.4 and 10 mg/L, your Sodium Thiosulfate is good and you can collect your sample.

12. If the result is less than 9.4 mg/l or greater than 10.0 mg/L, perform a 2nd test and record in the space on datasheet marked “2nd check”. If the second check is inside the 9.4 to 10 range, do a third check to make sure it is within range. If the third check is within range, you can collect your sample.

13. If the result is outside the 9.4 to 10 range, the Sodium Thiosulfate is bad and needs replacing. **Do not collect dissolved oxygen samples until fresh Sodium Thiosulfate is obtained and checked to be good.**

14. Dispose of solution in titrating tube and syringe by pouring down sink and flushing with additional tap water.

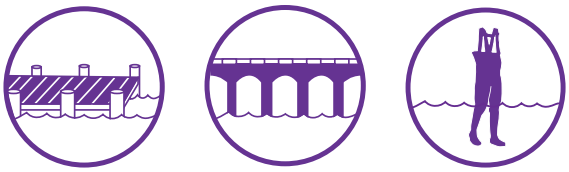
15. Keep the amber bottle solution at home stored in a dark and cool place like a closet. Do not take the amber bottle out into the field.

Credit: Alliance for the Chesapeake Bay

BEFORE SAMPLING

DISSOLVED OXYGEN - WINKLER

A. FROM A DOCK, BRIDGE OR WADING



If wading into the stream, always walk to the middle of the channel and then proceed a few steps upstream to collect your sample to avoid contamination from any disturbed sediment. Always collect samples upstream of where you are standing either in the waterway or on a bridge or dock!

I. Collecting directly in the waterway

1. Walk up creek to the sample location. From a dock or bridge, sample upstream of the platform.
2. Thoroughly rinse both water sampling bottles with the sample water, filling and dumping the waste water downstream three times before collecting your sample.

NOTE

Duplicate tests are run simultaneously on each sample to guard against error.

Don't forget to collect two samples with two sample bottles!

3. Using the first sample bottle, hold the bottle horizontal and submerge about 1/2 of the bottle opening allowing the water to gently flow into the bottle. Try to fill the bottle without causing a lot of bubbles.
4. As the bottle fills, gentle lower the bottom of the bottle until the bottle is filled and fully submerged under water.
5. Turn the submerged bottle upright and tap the sides of the bottle to dislodge any air bubbles clinging to the inside of the bottle. Cap the bottle while it is still submerged.
6. Retrieve the bottle and turn it upside down to make sure that no air bubbles are trapped inside. If any air bubbles are present, empty the sample bottle downstream and refill. Fill the second sample bottle. Once two satisfactory samples have been collected, proceed immediately to Steps for *Fix Your Sample*.

DISSOLVED OXYGEN - WINKLER

I. Collecting with a bucket

1. Toss your bucket into the center of the waterbody. Be sure not to kick up any sediment or debris. Collect a sample of water, swish it in the bucket and toss it downstream.
2. Repeat step 1, two more times to thoroughly clean the bucket with sample water.
3. Thoroughly rinse both water sampling bottles with the sample water from the bucket, filling and dumping the waste water outside of the bucket three times before collecting your sample.
4. Using the first sample bottle, hold the bottle horizontal and submerge about 1/2 of the bottle opening allowing the water to gently flow into the bottle. Try to fill the bottle without causing a lot of bubbles.
5. As the bottle fills, gentle lower the bottom of the bottle until the bottle is filled and fully submerged under water.
6. Turn the submerged bottle upright and tap the sides of the bottle to dislodge any air bubbles clinging to the inside of the bottle. Cap the bottle while it is still submerged.
7. Retrieve the bottle and turn it upside down to make sure that no air bubbles are trapped inside. If any air bubbles are present, empty the sample bottle downstream and refill. Fill the second sample bottle. Once two satisfactory samples have been collected, proceed immediately to Steps for *Fix Your Sample*.

NOTE

Duplicate tests are run simultaneously on each sample to guard against error.

Don’t forget to collect two samples with two sample bottles!

