THE UNIVERSITY OF RHODE ISLAND COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

SAFETY FIRST!

(Field SOP 001)

University of Rhode Island Watershed Watch

Date:	**1/23**
Revision:	**4**
Author:	**Linda Green, Elizabeth Herron**

Being a Watershed Watch volunteer usually involves going out on the water. It also may involve using chemical reagents to perform water quality tests. For your protection, here are some simple rules to follow. The most important is to use common sense and ***remember that your safety is far more important than any monitoring data.*** *This list is not meant to be exhaustive.*

Before going to your monitoring location:

- ❑ Keep a first aid kit in your vehicle.
- ❑ Check https://health.ri.gov/data/beaches/ and/or http://dem.ri.gov/programs/water/quality/surface-water/cyanobacteria.php for beach closures and/or harmful algal bloom advisories. Plan accordingly, using gloves and washing with soap and water after exposure if necessary, or simply don't sample.
- ❑ Check the weather report for storm alerts, watches, or warnings.
- ❑ If you are monitoring alone, alert someone in advance that you will be monitoring and check in when you are done. If you will be on the water, please bring and wear a personal floatation device.
- ❑ Apply sunscreen, bug repellent, and wear a hat.
- ❑ Make sure you have all your monitoring supplies.
- ❑ Familiarize yourself with all monitoring instructions.

Upon arrival at your monitoring location:

- ❑ Park legally, and as far off roads as possible, leave your vehicle flashers on if you have any concerns. We can provide you with a laminated ID card for your vehicle if you wish.
- ❑ No trespassing! Please obtain property owner permission if you will be crossing or on private land.
- ❑ Think about your footing while traveling to your monitoring site, watch your step! Watch and plan for
    - Steep and eroding slopes,
    - Tree roots and debris, plants and vines that tangle and scratch, poison ivy,
    - Loose or wet slippery rocks,
    - Ticks, spiders, snakes, snapping turtles, unfriendly dogs or waterfowl.

When readying to go on the water and when you are on the water:

- ❑ **Monitor with a partner if possible.** The old adage about "safety in numbers" applies here. (Having a partner helps improve quality data collection, too.)
- ❑ Familiarize yourself with all monitoring instructions *before* you go on the water.
- ❑ **Wear a personal flotation device.**
- ❑ If your boat has a motor, bring along oars or paddles too!
- ❑ Have an anchor with an attached anchor line on board.
- ❑ **Bring along a supply of drinking water**, especially in the summer.
- ❑ Watch out for other boats on busy days – especially those towing water-skiers!
- ❑ **Stay off the water if high winds, a storm, or lightning is expected soon or has started.**

- Stay off the water if you do not feel well.
- **Wearing protective gloves when you monitor is advisable**, especially if you are monitoring within 24 hours of a major storm, there are visible algae blooms or other debris, or you have any concerns about the water you are monitoring. We can provide you with gloves if needed.

When using monitoring kits:

- Familiarize yourself with all instructions. Ready the material safety sheets and safety instructions that come with each kit. Keep children away from chemicals.
- Follow the instructions step-by-step, in the order written.
- Keep a supply of paper towels, some dampened, on hand to quickly mop up spills or to wrap sample bottles in when running tests.
- Wear glasses or goggles and gloves when using test kit chemical reagents.
- Avoid contact between chemical reagents and your skin, eyes, nose, mouth.
- Use stoppers or bottle caps, not your fingers or hands, to cover bottles during shaking or mixing.
- **If you spill anything on yourself, immediately flush thoroughly with *lots* of water. It is perfectly acceptable to use nearby lake, stream or salt water – do NOT wait until you get home or to a faucet!**
- Rinse and wipe up any regent chemical spills, liquids, or powder as they occur.
- Thoroughly rinse all your testing apparatus with tap water after use.
- Thoroughly wash your hands after performing your tests, even if you wore gloves.
- Keep equipment and chemical reagents out of sunlight, extreme heat or cold (such as car trunks), or moist areas (such as under sinks.)
- Keep all equipment and supplies away from children, just like you would household cleaning products.

If you have *any* questions or concerns call URI Watershed Watch 401-874-2905 or 401-874-4552.

To report suspected blue-green algae blooms, contact Brian Zalewsky in DEM's Office of Water Resources at 222-4700 ext. 2777145.

For more information go to: https://dem.ri.gov/bluegreen/. There is a button on the page to generate an email to notify RIDEM. If possible to safely take a photo of the suspected cyanobacteria, please do so and attach to the email.

THE UNIVERSITY OF RHODE ISLAND COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

WHERE WE MONITOR: PIN-POINTING YOUR MONITORING LOCATION

(Field SOP 002)

Date: 1/23
Revision: 4
Author: Linda Green, Elizabeth Herron

University of Rhode Island Watershed Watch

All URI Watershed Watch volunteers monitor a particular location for an entire monitoring season. Unless otherwise described, **water quality monitoring is done at the deepest part of each lake or pond, and mid-stream in rivers and streams.** Salt ponds, bays and harbor sites are usually specifically described and assigned by the local sponsoring group, such as Salt Ponds Coalition or the Narrow River Preservation Association.

Lakes and Ponds.

We have several ways of determining where the deepest spot is. For many locations we rely on maps originally found in Fisheries Investigations and Management in Rhode Island Lakes and Ponds, by Richard Guthrie and John A. Stolgitis, available from the Rhode Island Division of Fish and Wildlife. This book contains bathymetric maps, which are maps of the bottom contours of lakes and ponds. The contours have three-foot intervals. These maps can be found on-line at http://www.dem.ri.gov/maps/mapfile/pondbath.pdf. For locations not in this book we rely on United States Geological Survey (USGS) topographic maps to help guide us. Unfortunately, those maps don't show bottom contours, but you may be able to infer where the deepest part is by locating adjacent steep areas that may extend into the pond. That provides a good starting point for going out onto the water to poke around with a Secchi disk or to use a depth finder to locate the deepest spot. If your location has been monitored previously, we can also provide annotated maps, where past volunteers have described and marked their monitoring location, generally following the directions below. We can provide new volunteers with the contact information for the past volunteers so you can learn directly where they monitored.

We have our active monitoring locations identified on a map online, which may be able to help new volunteers find an exact monitoring site. See https://uri.maps.arcgis.com/apps/webappviewer/index.html?id=e52febefccb247e7927ced6ba1b42284 for that map. We also invite you to use your own GPS device to confirm or update your monitoring location. Since different GPS units have their own instructions we will not provide any here.

What we rely on most is your knowledge of your particular monitoring location.

Supplies:

- ❑ boat, anchor, personal flotation device
- ❑ map, clipboard, pencil
- ❑ Secchi disk

Directions:

1. Bring your map to your site and orient yourself. Mark your starting location (dock, launch ramp, etc.) on the map.
2. Go out to where you think the deepest spot is.
3. Check the depth to the bottom using your Secchi disk.
4. Try some nearby areas, marking the bottom depths on your map. It may take you some time to find the deepest spot.
5. When you find the deepest spot, anchor your boat and take a look around.

6. Facing forward in your boat, what distinguishing landmarks do you see in front of you, in back of you, to your left and right? You will use these landmarks to locate your spot every time you monitor. On some lakes or ponds you may be able to leave a buoy to mark the spot.
7. Mark down these landmarks on your map. Also write them down on a separate piece of paper. Consider photographing your landmarks to further orient yourself and others.

Rivers and Streams:

Unless otherwise described, monitoring on rivers and streams is done in the middle of the stream, facing upstream. If you are monitoring a tributary stream to a lake, pond, salt pond or other stream, monitoring is done upstream of the location, so that your samples capture the river/stream water, not what it is flowing into.

Monitoring is done facing upstream, so that if you are standing in the water anything you stir up will wash downstream and not into your sample bottles.

If you are monitoring at a road crossing, unless otherwise described, monitor on the upstream side of the road, to minimize the contribution of the nearby road to your water samples.

We have maps with written descriptions for many monitoring locations, and rely on past volunteers to direct new ones to the exact spot. The online map accessible from https://uri.maps.arcgis.com/apps/webappviewer/index.html?id=e52febefccb247e7927ced6ba1b42284 can be helpful to confirm site locations.

If your location is brand new, we encourage you to use a GPS device to record the coordinates.

Another great way to help "mark" your stream site is to take photos of it both to share with us (we love photos) and as a record of where your site it. With so many digital cameras in use, some volunteers take a photo of their site each time they monitor it, and in particular of any outstanding feature, such as a rock, culvert, existing marker or even the road crossing. A series starting from further out and then successively zooming in is also very useful.

Salt ponds, Bay or Harbor sites:

In many cases salt water monitoring is done off the ends of docks. These locations are generally specified by the sponsoring organization such as the Salt Ponds Coalition or Save Bristol Harbor and their monitors are shown exactly where to monitor. Those organizations and URI Watershed Watch have GPS coordinates of those locations. If monitoring is done in the middle of, for example, Green Hill Pond, the location is found and marked as in the "Lakes and Ponds" section above.

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No matter how you mark your spot, ***think about how you would explain your location to someone who isn't as familiar with the spot as you are.*** *This is very important, both for future monitoring efforts and for supplementary monitoring by water quality professionals.*

At intervals Watershed Watch will also ask for current volunteers to complete site description forms to both ensure that volunteers are monitoring at correct locations and to have a record of any changes at sites.
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THE UNIVERSITY OF RHODE ISLAND
COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

MONITORING POSTCARD INSTRUCTIONS

(Field SOP 003)
Modified for salt water and online data

Date: 10/20
Revision: 4
Author: E. Herron & L. Green

University of Rhode Island Watershed Watch

Your monitoring supplies contain a set of monitoring postcards. Please fill one out each time you do your water quality monitoring, or a field data sheet. The postcards are pre-stamped. If you enter your data online, please be sure to check the line so we know to download your data.

Please be sure to mail it to us right away if you aren't entering data online.

Often monitors forget to write their name, their location, and/or the date. Without this information we cannot record and use your valuable data. **Please check over your postcard before you mail it to be sure you have included everything needed**. Sample depth either circled for shallow samples of written in for deep samples is important to include!

Codes for "Light", "Wind" and "State of Tide" are described on the next page.

Salinity is measured in the field at just a few salt water locations with a meter. It is only applicable to sites that are influenced by the ocean such as the Narrow River, Salt Ponds, estuaries and Narragansett Bay. If "Salinity" is *not* determined at your site write "N/A" or "-".

Please read the monitoring postcard carefully. Some additional information is requested from certain monitors or groups and would have been described during your training. If you still have questions, call us at 401-874-2905.

Monitoring Postcard:

LOCATION: My favorite site
MONITOR(S): Stellar Family
Check if entered on-line: ✓
DATE MONITORED: 07/4/2020 (mo/day/yr)
TIME: 13:15 (military)
SECCHI DEPTH (measure 4 times):
4.2 3.8 4.1 3.8 meters

Measured on just a few salt water or river locations

Depth to bottom is 9.8 meters. Is Secchi visible on bottom? yes or no
CHLOROPHYLL SAMPLES: FILTERED and FROZEN: yes or no

DEPTH MONITORED (meters)	Surface	0.5 or 1 m	Record actual depth: 8 m deep	Record actual depth: 8m deep
WATER TEMPERATURE (deg. C)	21.2	21.0	16.2	16.1
DISSOLVED OXYGEN (mg/L) (Measure twice at each depth)	N/A	8.0 | 7.9	3.0 | 2.9	3.2 | 3.4
SALINITY (ppt)	N/A	-	-	-

Field measured with meters on just a few sites

(for below, circle best description, see monitoring manual for details)
LIGHT: 1 = Distinct shadows 2 = No shadows 3 = Very overcast
WIND: 0 = Calm 1 = Light 2 = Gentle 3 = Moderate 4 = Strong
RAIN W/IN 48 Hrs: 1 = None 2 = Light 3 = Moderate 4 = Heavy
STATE OF TIDE: Ebb Flood High Low Not tidal

CODES FOR ENVIRONMENTAL CONDITIONS

These codes describe environmental conditions when you are monitoring. Please enter the code number that best describes the conditions on your monitoring postcard.

Light conditions:

Code #	Description
1	Bright, distinct shadows
2	Cloudy-bright, no shadows
3	Heavily overcast

Wind speed:

Code #	Wind Velocity (mph)	Weather Term	Condition of Water surface
0	0	Calm	Completely calm
1	1 - 7	Light	Smooth or rippled to small wavelets
2	8 - 11	Gentle	Large wavelets, crests begin to break, few whitecaps
3	12 - 16	Moderate	Small waves, frequent whitecaps
4	17 - 24	Fresh	Moderate crested waves, many whitecaps
5	25 - 35	Strong	Large waves, white foam crests everywhere, wind blown spray – **too dangerous for monitoring!!!**

Rain within 48 hours

Code #	Description
1	None within the last 48 hrs
2	Light < 0.5 inch within the last 48 hrs
3	Moderate 0.5 – 1 inch within the last 48 hrs
4	Heavy > 1 inch within the last 48 hrs

State of Tide:

State of Tide	Description
EBB	Tide is flowing OUT toward the ocean
FLOOD	Tide is flowing IN toward land
HIGH	At high tide
LOW	At low tide
N/A	None of the above apply (site is inland and not connected to the ocean)

Using URI Watershed Watch's Online Data Entry

This Data Entry platform performs best when accessed using either Firefox or Chrome web browser.

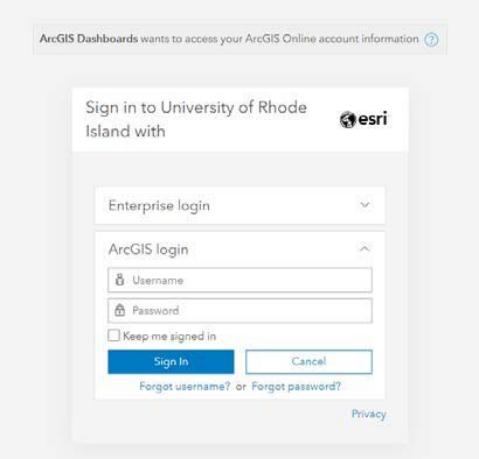
Navigate to the URIWW website

- **http://web.uri.edu/watershedwatch/**
- **Click "Data" from top menu > Choose "Online Data Entry"**

Or use this link to connect directly to the Data Entry platform

- https://arcg.is/H8PHe (type directly into your browser)

You will be prompted to **sign in to URI's platform**.



- Select **ArcGIS Login** using the following login credentials.
  - Username: **URI_WatershedWatch**
  - Password: **URI_ww_2020** ***(updated annually)***

The Watershed Watch Monitor: Data Entry App will load. This may take a few seconds.

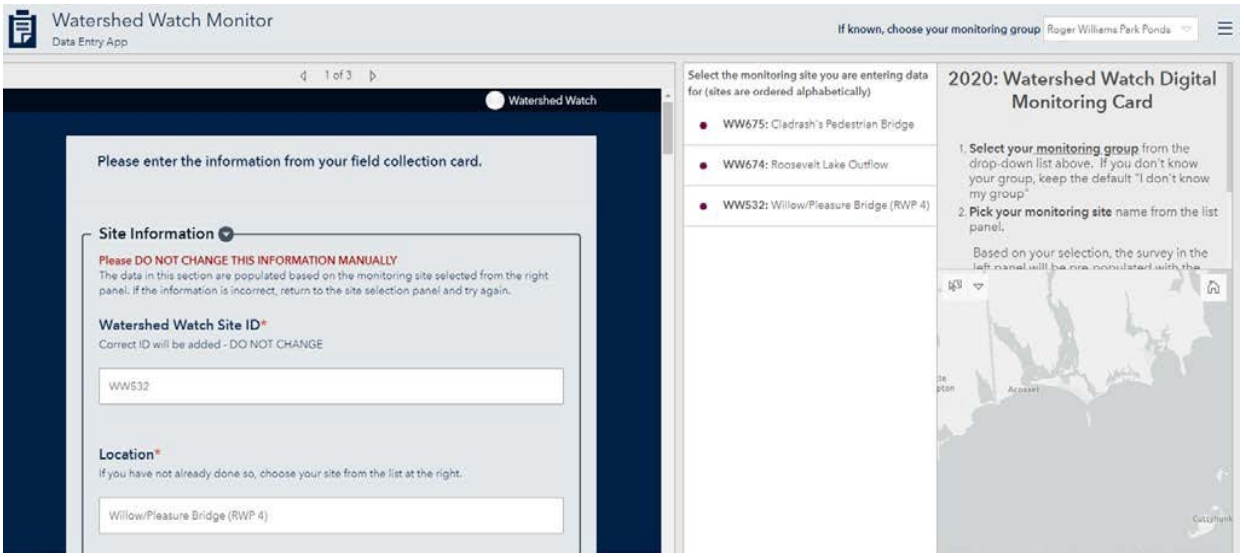
Watershed Watch Monitor: Data Entry App

Select your site using the site list panel

- Scroll through the alphabetized site name list panel to find your monitoring location

Or choose your **monitoring group** first to get a smaller list of sites.

- From the drop-down selection box in the upper right hand corner, pick your group if you are part of one such as the *Roger William Park Ponds*)



Entering Data

- Click on your monitoring site from the site list panel.
- The **field collection card** on the left is automatically populated with **Site information**.
    - Station ID (WW##)
    - Location
    - Monitoring Group

Please do not change this.

If your information is not there or is not quite correct, please contact us to make adjustments or to confirm your monitoring site.

Scroll through the **field collection card** to begin entering your information.

- **Field Collection Data**
    - **Monitor(s) Name:** Type your name, and that of any others monitoring with you.
    - **Date Monitored:** Select the monitoring date and time from the drop down.

Scroll through the survey to enter the remaining data into the appropriate fields from your monitoring postcard or field datasheet.

Note: there are required data fields that must be completed before the system will allow you to submit your data.

- **Picture of site conditions:** Photos of your monitoring site, especially if it is experiencing an algal bloom or other unusual condition are welcome and can be uploaded with this data.

Click "Submit" to upload your data to the data dashboard.

Please check "entered online" on your postcard, turn postcards in at water collections. We will use your hard copy to proof online results.

Please contact Elizabeth (874-4552 or eherron@uri.edu) if you have any questions or problems entering your field monitoring postcard data.

THE UNIVERSITY OF RHODE ISLAND COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

HANDLING AND TRANSPORTING WATER SAMPLES

(Field SOP 004)

University of Rhode Island Watershed Watch

Date: 10/20
Version: 4
Author: Linda Green, E. Herron

Keep 'em cold & NO Smoking!!!

How you handle your water samples once they are out of the water is extremely important in ensuring that the results of what you test truly reflect the condition of the water. Sunlight and warm air temperatures can dramatically affect your samples. Here are some important points for transporting your water samples:

Before you go on the water:

- Bring a cooler/bag and a frozen cold pack with you for chlorophyll monitoring and on water collection days.
- Have a zip lock bag and a separate cold pack on shore to store your chlorophyll filters in.
- On hot, sunny days store your deep water sampler in the cooler/bag while you are on your way out to your monitoring site. (The temperature of the sampler can raise the temperature of the water inside it.)

On the water, after you collect your water samples:

- Check the water temperature of one sample and then…
- Immediately put your two chlorophyll bottles in the cooler/bag.
- It is a good practice to store your dissolved oxygen bottles in the cooler/bag too!
- If you forget your cooler/bag at least store your water samples out of the direct sunlight.