DISSOLVED OXYGEN - WINKLER

FIX YOUR SAMPLE

1. Place both sample bottles on a flat surface and uncap. While holding the bottle vertical, add 8 drops of Manganese Sulfate Solution (pink colored solution). Always add the Manganese Sulfate first.
2. Add 8 drops of Alkaline Potassium Iodide Solution (usually has a blue cap) to each sample bottle.
3. Cap each sample bottle and mix by inverting gently several times. A precipitate will form. Allow the precipitate to settle to the shoulder of the bottle.
4. Mix both bottles again and allow the precipitate to settle to the shoulder again.
5. Uncap the bottles and add 8 drops of the 50% Sulfuric Acid to both sample bottles.
6. Cap the bottles and gently shake using a waving motion ("making rainbows"), until both the reagent and the precipitate have dissolved. A clear yellow to brown orange color will develop. If brown flecks are present, keep mixing the samples until the flecks will not dissolve any further. Water that is below 10 °C will may take considerably longer to fully dissolve the brown flakes.

NOTE

Following the completion of Step 6, the samples have been "fixed," which means that dissolved oxygen cannot be added to the sample bottles. The titration procedure described in Titrate Your Sample may be performed at a later time (but must be performed within 8 hours of sample collection). This means that several samples can be collected and "fixed" in the field and then carried back to a testing station for the remaining steps.

Credit: Alliance for the Chesapeake Bay

DISSOLVED OXYGEN - WINKLER

TITRATE YOUR SAMPLE

1. Rinse the glass titration tube with about 5 ml of fixed solution twice to remove any residue from previous tests. Pour 20 ml of the fixed solution from one of the sample bottles into one of the glass titration tubes with its plastic cap removed. Fill to the white line so that the bottom of the meniscus (the curved surface of the liquid in the tube) rests on the top of the white line marked with at 20. The amount is critical so be sure to use the glass dropper to add or remove and discard excess sample solution from the tube. Do not place removed solution back into the sample bottle. Place cap on the tube.
2. Fill syringe (titrator) to the 0 mark with Sodium Thiosulfate solution. Be sure that there are no air bubbles in the syringe. Refer to kit manual for instructions on how to properly fill syringe.
3. To titrate the solution in the tube, insert the syringe into the cap of tube.
4. Add 3-4 drops of Sodium Thiosulfate to test tube and gently swirl the glass tube to mix.
5. Add another 3-4 drops of the Sodium Thiosulfate and swirl the tube. Continue this process until the yellow brown solution in the glass tube turns a pale yellow (lighter than the original yellow-brown solution but not clear). Once you reach this point, take the cap off while leaving the syringe in the cap.
6. Add 8 drops of Starch Solution to the glass titration tube. Swirl the tube gently to mix. The solution should turn from light yellow to dark blue.

Credit: Alliance for the Chesapeake Bay

7. Recap the glass tube and continue the titration process with the Sodium Thiosulfate remaining in the syringe (as described in Step 4 and 5). Once the solution turns light blue start adding the Sodium Thiosulfate one drop at a time until the solution turns from blue to clear. This is the endpoint and can occur quickly, adding one drop at a time is crucial to get the accurate endpoint. If the solution turns blue again, ignore it. Do not add any more Sodium Thiosulfate than is necessary to produce this first color change.

Continued on next page...

AFTER SAMPLING

DISSOLVED OXYGEN - WINKLER

TITRATE YOUR SAMPLE CONTINUED

8. Using the scale on the side of the syringe, read the total number of units of Sodium Thiosulfate used. Each line is 0.2 units. This number equals the number of parts per million (ppm) or milligrams per liter (mg/l) of dissolved oxygen in the water sample.
9. Carry out Steps 1 to 8 on the second sample bottle and second glass tube.
10. Record the results of the two tests on the datasheet. If the difference between Test 1 and Test 2 is more than 0.6 mg/L, you should do a third test and record the two results which are within 0.6 mg/L.

Credit: Alliance for the Chesapeake Bay

NOTE

When the dissolved oxygen level is above 10 mg/L, the solution in the tube will still be blue when the plunger tip of the titrator reaches 10 units. If it reaches this 10 unit line, do not go beyond that line. In this case, refill the syringe to the 0 line from the Sodium Thiosulfate bottle and continue adding a drop at a time and swirling until reaching the endpoint. Do not forget to add 10 mg/L to your final reading.

AFTER SAMPLE CALIBRATION CHECK

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

EQUIPMENT CLEANING AND STORAGE

1. Rinse your sample bottles, titration tubes, and caps with warm tap water three times and set out to dry. **DO NOT** use soap or any detergent products.
2. Dismantle your titrator syringe, rinse with water for 5 seconds and set to dry.
3. Store your chemicals in a cool dry place. They are sensitive to temperature fluxes and can expire early if not properly stored.

AFTER SAMPLING

PH - PROBE

GATHERING MATERIALS AND EQUIPMENT LIST

- Various models of conductivity probes and meters
- Distilled or DI water
- Bucket (if using)
- Calibration solutions 7 and 4 or 10

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine the probe for wear or damage.
- Make sure there is sufficient battery life for your field trip and check for battery leaks.
- Make sure all openings are sealed tight.
- Calibrate your meter before each sampling day.

CALIBRATION

Calibration must be done each day you perform samples. Most meters allow calibrating the pH probe using two different buffers. In most cases the use the 7 and 4 pH buffer solutions is suitable. If your waterway usually measures above pH values of 7, you should calibrate using 7 and 10 buffer.

NOTE

Most manufacturers specify calibrating first with 7 buffer solution however some may specify a different order of calibration. Refer to manufacture instructions for additional information. The below instructions assume calibrating with 7 buffer first.

Use fresh buffer solution when you calibrate the probe. You can save reuse these solutions for your post-sample check readings. Please record the probe readings to the nearest hundredth unit place (Ex. 7.01) when performing the calibration.

1. If you are using premixed calibration solution, pour a small amount (~50mL) of solution 7 and solution 4 or 10 in two separate clean cups. If not, skip to step 2.

PH - PROBE

2. If you are using powder packets, pour 50 mL of DI or distilled water into a small beaker and empty the entire pH 7 packet into the water. Use a clean stir stick to mix the solution. Repeat the steps with the pH 4 or pH 10 powder packs.
3. Place the probe in the 7.00 buffer solution. Gently swirl the probe in the buffer to obtain an accurate reading. Record the temperature of the probe in the solution.
4. Press the CAL button. The bottom number will change to indicate the buffer solution present (should read 7.00 for the pH 7 buffer solution).
5. Wait for the reading to stabilize again and press HOLD/ENT. The top value will flash quickly with a value that should be close to 7.00 pH units. Record this value on your field datasheet.
6. Rinse probe with tap water and blot dry with a clean cloth or paper towel.
7. Immerse the probe in the 4.01 (or 10.01) buffer solution. The bottom number will change to indicate the buffer solution present (either 4.01 or 10.01).
8. Wait for the reading to stabilize. Calibrate the probe (press HOLD/ENT) and the top value will flash quickly with a value that should be close to 4 (or 10) pH units. Record this value
9. Repeat steps 6-8 if necessary for a third calibration with either 4 or 10 buffer solution.
10. Cover and set aside the calibration solutions for use when you return from sampling.

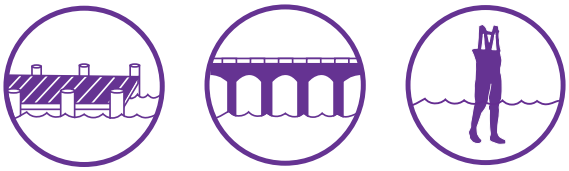
Credit: Alliance for the Chesapeake Bay

11. After calibration, replace the protective cap and turn off the probe while you travel to your site.

BEFORE SAMPLING

PH - PROBE

A. FROM A DOCK, BRIDGE OR WADING



If wading into the stream, always walk to the middle of the channel and then proceed a few steps upstream to collect your sample to avoid contamination from any disturbed sediment. Always collect samples upstream of where you are standing either in the waterway or on a bridge or dock!

I. Collecting directly from waterway

1. Place the tip of your probe 0.3m beneath the surface of the water.
2. Wait for the probe to stabilize.
3. Record your reading on your datasheet.