On-shore:

- ***NO SMOKING!*** It will affect the amount of ammonia-N in your water (no kidding!)
- Find some shade! Chlorophyll filtering must be done out of direct sunlight if outside and in subdued light if indoors.
- Keep the processed filters cold! If you filter your samples at home put the filters right in the freezer when you are done. If you aren't home, put the filters in a zip lock bag next to a cold pack. Do not store the filters directly on ice. Please keep the filter packets in the labeled desiccant chip baggie in your freezer – those chips help to keep the filters dry.
- Water samples should be stored in your refrigerator until you are ready to bring them to the URI Watershed Watch laboratory.

Bringing your water samples and chlorophyll filters to the URIWW lab:

- ***KEEP 'EM COLD!*** Use an insulated cooler/bag with cold packs or ice. If you choose to use ice, please put the ice in *its own* zip lock bag *or* put your water bottles in a bag so that the melting ice doesn't cause the labels to slip off your bottles.
- Please put your bag of chlorophyll filters right next to a cold pack. Either put the pack inside the zip lock bag with your filters or use a rubber band to keep the chlorophyll bag right next to the cold pack.

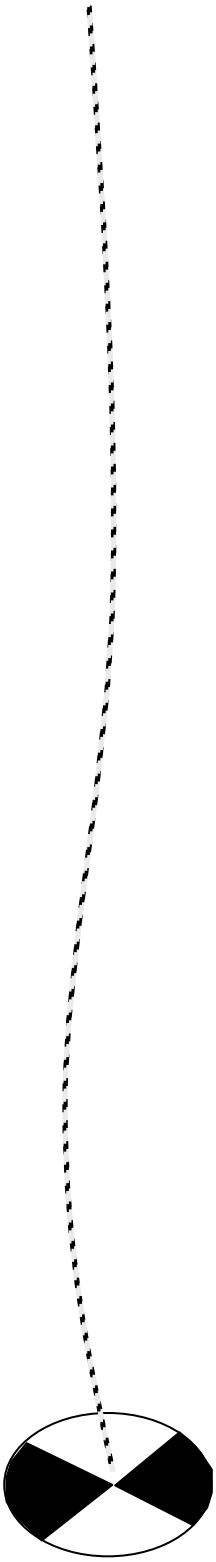
THE UNIVERSITY OF RHODE ISLAND
COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

SECCHI DEPTH TRANSPARENCY

(Field SOP 005)

Date: 1/23
Revision: 5
Author: Linda Green, E. Herron

University of Rhode Island Watershed Watch



1. **Make your measurements between 10 AM and 2 PM**, preferably at about the same time, each week you go out.
2. **Position your boat over the deepest point in your pond and anchor it.**
3. **Secchi depth measurements are taken with the aid of a view tube.**
4. **Make your measurements from the sunny side of the boat.** Wear your regular prescription glasses, but not sunglasses.
5. **Hold the view tube vertically** by the handle so that it extends **into the water about 4 inches**.
6. Using your free hand, **lower the Secchi disk slowly until it just disappears**. (See the Secchi Simulator https://web.lakestewardsofmaine.org/secchi-simulator/ to better understand what it should look like – this is a GREAT tool!)
7. At this point **mark where your line meets the water with a clothespin**. This is the descending Secchi depth transparency.
8. **Now, lower your line a few feet more, then slowly raise it. When you can just make out the Secchi disk, mark the line with another clothespin.** This is the ascending Secchi depth transparency.
9. Bring your disk back on board your boat.
10. **The engineering tape attached to your Secchi disk is marked** in meters and tenth's of meters. (1 meter = 3 1/4 feet).
11. ***Measure the distance to each clothespin from the Secchi disk to the nearest 1/10 meter.*** Record your measurements in your field note pad, or on your postcard using a pencil. (Pencils write when wet, pens usually don't).
12. **After any other monitoring procedures are competed, make a second set of Secchi depth transparency measurements** following Steps 4-11. Record those too.
13. **After all monitoring procedures are completed** determine bottom depth by lowering the Secchi disk all the way to the bottom. It is important to do this last because when the Secchi disk hits the bottom it will stir up sediment.
14. When you are back **on shore,** transfer your readings and other appropriate monitoring information to the pre-stamped postcard and drop it a mailbox as soon as possible. Postcards should be mailed weekly, not just when biweekly chlorophyll filtering is done. And/or add the information to your field datasheet. Alternatively enter your field data on-line and save your postcard and hand it in at the end of the monitoring season.

PLEEEZE remember to put your monitoring location, your name, date and time on your monitoring postcard. We can't use your data if we don't know from where and when it came!

THE UNIVERSITY OF RHODE ISLAND COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

WATER TEMPERATURE

(Field SOP 006)

University of Rhode Island Watershed Watch

Date: 10/20
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Author: Linda Green
E. Herron

General Points to remember:

- Keep your thermometer out of direct sunlight when not in use. It will heat up and take longer to stabilize if not.
- **Your thermometer must be immersed in water while you read it.**
- Measure water temperature while on the water. Do not wait to come back to shore.
- If your river/stream site is shallow enough, as many streams are, hold your thermometer directly in the water, half way to the bottom to measure water temperature.
- All thermometers are calibrated before being given out at the start of the season to ensure that they are accurate.

Using Liquid-filled Thermometers:

- Visually check your thermometer to make sure that the liquid (non-toxic alcohol) has not separated. If it has please return it to Watershed Watch for a replacement.
- If your thermometer has a plastic cover it does not need to be removed before use. If you notice that water is not getting inside the cover, loosen it a bit. (You can also remove the cover, heat a pin over a flame and push it through the plastic cover to create a vent hole.)
- **Measure water temperature while the bulb of the thermometer is still in the water**. Swish the thermometer in the water until the temperature stops changing. It will respond quickly.
- The thermometer does not need to be completely submerged to take a reading.
- The thermometers we use measure temperature in degrees Celsius. On the next page is a conversion chart to Fahrenheit.
- It is best to store the thermometer upright, bulb end down.

Using Electronic (yellow lollipop) Thermometers:

- This thermometer can accidentally be turned on if the on/off button hits other equipment in your monitoring supply bag, so please be careful to check it before storing your supplies between sampling trips (the batteries will not last long if left on). We have replacement batteries, so please contact us if your battery goes dead.
- To operate the thermometer, press the on/off button.
- Once the thermometer is on, check to be sure the instrument is reading in degrees Celsius (^oC), if not press the $^oF/^oC$ button. URI Watershed Watch records temperature in ^oC.
- Remove the plastic cover from the stem of the thermometer and insert it into the sample bottle or directly into the water (for streams and surface temperatures). Only the metal stem needs be submerged to obtain a temperature reading. **Record the water temperature while the metal stem is in the water and once the reading has stabilized.**

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To determine water temperature from shallow lake, pond (including salt pond) or coastal locations:

1. Water temperature is measured at a depth of 1 meter from the surface on lakes and ponds unless otherwise specified. It is measured from a depth of 0.5 meters, or arm's depth from many salt or estuarine sites if a sampler is not used to collect water. Please be sure to circle the shallow depth (usually 0.5 or 1 meter) sampled at.
2. Obtain a water sample using your sampler, typically filling your plastic chlorophyll bottle.
3. Put your thermometer into the water sample contained in the plastic chlorophyll bottle.
4. Wait for your thermometer to stabilize; this usually takes a minute or two. Record the temperature on your monitoring postcard and field data sheet.

To determine water temperature from deep lake and pond (including salt ponds) and deep river locations:

1. There is a place inside the clear LaMotte deep water sampler for your spirit-thermometer to fit in nicely.
2. Put the spirit-thermometer in the sampler *before* you collect your water sample. Position it so that you can read the thermometer without taking it out.
3. Collect your shallow and deep water samples as you would normally (SOP 012). For most sites it should be collected from a depth of about 1 meter FROM the bottom, or a defined depth, such as 3 meters (Narrow River). Be sure to record the deep depth from the surface on your monitoring postcard with your deep temperature.
4. If you are collecting water for dissolved oxygen as well as temperature, please read the water temperature after you have capped the dissolved oxygen bottle.
5. Record water temperature for both 1 meter and deep sample depths on your monitoring postcard and field data sheet. The temperature at the 1 meter depth can be taken from the water sample in the plastic chlorophyll bottle (filled from a depth of 1 meter).
6. Alternatively, you can use an electronic thermometer by removing the cover and putting it inside the deep water sampler *after* you collect your water sample.

(continued on next page)

Comparison of Celsius and Fahrenheit Temperatures

Celsius Temperature (ºC)	Fahrenheit Temperature (ºF)
0	32.0
1	33.8
2	35.6
3	37.4
4	39.2
5	41.0
6	42.8
7	44.6
8	46.4
9	48.2
10	50.0
11	51.8
12	53.6
13	55.4
14	57.2
15	59.0
16	60.8
17	62.6
18	64.4
19	66.2
20	68.0
21	69.8
22	71.6
23	73.4
24	75.2
25	77.0
26	78.8
27	80.6
28	82.4
29	84.2
30	86.0
31	87.8
32	89.6
33	91.4
34	93.2
35	95.0

Equipment

- ❑ Insulated cooler/bag with freezer pack
- ❑ 2 white lidded plastic bottles (labeled for chlorophyll) of sample water

Chlorophyll filtering apparatus:

- ❑ 60 mL plastic syringe, marked at 50 mL
- ❑ 2 round white plastic filter holders
- ❑ Small glass fiber filters (stored in 35 mm film canister)
- ❑ Wrapping paper: coffee filters or paper toweling (provided by you)
- ❑ Tweezers or large safety pin
- ❑ 4" squares of aluminum foil (provided by you)
- ❑ Sheet of chlorophyll labels
- ❑ Squeeze bottle containing magnesium carbonate ($MgCO_3$) – non-toxic
- ❑ Re-sealable plastic bag containing desiccant chips
- ❑ Plastic bottle with a yellow label "filtered" (used just on water collection days)

Getting Started…

Remember, NO SMOKING ALLOWED

Measuring chlorophyll tells us how much algae are in your water. Sample collection and filtering for chlorophyll is typically done on water from a depth of 1 meter (approximately 3.25 ft). **Remember, it is very important to keep the water samples in an insulated cooler/bag and out of the light until you are ready to begin the chlorophyll filtration.**

If you are doing this on a scheduled water collection day, you will save some of your filtered water in your yellow-labeled plastic bottle. If not a collection day, you can discard the filtered water.