II. Collecting with a bucket

1. Throw the bucket out as far as possible in the main channel, and try not to disturb the bottom.
2. Rinse the bucket three times with sample water collected downstream of your sampling location.
3. Fill the bucket with the sample water to 3/4 full.
4. Place your probe in the bucket of water and swirl gently. Allow the reading to stabilize.
5. Record your reading on your datasheet.

PH - PROBE

POST-SAMPLE CHECK

To ensure the probe has maintained proper calibration, it is important to verify no significant probe drift has occurred. The procedures listed below will verify the probe did not drift outside QA/QC specifications. **DO NOT CALIBRATE** the probe during this check. Doing so will invalidate the data collected during the sample run.

1. Rinse off the probe and probe tip with tap water and wipe dry using a soft cloth. Washing the probe will remove any material that may reduce probe life.
2. Place the probe into a container of pH 7.00 buffer. You may use the same buffer used during the morning calibration as long as the buffer was covered and appears clean.
3. Allow the probe to stabilize and record the temperature and pH reading on your datasheet.
4. Rinse the probe and repeat the end of day check process using the 4.00 or 10.00 buffer.

NOTE

If both calibration and post-sample checks are within 0.20 units from the buffer values, the probe is within specifications. If the readings are greater than 0.20 units, contact your Program Coordinator to resolve the issue. When uploading data, add a note in the comments field that the pH calibration is out of range. Also note “pH probe flag” at the top of the hard copy datasheet.

PH - PROBE

EQUIPMENT CLEANING AND STORAGE

1. Ensure the probe is cleaned and well maintained. After each sample run, rinse off the probe with distilled water. Use a soft cloth and gently dry the probe and glass sensor.
2. Store the probe tip in the cap provided by the manufacturer. Inside this cap, place a small cotton ball or piece of paper towel soaked with pH 4.00 buffer (or white vinegar). This will keep the probe in working condition until the next field sampling event.
3. If you see any biological growth (mold, algae, etc.), use mild soap or warm (~30° C) pH 4.00 buffer to clean. Rinse with distilled water and dry.
4. If the calibration or end of day check indicates there is a problem with the probe, and standard cleaning does not produce acceptable results, replacement of the sensor cap may be necessary. Contact a Project Team Member to get a replacement sensor cap.
5. Store the probe in a clean, cool, and dry space.

NOTE

When traveling to a sample station or between sample events, keep the probe tip stored in the protective cap with a small amount of pH 4.00 buffer or household vinegar. This will keep the glass sensor hydrated. Never store or transport the probe dry, or in distilled or deionized water, or pH 7 or 10 buffer. Doing so will result in permanent damage the probe resulting in inaccurate readings.

SALINITY - REFRACTOMETER

GATHERING MATERIALS AND EQUIPMENT LIST

- Salinity refractometer
- Dropper
- DI or distilled water
- Tissue paper or soft cloth
- Bucket (if using)

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine the refractometer wear or damage.
- Check the refractometer with distilled water. If it does not read 0 o/oo, you must calibrate the instrument.

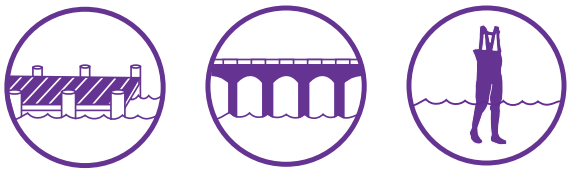
CALIBRATION

1. Check the refractometer with distilled water. If it does not read 0 o/oo, you must calibrate the instrument. DO NOT PERFORM CALIBRATION IN THE FIELD. Calibration must take place in controlled environment at approximately 20 °C (room temperature) using distilled water of the same temperature.
2. Lift the cleat plate and add 1-2 drops of distilled water to the oval blue prism. Hold the prism at an angle close to parallel so the water drops will not run off.
3. Close the plate gently. The water drops should spread and cover the entire prism. Repeat the process if there are any gaps or if the sample is only on one portion of the prism.
4. Look through the eyepiece. If the scale is not in focus, adjust it by turning the eyepiece either clockwise or counterclockwise.
5. The reading is taken at the point where the boundary line of the blue and white fields crosses the scale.
6. If the reading is not at “0” turn the calibration screw with the included screwdriver while looking through the eyepiece until the boundary line falls on “0.”
7. When the measurement is complete, the sample must be cleaned using tissue paper and distilled water.

BEFORE SAMPLING

SALINITY - REFRACTOMETER

A. FROM A DOCK, BRIDGE OR WADING



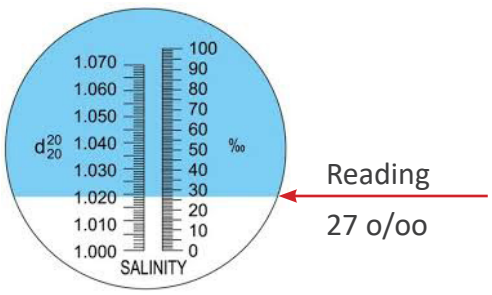
If wading into the stream, always walk to the middle of the channel and then proceed a few steps upstream to collect your sample to avoid contamination from any disturbed sediment. Always collect samples upstream of where you are standing either in the waterway or on a bridge or dock!

I. Collecting sample

1. Rinse your dropper with sample water three times. You can collect water directly from the waterway or from your bucket.
2. Open the lid on the refractometer and using the dropper, rinse the sample surface with sample water.
3. Collect your sample in the dropper, apply the drops on the refractometer and close the lid.

Credit: UMCES

4. Hold up to the light to read salinity where the blue and white sections meet.
5. Record as parts per thousand (o/oo) using the scale located on the right hand side of the refractometer view scope.



Credit: https://www.agriculturesolutions.com

IN THE FIELD

SALINITY - REFRACTOMETER

POST-SAMPLE CHECK

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

EQUIPMENT CLEANING AND STORAGE

1. Rinse with DI or distilled water.
2. Wipe dry with a clean non-scratching cloth.
3. Store in case.

WATER CLARITY - SECCHI DISK

GATHERING MATERIALS AND EQUIPMENT LIST

- 8” Secchi disk with attached line

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Secchi depth should be measured using a weighted line with decimeter (a tenth of a meter) markings.
- Examine the water depth line for wear or damage.
- Measure the increments against a meter stick to ensure line has not stretched.
- Ensure that the line is securely fastened to the Secchi disk.

NOTE

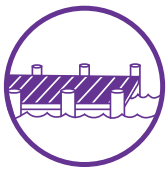
- Make sure the line is securely fastened to Secchi disk.
- Make sure the line is held securely on the boat (do not let go of the line).
- Allow boat wakes and large waves to pass by before measuring Secchi depth.
- Lower the disk on the shady side of the boat.
- Take off sunglasses.

Credit: Matt Rath / Chesapeake Bay Program

BEFORE SAMPLING

WATER CLARITY - SECCHI DISK

A. FROM A DOCK OR BRIDGE



I. Measuring directly in the waterway

1. Remove sunglasses if you are wearing them and stand with the sun to your back. Try to lower the disk into a shaded area.
2. Lower the disk into the water until the disk barely disappears from sight. Note the depth reading, in tenths of a meter, based on the length of line submerged.
3. Slowly raise the disk and record the depth at which it reappears (i.e. is barely perceptible).
4. It can be helpful to pinch the line exactly at the waterline before retrieving for measurement.
5. Average the two depth readings obtained above. The average of the two readings is considered to be the limit of visibility, or index of transparency. Record this average to the nearest tenth of a meter on your data form.

WATER CLARITY - SECCHI DISK

POST-SAMPLE CHECK

You do not need to perform a calibration or check after sampling. Your secchi disk will be checked annually to make sure the markings are accurate during your recertification training.

EQUIPMENT CLEANING AND STORAGE

Rinse line and disk with water to clean off any mud or debris clinging to the line. Dry the line and disk before storing it in a cool dry location. If algae begins to grow on the disk, wash with warm water and soap and scrub gently with a sponge.

AFTER SAMPLING

WATER CLARITY - TRANSPARENCY TUBE

GATHERING MATERIALS AND EQUIPMENT LIST

- Transparency tube

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Check the transparency tube for wear or damage.
- Check that the Secchi disk is clearly visible at the bottom of the tube.
- Check that the drain tube stays closed until released.