1. Before you go out on the water, on shore and out of direct sunlight, set out your filtering apparatus, making sure you have everything you need, including paper toweling or coffee filter paper for wrapping filters, aluminum foil for sealing them and labels for identifying samples.
2. **Collect two separate 1 meter water samples using your water sampler (or two separate 0.5 meter samples if you don't have a sampler and just scoop up you sample directly into your chlorophyll sample bottles.** After rinsing your plastic chlorophyll bottle with water from the sampler, fill the first bottle with your first sample and the second bottle with your second sample. Cap the bottles and put them into your insulated cooler/bag. **They must be kept out of sunlight and cool.**
3. Finish your other monitoring activities and return to shore.

(continued on next page)

Rinse and prepare the syringe.

4. Thoroughly shake one of the plastic bottles containing your water sample.
5. Using your syringe, draw up approximately 10 mL of water from the bottle into the syringe.
6. Rinse the syringe by pushing the water back and forth using the syringe plunger or by shaking the syringe.
7. Then, push the water out of the syringe. The syringe is now rinsed.
8. Take apart your syringe by pulling the plunger all the way out.

Prepare the filtering apparatus (out of direct sunlight):

9. Open one round white filter holder assembly.
10. Using tweezers, remove 1 small filter circle from its container (35 mm film canister).
11. **Put the filter circle in the filter holder.**
    - Handle the filter circle with your tweezers, not your fingers.
    - Center the filter circle **rough side up, gridded side down**, on the metal screen on the bottom of the filter assembly. (Remember – grid to grid, or "roughed up.")
    - Place the black rubber gasket on top of the filter and,
    - Firmly screw the filter holder back together.
12. Attach the round white filter holder to the syringe by twisting it on. You will see that there is only one way in which it will fit, and only ¼ turn is needed to seat it.

Filter your water sample.

13. Cap your sample bottle and shake well again.
14. Hold the syringe with filter holder facing down. Put your finger over the outlet.
15. Pour your water sample into the syringe up to the 50 mL line marked on the syringe.
16. Shake the flip top bottle of magnesium carbonate. Squeeze **four drops of magnesium carbonate** into the water sample in the syringe.
17. Attach the syringe plunger and slowly push the water through the filter apparatus with even pressure, keeping the syringe vertical, not at an angle. Take your time!
18. Usually you will discard the filtered water. **If it's a water collection day you will save the filtered water** in the plastic bottle with the yellow "filtered" label. Use some of the filtered water to first rinse the bottle. Then collect about half of the remaining filtered water.

CAUTION: On some lakes with intense algal blooms the algae will completely clog the filter before you have filtered all 50 mL of water. ***You should not have to push with all your strength to filter the water sample.*** *If this is the case or if you see water drops coming out from between the top and bottom of the white plastic filter holder* ***the filter has become clogged (either with algae or sediment). You must start over with a fresh filter and water sample.*** *Use less water, perhaps 25 mL, and remember to record the amount used on your postcard and on the filter label itself. The amount of water filtered should be the same for all filters in each foil packet for the same date. If the volumes are different, then package the filters separately with labels indicating the volume filtered.*

After you have filtered a water sample. *Out of direct sunlight*…

19. **Take the filter holder off the syringe.**
20. **Unscrew the two halves**. Using tweezers lift out the black rubber gasket (unless it has stuck to the lid, then proceed to the next step).
21. Again using tweezers (or the tip of a large safety pin), **lift out the filter circle by an edge**.
22. **Place the filter circle on a piece of blotting/wrapping paper** (paper towel/coffee filter). If the filter breaks while you are removing it, try to get all the pieces onto the blotting/wrapping filter paper.
23. Fold the filter in half with the rough sides together. **BE SURE TO FOLD THE FILTER SO THAT THE CHLOROPHYLL SAMPLE IS ON THE INSIDE – your filter will be a half circle, like pita bread!** Wrap the blotting/wrapping paper over the filter.
24. Place the folded filter paper on a piece of aluminum foil. Cover it loosely with foil.

Filter three more water samples.

25. Shake your first water sample in the white plastic bottle again. Repeat steps 9 – 24 to **filter a second sample of water from the first chlorophyll bottle.**
26. **Then repeat these steps twice with the water from the second chlorophyll sample bottle.**

✔ *You will have filtered a total of 4 samples of water!*

Finish processing the four filter circles.

27. **Securely fold a piece of aluminum foil around the four filters** (folding the foil over the filters from the edge like a jelly roll helps keep them separated and easier to handle).
28. Attach a chlorophyll label, filling in your name, the date, the amount of water you filtered, and the number of filters in the foil packet.
29. **Place the aluminum foil packet in the labelled, re-sealable plastic bag containing desiccant chips and then into your freezer**.

Rinse the filtering apparatus and fill out your postcard.

30. Take apart the syringe and filter assembly.
    - Rinse all apparatus with tap water - **DO NOT USE DETERGENTS.**
    - Place upside down on a paper towel to dry. Reassemble loosely when dry.
31. Circle “Yes” on your Monitoring Postcard in the section: “CHLOROPHYLL SAMPLES: FILTERED and FROZEN: yes or no.

Only on water collection days:

32. **Save the filtered water in the plastic bottle with the yellow “Filtered” label.**
33. Add some filtered water from second, third and fourth chlorophyll samples to that from the first sample. You will have more than enough water to rinse and fill your bottle. **We use this water to test for nitrate-N, ammonia-N, dissolved phosphorus, and chloride (as appropriate). Transport in a cooler with a cold pack.**

BACTERIAL MONITORING

(Field SOP 008)

University of Rhode Island Watershed Watch

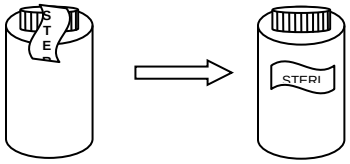
Date:	**10/20**
Revision:	**4**
Author:	**Linda Green, E. Herron**

In bacterial monitoring maintaining sterility is essential, because bacteria are everywhere! **All the sample bottles that have been sterilized have a piece of tape with the word "sterile" across the bottle cap.** Since bacteria are everywhere – in the air, in the water, on our skin and on the outside of the sample bottles, it is important to avoid getting anything in the sample bottle, on the mouth of the bottle, or inside the lid except the water sample you are collecting. Bacteria samples are collected at the same monitoring location as the rest of your samples. However, the sample is collected half way to the bottom *or* at arm's length using only your arm to scoop the ample directly into the bottle, never by using a water sampling device.

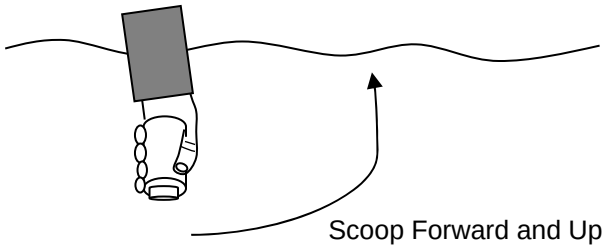
We recommended that you wear disposable plastic gloves to further avoid any contamination, either from you to the sample or from the water to you.

KEEP THE LID ON UNTIL YOU ARE ABOUT TO COLLECT YOUR SAMPLE.

1. Roll up your sleeve and put on your gloves.
2. When you are ready to sample, remove the "sterile" tape from the bottle cap and place it on the side of the bottle, as shown below.



3. **Take the cap off the sample bottle.** Don't touch the inside of the cap or the rim of the bottle. Carefully hold the lid in the hand you used to remove the cap, don't put the lid down.
4. **Grasp the middle of the bottle with your sampling arm.**
5. **Holding the bottle upside down, push the bottle as far down into the water as you can reach.** Turn the bottle opening forward and scoop it forward and up out of the water in one sweeping motion. Make sure you sample forward and away from you so that there is no chance that you will contaminate the sample with bacteria from your arm. The figure below shows this motion.



6. **Pour off a little water in the bottle so the water level in the bottle is at the neck of the bottle**. This provides necessary space for mixing.
7. Carefully cap the bottle. **Store the bottle in your cooler with ice or an ice pack.**
8. Bring your water sample in a cooler with an ice pack to the URI Watershed Watch laboratory as soon as possible.

THE UNIVERSITY OF RHODE ISLAND
COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

COLLECTING UNFILTERED WATER SAMPLES

(Field SOP 009)

Date: 09/20
Revision: 3
Author: Linda Green
E. Herron

University of Rhode Island Watershed Watch

Unfiltered water samples are collected for a variety of laboratory analyses, as well as field processing for lab chlorophyll analysis and field analysis of dissolved oxygen. We collect water samples in plastic bottles for pH and alkalinity and in glass bottles (labeled unfiltered) for total phosphorus and nitrogen. We also save the filtered water from chlorophyll filtration in plastic bottles for analysis of nitrate- and ammonia-nitrogen, dissolved phosphorus and chlorides.

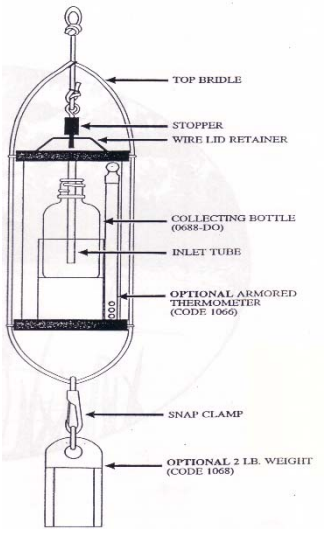
The samples bottles you are supplied with have been thoroughly cleaned to make sure that they are as free from contaminants as possible. Our Watershed Watch students occasionally even fill the shallow and deep samplers with ultra-pure water to check for residual contamination.

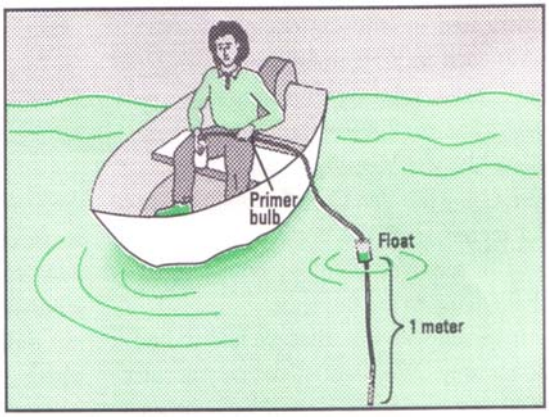
The most important step you can take to prevent contamination is to rinse your water sampling apparatus and any bottles (except your sterile one) before you use or fill it. This is called *conditioning*. And then rinse your sampler and chlorophyll bottles with tap water *after* use and let air-dry!

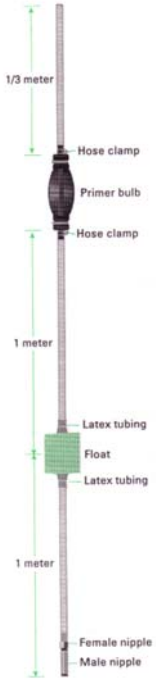
1. Rinse your water sampling apparatus with some surface water and then collect a shallow water sample either using the shallow water sampler (see Shallow Water Sampler Operation Field SOP 011) or a deep water sample using the deep water sampler (see Deep Water Sampler Operation Field SOP 012).
2. Circle or add the sampling date, time and depth as appropriate on the label.
3. Un-cap and **rinse your unfiltered sample bottle(s**) with some of the collected water. Discard the water used to rinse the bottle.
4. **Fill your sample bottle(s)** to within approximately 0.5 inch of the bottle rim. This will leave an air space in the sample bottle to allow for mixing of the sample in the laboratory.

Dissolved oxygen bottles must be filled to the brim, no air space or air bubbles allowed!

5. **Cap your sample bottle and place it into your cooler**.
6. Repeat as needed until all surface and/or deep unfiltered water sample bottles are filled.
7. Finish your other monitoring activities and return to shore.







The most common deep-water sampler URI Watershed Watch uses is the LaMotte #3-0026 water sampler. Detailed instructions for this water sampler are in Deep Water Sampler Operation Field Standard Operating Procedure (SOP) 012. Briefly:

1. Remove the cap of a glass dissolved oxygen bottle and place it in the sampler.
2. Put the lid on the sampler making sure the inlet tube on the sampler lid goes into the glass bottle.
3. Put the black plug firmly into the hole in the top of the sampler lid, but no too tightly.
4. Lower the sampler to the desired depth.
5. Jerk sharply on the sampler line to pop the plug out of the lid. Water flows through the inlet tube into the glass bottle and then overflows, flushing the glass bottle several times before filling it and the sampler.
6. As the water fills the sampler a steady stream of air bubbles will rise to the water surface, how close to your boat depends on the water current. Sometimes you may not see them. Often, they come up under the boat and you may hear them popping softly.
7. Wait at least five minutes before bringing your sampler to the surface or until there are no more bubbles.
8. After the sampler is taken out of the water you can do one of two things. You can cap the glass bottle and then remove it from the sampler. Alternatively, if no other water sample is being kept (i.e. for water collection or chlorophyll) you can add your 8 drops of reagents 1 and 2 directly through the surface of the water into the dissolved oxygen bottle right in the sampler, then cap it. Remove and shake it.
9. Remember to read the thermometer right away when you pull your deep water sampler onto the boat. More information on how to collect temperature samples is found in the “Water Temperature” procedure (SOP 006).

The most important first step is to make sure your dissolved oxygen bottle is filled to the brim and that there are no air bubbles. When obtaining water samples for dissolved oxygen measurement you must be very careful to **minimize contact of the water sample with air**. While our water samples will typically contain 0-12 ppm oxygen, the air we breathe contains about 210,000 ppm oxygen. This is especially important with deep samples since deep water can become depleted of its oxygen during the summer. If you are collecting both a shallow and deep water sample, collect the deep water sample after collecting the shallow water sample. This way the deep water sample does not sit in the boat as long, decreasing the chances of introducing oxygen into the deep samples.

When you arrive back on shore, **the dissolved oxygen test must be started before any other measurements**. We use LaMotte test kits. The specific instructions for the kit are on the next pages as well as in the kit itself. Please familiarize yourself with the procedure before you begin. The basic procedure involves "fixing" the oxygen by reacting it with several different chemical reagents. Once the dissolved oxygen is "fixed" atmospheric oxygen cannot affect the results.

Read the information contained on the Material Safety Data Sheets (MSDS) that come with each kit. **Glasses or safety goggles and gloves should be worn because of the chemical reagents used**. **The dissolved oxygen kits must be kept out of the reach of children**. Keep a supply of paper towels on hand to mop up any spills right away.

After the tests are completed all the equipment must be carefully rinsed with tap water and allowed to air dry. The chemical reagents used in the analysis can safely be flushed down the drain with plenty of water or poured onto the ground. **Wash your hands thoroughly when you are done**.

If you spill any of the chemical reagents on yourself, immediately flush the affected area with lots of water. It is perfectly acceptable to use lake or stream water. *Do not wait to wash off until you are at a faucet.*

Remember to enter your Dissolved Oxygen data on the Monitoring Postcard (as shown below) or online and on your Field Data Sheet.

Monitoring Postcard example:

LOCATION: My favorite site **MONITOR(S):** Stellar Family

Check if entered on-line: ✓

DATE MONITORED: 07/4/2020 (mo/day/yr) **TIME:** 13:15 (military)

SECCHI DEPTH (measure 4 times):

4.2 3.8 4.1 3.8 meters

Depth to bottom is 9.8 meters. Is Secchi visible on bottom? yes or (no)

CHLOROPHYLL **SAMPLES:** FILTERED and FROZEN: (yes) or no

DEPTH MONITORED (meters)	Surface	0.5 or (1 m)	Record actual depth: 8 m deep	8m deep
WATER TEMPERATURE (deg. C)	21.2	21.0	16.2	16.1
DISSOLVED OXYGEN (mg/L) (Measure twice at each depth)	N/A	8.0 | 7.9	3.0 | 2.9	3.2 | 3.4
SALINITY (ppt)	N/A	-	-	-

(for below, circle best description, see monitoring manual for details)

LIGHT: (1) = Distinct shadows 2 = No shadows 3 = Very overcast

WIND: 0 = Calm (1) = Light 2 = Gentle 3 = Moderate 4 = Strong

RAIN W/IN 48 Hrs: 1 = None (2) = Light 3 = Moderate 4 = Heavy

STATE OF TIDE: Ebb Flood High Low (Not tidal)

Fill out this section with your Dissolved Oxygen data. The dotted line provides room for 2 results

DISSOLVED OXYGEN TESTING
LaMotte Dissolved Oxygen Kit Instructions
Model 7414 or 5860

- The following instructions are also on the inside of the lid of your dissolved oxygen kit. Familiarize yourself with the instructions before your use your kit. **Wear safety goggles and gloves while completing the procedure outlined below. Keep a supply of paper towels on hand to mop up any spills right away.**
- **Do the tests on paper towels or on a paper plate to make sure that none of the reagents stain your work area. Before you shake your bottles wrap them in paper towels to help prevent droplets flying through the air.**

Make sure you completely fill your dissolved oxygen bottle. No air space - turn it over to check for air bubbles.

Air bubbles will cause erroneously high results. Please follow the steps in the order they are written.

Step 1. "Fix" your sample in the glass bottle.

a) Holding the reagent bottle completely upside down, **add 8 drops of Manganous Sulfate solution (labeled "1" on bottle).**
b) Holding the reagent bottle completely upside down, **add 8 drops of Alkaline Potassium Iodide Azide** (labeled "2" on bottle.)
c) Cap and shake the bottle for 30 seconds. A white to brownish orange floc will cloud the sample bottle.
d) **Let the floc settle until the top half of the bottle is clear.** Shake again. Allow to settle again. If you are testing salt water, wait no more than 15 minutes before continuing since the floc may not settle.

Step 2. Add 8 drops of Sulfuric Acid 1:1 (red cap on bottle) and shake for 30 seconds. The solution will turn from cloudy to clear in color. (**If you still see some dark solids in the solution add 1 more drop.)**. Your sample is now "fixed".