NOTE

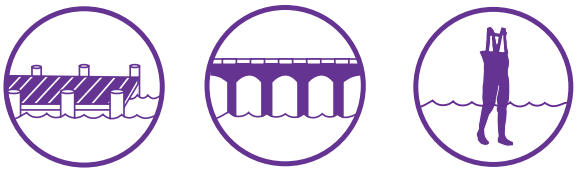
- Transparency tubes are best for sampling sites where Secchi disks would be visible on the boat or where sites are shallow.
- If you are unsure of your measurement, take a second sample.
- Have a buddy help you out by controlling the water release crimp while you look down the tube.
- Measure the turbidity tube in the shade.
- Take off sunglasses.

Credit: UMCES

BEFORE SAMPLING

WATER CLARITY - TRANSPARENCY TUBE

A. FROM A DOCK, BRIDGE OR WADING



If wading into the stream, always walk to the middle of the channel and then proceed a few steps upstream to collect your sample to avoid contamination from any disturbed sediment. Always collect samples upstream of where you are standing either in the waterway or on a bridge or dock!

I. Collecting directly in the waterway

1. Close the drain tube by squeezing the crimp. Enter the waterway downstream of the monitoring site and move to the center of the waterway.
2. Point the top of the tube in the upstream direction and collect water from the waterway, being careful not to disturb the stream bed.
3. Once the tube is full, lift out of the water and carefully exit the waterway.

NOTE

If you cannot fill your tube directly in the waterway, you may use your bucket to collect the sample and pour it into the turbidity tube.

4. Remove sunglasses if you are wearing them and move the tube to a shaded area or stand with the sun to your back.
5. Look down through the opening of the tube and look for the black and white pattern. If you can see the pattern with the tube full, record 120cm on your field datasheet and check the > box below the value.
6. If you cannot see the pattern, partially open the drain crimp and slowly draw off sample (controlling the flow by squeezing the crimp).
7. When the black and white pattern begins to appear, immediately tighten the crimp.
8. Record the level of water (in cm) remaining via the centimeter ruler on the side of tube.

WATER CLARITY - TRANSPARENCY TUBE

POST-SAMPLE CHECK

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

EQUIPMENT CLEANING AND STORAGE

Rinse tube with water to clean off any mud or debris remaining. Allow for the tube to dry before storing it in a cool dry location.

AFTER SAMPLING

TOTAL WATER DEPTH

GATHERING MATERIALS AND EQUIPMENT LIST

- Weighted line with decimeter (a tenth of a meter) markings. This line can be the Secchi disk line if you don't have an additional weighted measuring line or the turbidity tube.

CHECKING YOUR EQUIPMENT BEFORE GOING OUT IN THE FIELD

- Examine the water depth line for wear or damage.
- Ensure that the line is securely fastened to the weight.
- Annually measure the increments against a meter stick to ensure line has not stretched.

NOTE

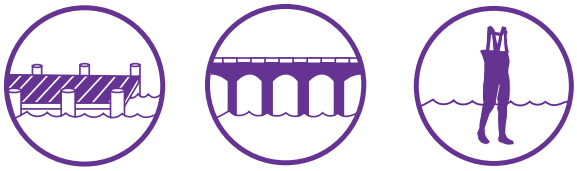
- Make sure the line is securely fastened to weight.
- Make sure the line is held securely on the boat (do not let go of the line).
- Allow boat wakes and large waves to pass by before measuring total depth.

Credit: UMCES

BEFORE SAMPLING

TOTAL WATER DEPTH

A. FROM A DOCK, BRIDGE OR WADING



I. Measuring directly in the waterway

1. At your sampling site, slowly lower the measuring line into the water until it is resting on the bottom and the line has just become slack. Record the depth reading, to the nearest tenth of a meter, based on the length of line submerged.

NOTE

You can wade into the waterway and use your turbidity tube to take the total depth measurement if feasible. Just remember to convert your reading to meters instead of centimeters!

TOTAL WATER DEPTH

POST-SAPLE CHECK

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

EQUIPMENT CLEANING AND STORAGE

Rinse tube or line with water to clean off any mud or debris remaining. Allow for the tube or line to dry before storing it in a cool dry location.