Step 3. Prepare to test your fixed water sample.

a) **Pour your fixed sample into the graduated cylinder to the 20 ml mark.**
b) **Pour this 20 ml of fixed sample into the titration vial (glass vial with white lines and flat plastic cap).**

Step 4. Fill the titrator syringe (plastic syringe with the pink tip).

a) First push in the plunger to expel air.
b) Put the tip of the titrator into the hole in the top of the **titrating solution (bottle labeled Sodium Thiosulfate 0.025N).**
c) **Fill the syringe by turning the bottle upside down and slowly pull back on the syringe** plunger until the tip on the bottom of the plunger is well past the zero mark on the scale on the titrator. You may have to push the plunger in and out a few times to get rid of any air bubbles in the syringe, which his critical for getting a correct reading.
d) Turn everything right side up.
e) **Slowly push the plunger until the large ring on the plunger of the plastic titrator is right at the zero mark on the syringe barrel**.
f) Remove the titrator from the sodium thiosulfate bottle.

Step 5. Start to titrate the sample.

a) Put the tip of the titrator into the opening on the plastic cap of the glass titration vial that holds your fixed sample.
b) **Add the titrating solution one drop at a time by gently pushing the plunger**. Swirl the solution between drops **until the sample has turned pale yellow**. If your solution is already pale yellow, skip this step. If your solution is colorless you have zero mg/l dissolved oxygen (if this is the case you can proceed to step 6 for confirmation).

Step 6. Add starch indicator.

a) Pop off the plastic cap from the titration vial *without moving the titrator's plunger*.
b) **Add 8 drops of starch indicator solution to the pale yellow sample in the titration vial**. The sample should now turn deep blue or black.
c) Put the cap back on the titration vial.
d) **Swirl to mix the contents.**

Step 7. Finish the titration.

a) **Continue to add sodium thiosulfate one drop at a time**, swirling the solution between each drop**.**
b) Observe the color change from dark blue to light blue.
c) **Stop right when the solution turns from pale blue to colorless**.
d) (If no color change occurs by the time the plunger tip reaches the bottom of the scale on the titrator, refill the titrator by filling with titrant to the zero mark and continue the titration. Include both titration amounts in the final test results: 10 + the second value.)

Step 8. Read the test result directly from where the scale intersects the ring of the plunger for plastic titrator or the tip of the plunger for the glass titrator. The titrator is marked at 0.2 ppm increments. If the titrator ring or tip (as appropriate) is touching the third line below the line marked "7" the result would be 7.6 mg/l dissolved oxygen. (If the titrator has been refilled once before, the result would be 17.6 mg/l dissolved oxygen.)

Step 9. Repeat steps 1 through 8 for a second test from the *same* DO bottle. If the results are more than 1 mg/l apart between the two tests, repeat the test again and record all three results on your monitoring postcard.

Step 10. Repeat steps 1 through 9 for a duplicate tests with any other DO bottles. If the results are more than 1 mg/l apart between the two tests, repeat the test again and record all three results on your monitoring postcard.

Step 11. Record all results on your monitoring postcard &/or on-line.

Step 12. Clean-up.

a) Dispense any remaining sodium thiosulfate in the syringe into the titration vial. ***Never*** put it back in the bottle it came from, it could contaminate your titrant.
b) By the end of the test all the liquids are safe to pour into the ground or down the drain.
c) Rinse everything with tap water. Allow to air dry before putting everything back into the kit.

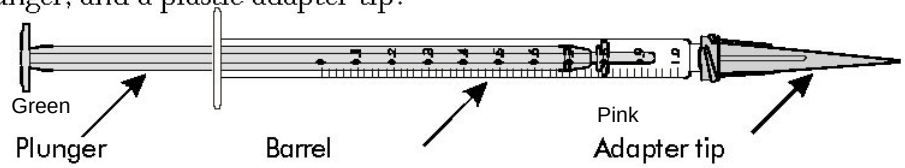
LaMotte

Product Upgrade Notice

Direct Reading Titrator General Instructions

Code 1649

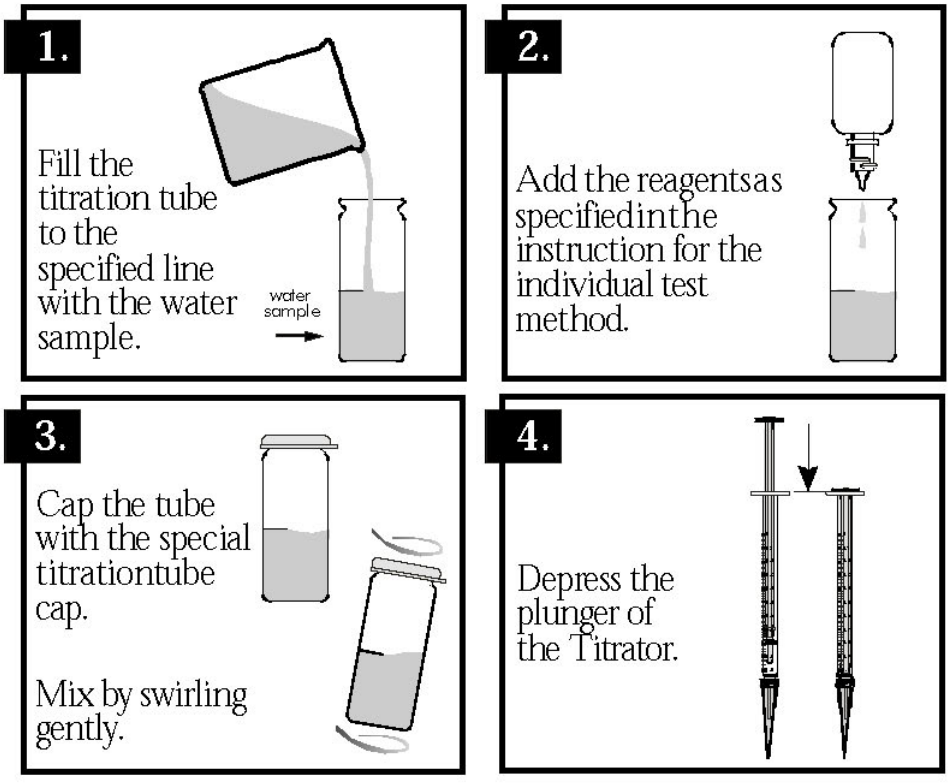
The new Direct Reading Titrator consists of a plastic barrel, a plastic plunger, and a plastic adapter tip.



The adapter tip reduces the size of the drops that are dispensed and increases the precision of the test results. DO NOT REMOVE THE ADAPTER TIP.

Instructions

These are general instructions for the use of the Direct Reading Titrator. The titrator in the illustrations is an example. Refer to individual test kit instructions for test procedures and the actual range and increment values.

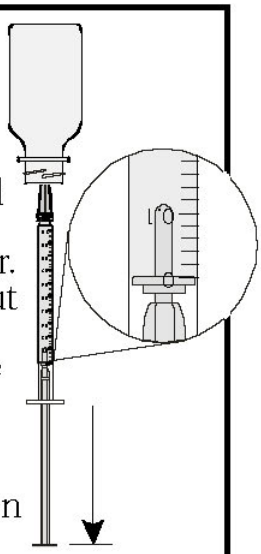


5.

Insert the adapter tip into the special plastic plug in the titrating solution bottle.

6.

Invert the bottle. Hold the bottle and the Titrator firmly together. Slowly pull out the plunger until the large ring on the plunger is opposite the zero (0) line on the scale.

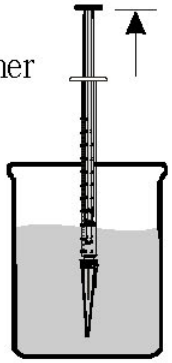


7.

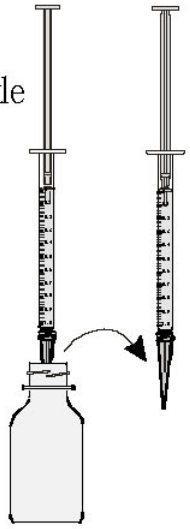
If an air bubble appears in the Titrator barrel or the adapter tip, partially fill the barrel and pump the titration solution back into the inverted reagent bottle to expel the bubble.

NOTE:

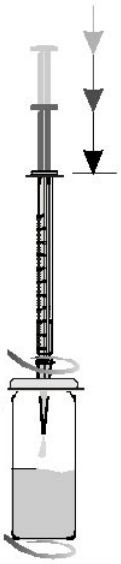
When filling the Titrator from a container without a special plug, submerge the adapter tip below the surface of the solution and pull out the plunger.



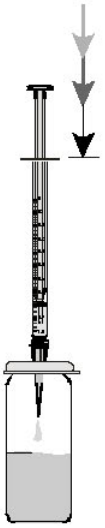
8. Turn the bottle right side up and remove the Titrator.



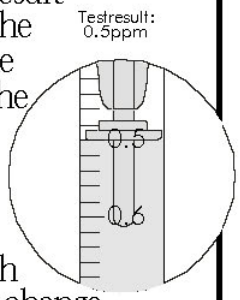
9. Insert the adapter tip into the opening in the titrator tube cap. Slowly depress the plunger to dispense the titrating solution. Gently swirl the tube to mix the solution.



10. Continue adding the titrating solution until the specified color change occurs. If the color change does not occur when the large ring on the plunger reaches the bottom of the scale, refill the Titrator to the zero line. Continue the titration until the color change occurs.



11. Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. If the Titrator was refilled to reach the final color change, add the total amounts of titrant used to determine the final test result.



12. If no additional tests are to be made, discard the remaining titrating solution in the Titrator. Do not return the titrating solution to the reagent bottle. Thoroughly rinse the titration tube and the Titrator. Do not remove the plunger or the adapter tip from the Titrator.

LaMotte
PO Box 329
Chestertown, MD 21620
800-344-3100
www.lamotte.com

COMMON QUESTIONS ABOUT ANALYZING DISSOLVED OXYGEN

This assumes that you have collected your water sample(s) and have capped the bottle(s).

Should I pour off any of the water in my sample bottle before I add the reagents?
NO! If you pour off some water you are introducing air (and oxygen). When you cap the bottle and shake it this oxygen can cause erroneously high results. Put the bottle on a paper towel if necessary to catch any water that spills over when you add the reagents.

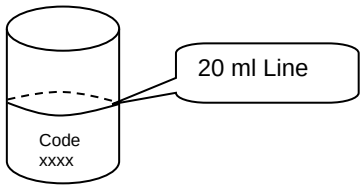
How should I hold the dropper bottles to dispense each reagent?
Hold the dropper bottles completely upside down. This ensures a uniform drop size. The liquid reagents won't come out until you squeeze the bottle.

Why must I shake the bottle and let the floc settle twice?
Doing this twice ensures that the chemical reactions are complete and that all the oxygen molecules have reacted with the chemical reagents.

Sometimes after I add the eight drops of sulfuric acid some brown particles remain. Is this OK?
The brown particles should be dissolved before you continue with your test. First, try shaking the sample bottle quite hard to see if they dissolve. If this doesn't work add one more drop of sulfuric acid (red capped bottle). Occasionally in water with an algae bloom there may be some organic matter present in you sample. This won't dissolve. You should be able to tell the difference between this and the chemical particles.

What does it mean by saying that the sample is "fixed"?
In a practical sense it means that contact with atmospheric oxygen will not affect your test results. Fixed samples may be stored up to eight hours, if kept refrigerated and in the dark. The chemical reactions that occur in this analysis are explained after these questions.

What is the best way to measure the amount of fixed sample that I should titrate?
If you have a plastic graduated cylinder, use it to measure 20 ml of fixed sample. If you don't have one pour the fixed sample directly into the titration vial (glass bottle labeled 0299) to the white 20 ml line.



Titration Vial

Okay, now I've got my syringe filled and through the hole in the cap on the titration vial. Sometimes the drops don't seem to fall right into the water sample. Why?
Each cap should have a tiny vent hole in it so that as the sodium thiosulfate is added to the fixed water sample the displaced air can escape. If you don't have this tiny hole, when you add the sodium thiosulfate instead of it dropping into the liquid it will run down the side of the bottle. This will also happen if a drop of liquid on top of the cap covers the vent hole. So, make sure that 1) your cap has a vent hole and 2) that is remains unobstructed during the titration. If your cap doesn't have a vent hole you can easily make one or enlarge an existing one by heating a pin and pushing it through the plastic.

The directions say to add sodium thiosulfate until the water samples turns a straw yellow. How much does the color matter? Why shouldn't I add the starch indicator all at once in the beginning?
I checked with Steve Wildberger of LaMotte Chemical Company about these questions. He feels that if you add the starch indicator all at once you will be likely to overshoot the end point. The color change from dark blue to colorless is much more abrupt than the more gradual change from brown to yellow. The pale yellow color in itself is an indicator that you are nearing the end point of the titration. He suggests that the yellow color you should be looking for when adding the indicator is "a manila folder yellow" rather than a straw yellow. I have also found that in high oxygen water if you add the starch indicator in the beginning the dark blue color seems to coat the sides of the titration vial, which makes the visual determination of the endpoint more difficult.

My water sample is pale yellow right after it is fixed. Do I still have to see it get lighter before I add the starch indicator?
If your water sample is already a pale yellow after it is fixed, add the starch indicator before you begin your titration. If your sample is completely colorless after it is fixed and remains that way after you add the indicator this means that there is no dissolved oxygen in your sample. If this is the case you might want to check the dissolved oxygen content of the 1 meter water just to make sure that the reagents in your kit are still functioning properly. If the surface water also has no detectable dissolved oxygen, call URI Watershed Watch at 874-2905 so that we can check your reagents to make sure everything is OK.

How many times should I run the test on my water sample?
You should run the dissolved oxygen test at least **twice** on each of your water samples. If the results are more than 1.0 ppm apart run it a third time. Remember to report <u>all</u> the results on your monitoring postcard.

What should I do with any leftover sodium thiosulfate in the syringe?
Discard any remaining sodium thiosulfate into your titrator vial. Do not put it back into the bottle it came from. Then take apart your syringe and rinse it with tap water. Store it with the plunger backed off from the bottom of the syringe.

Chemical Reactions when Using the Azide Modification of the Winkler Method to Test for Dissolved Oxygen

(Originally from: *Clean Water: A Guide to Water Quality Monitoring*, by E. Stancioff, University of Maine Cooperative Extension. Updated by URIWW volunteer and retired chemistry teacher J. Watts.)

The first step in a dissolved oxygen (DO) titration is the addition of manganous sulfate solution (4167) and alkaline potassium iodide azide (7166) to the water sample. These reagents react with each other to form a precipitate, or floc, of manganous hydroxide, $Mn(OH)_2$. Alternatively, 1 mole of oxygen (O_2) is equivalent to 2 moles of $Mn(OH)_4$. Chemically the reaction is:

$MnSO_4$ + 2KOH ⟶ $Mn(OH)_2$ + K_2SO_4
manganous sulfate + potassium hydroxide ⟶ manganous hydroxide + potassium sulfate

Immediately upon formation of the precipitate, the oxygen in the water oxidizes an equivalent amount of the manganous hydroxide to manganic hydroxide. In other words, for every atom, in the water one molecule of manganous hydroxide is converted to manganic hydroxide. The reaction is:

2 $Mn(OH)_2$ + O_2 + $2H_2O$ ⟶ $2Mn(OH)_4$
manganous hydroxide + oxygen + water ⟶ manganic hydroxide

After the precipitate is formed a strong acid, sulfuric acid 1:1 (6141WT) is added to the water sample. The acid converts the manganic hydroxide to manganic sulfate. At this point the sample is considered “fixed”. Any concern for additional oxygen being introduced into the sample is reduced. The chemical reaction is:

$Mn(OH)_4$ + $2H_2SO_4$ ⟶ $Mn(SO4)_2$ + $4H_2O$
manganic hydroxide + sulfuric acid ⟶ manganic sulfate + water

Simultaneously, iodine from the potassium iodide in the alkaline potassium iodide azide solution is replaced by sulfate, releasing free iodine into the water. Since the sulfate for this reaction comes from the manganic sulfate which was formed from the reaction between the manganic hydroxide and oxygen; the amount of iodine released is directly proportional to the amount of oxygen present in the original sample. The release of free iodine is indicated by the sample turning a yellow-brown color. This chemical reaction is:

$Mn(SO_4)_2$ + 2KI ⟶ $Mn(SO_4)$ + K_2SO_4 + I_2
manganic sulfate + potassium iodide ⟶ manganous sulfate + potassium sulfate + iodine

The final step in the Winkler titration is the addition of sodium thiosulfate. The sodium thiosulfate reacts with the free iodine to produce sodium iodide. When all the iodine had been converted the sample changes color from yellow-brown to colorless. Often a starch indicator is added to enhance the final endpoint. This chemical reaction is:

$2Na_2S_2O_3$ + I_2 ⟶ $Na_2S_4O_6$ + 2NaI
sodium thiosulfate + iodine ⟶ sodium tetrathionate + sodium iodide

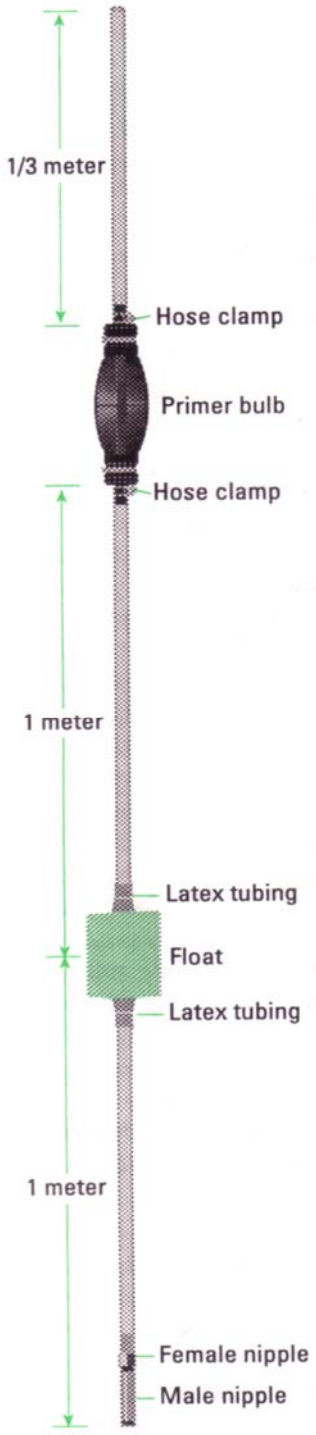
THE UNIVERSITY OF RHODE ISLAND
COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

SHALLOW WATER SAMPLER OPERATION

(Field SOP 011)

University of Rhode Island Watershed Watch

Date: 07/12
Revision: 2
Author: Linda Green

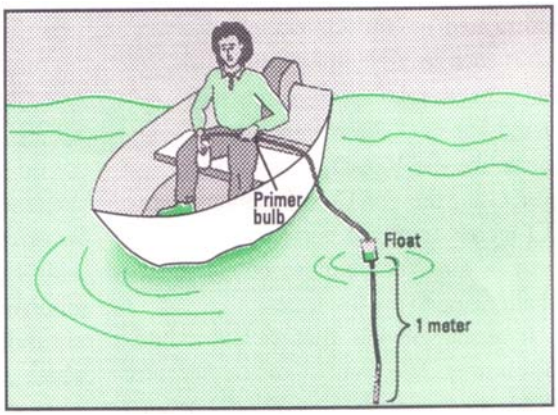


Introduction

The Shallow water sampler was designed by Jim Geib, a volunteer monitor with the URIWW program. A marine gasoline tank primer bulb acts as a pump and can be operated with one hand. The other hand is left free to hold the tubing securely inside the mouth of the collection bottle. To maintain the proper sampling depth, Geib made a float by cutting pieces from a polyethylene foam noodle pool toy. The float is held securely in place at 1 meter above the end of the sampling tube. The sampler should not be used to collect samples for bacteria since its not sterile or dissolved oxygen since the collection procedure introduces oxygen into the sample.

Instructions for use

1. Place the end of the sampler with the brass pipe into the water and lower it until it is supported by the float.
2. Squeeze the bulb 10 times to rinse out the sampler. Do not use this water as your sample.
3. Holding the sample bottle in one hand, pump the bulb with the other hand to rinse and then fill your sample bottle. You are sampling at a depth of 1 meter.
4. When you return to shore rinse your shallow sampler by pumping tap water through it and hanging it to drain.



The Shallow Water Sampler in use.

THE UNIVERSITY OF RHODE ISLAND
COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

DEEP WATER SAMPLER OPERATION

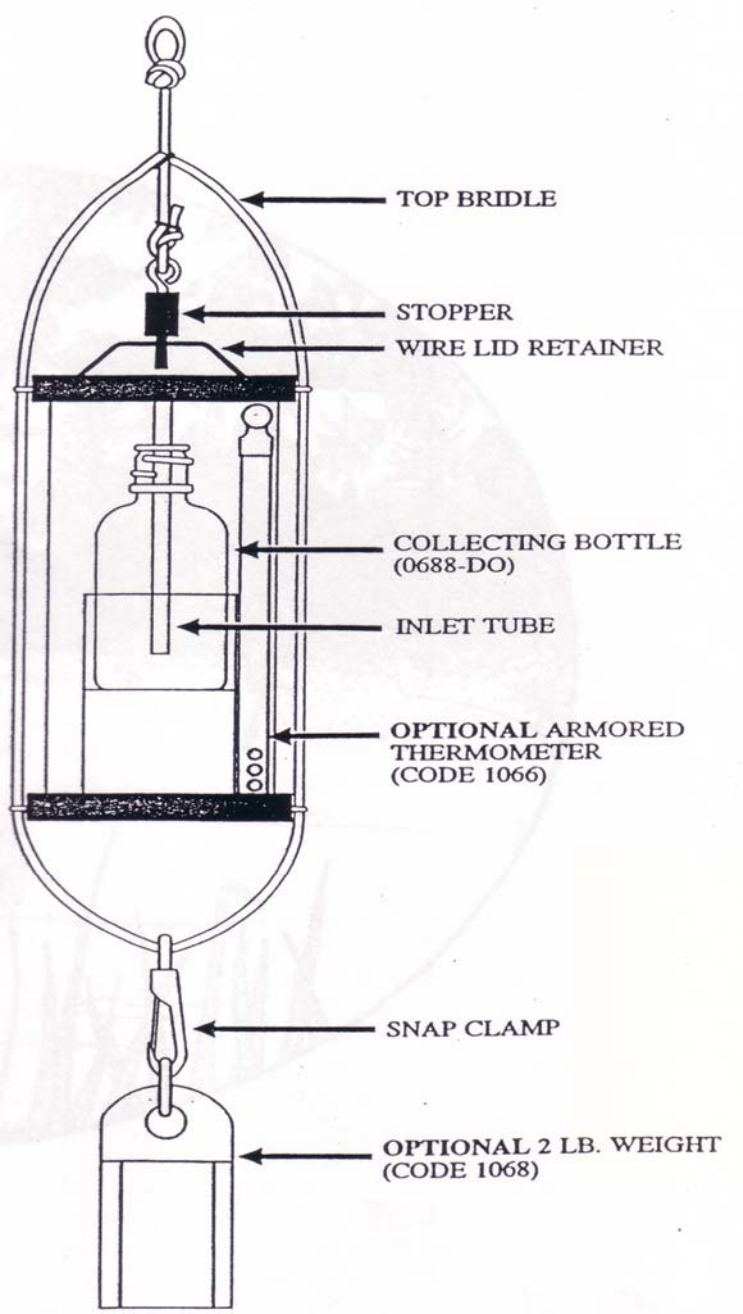
(Field SOP 012)

University of Rhode Island Watershed Watch

Date: 10/20
Revision: 4
Author: Linda Green, E. Herron

Introduction

The LaMotte Water Sampling Bottle (3-0026) is a unique device that collects water samples representative of specific depths and is particularly suited to the collection of dissolved oxygen samples. Samples may be taken at specific depths by using the attached stopper and attached calibrated line and (2 pound) weight. Simply lower the bottle to the sample depth. When the trip line is pulled the sample collection bottle will begin to fill, overflowing and flushing more than 5 times. During retrieval, decreasing water pressure prevents exchange of air and water with the sample. Excess water in the sample chamber can be used for other tests. The interior chamber also accommodates LaMotte Model 545 Armored Thermometer for accurate sample temperature readings. The thermometer can be pressed gently into a hole in the base of the sampler chamber, and the sample temperature can be read through the clear body of the sampler.



Operation

1. To release the wire lid retainer lift it up and away from the sampler.
2. Remove the plastic lid with attached inlet tube, by sliding it up the rope bridle.
3. Rinse the sampler with some surface water, discarding rinse water.
4. Insert a Dissolved Oxygen collecting bottle, with the cap removed, into the inner chamber of the sampler.
5. Replace the grey sampler lid, inserting the inlet tube into the collecting bottle.
6. Snap the wire lid retainer into the grooves on the lid by lifting up and in with your thumbs.

7. Attach a two pound weight to the snap clamp at the bottom of the rope bridle.
8. Press the black plastic stopper securely into the center inlet hole.
9. Lower the water sampling bottle quickly to the desired depth.
10. Jerk the calibrated line to remove the stopper from the inlet hole and start collecting your water sample.
11. Note: As air is displaced by water entering the sampler, bubbles will be observed rising to the surface (downstream). When the water sampler is filled, bubbles will no longer appear. Filling takes about 45 seconds to one minute and the bubble rarely appear near the sampler line.
12. Once there are no more air bubbles, use a steady, hand-over-hand motion, to retrieve the water sampler.
13. If the thermometer is used with the sampler, read the temperature through the clear sample body *without* removing the thermometer from the sampler. Record the temperature.
14. Place the sampler on a flat surface.
15. Release the wire lid retainer and remove the plastic lid with inlet tube attached, sliding it up the rope bridle.
16. Cap and remove the dissolved oxygen bottle from the inner chamber of the sampler. If the dissolved oxygen test is to be performed on this sample follow the directions in your dissolved oxygen test kit (Field SOP 010).
17. Use the remaining water in the sampler to rinse and fill your chlorophyll and sample bottles. You may need to collect more than 1 water sample to rinse and fill all your bottles from a specific depth.
18. When you are back on shore, rinse your water sampler with tap water and let air dry.
19. For more information contact:

    LaMotte Company
    PO Box 329 Chestertown, MD 21620
    1-800-344-3100
    https://lamotte.com/

THE UNIVERSITY OF RHODE ISLAND COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

MEASURING SALINITY USING A HAND-HELD REFRACTOMETER

(Field SOP 015)

Date: 1/23
Revision: 2
Author: Linda Green, E. Herron

University of Rhode Island Watershed Watch

Handheld salinity refractometer with automatic temperature compensation kit:

- ❑ Salinity refractometer
- ❑ Adjustment screwdriver (in small pocket inside padded bag)
- ❑ Glass or plastic pipet (in small pocket inside padded bag)
- ❑ Small bottle of zero ppt salinity water (de-ionized water)
- ❑ Small bottle of 10 ppt salinity water (from sodium chloride)
- ❑ Lint-free wipes or tissues, supplied by you

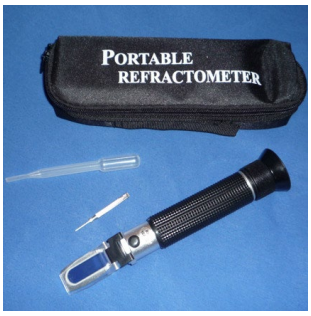


Image from: http://www.mangrove.at/mangroveshop/mangroveequipment.html

Introduction

Salinity is usually expressed in parts per thousand (ppt). Seawater has approximately 35 parts salt per thousand parts of water. Drinking water typically has less than 0.5 ppt. Salinity can be measured in several ways. This is a visual method, using just a drop or two of water. **The refractometer must be handled with care! It has been calibrated by URIWW staff and must be checked before each use using the provided zero and 20 ppt salinity standards.**

Note: A number of inexpensive refractometers readily calibrate at zero, but do not measure 20 ppt (or any other known salinity) correctly. This relatively expensive refractometer was selected because it does when handled carefully.

Calibration

(Instructions are also included with the kit)

1. Open the daylight plate, hold the blue surface (prism) horizontal, and place 2-3 drops of zero ppt water on the prism.
2. Shut the daylight plate so that water wets the surface.

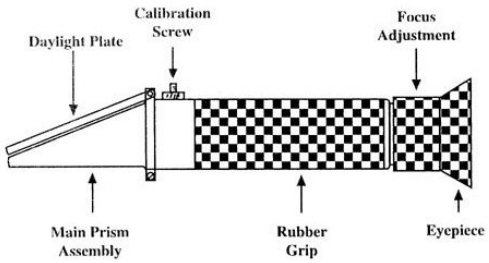


image from: www.aliexpress.com

3. Wait ~ thirty seconds for temperature adjustment.
4. Hold the daylight plate towards light and look into the eyepiece.
5. You will see a circular field with two sets of graduations. Use the focus adjustment to sharpen the numbers. We are interested in those on the RIGHT SIDE. You will also see that part of the field of view is blue, part white.
6. Use the provided screwdriver to turn the calibration screw until the boundary between blue and white is at 0 on the right scale, (or 1.000 on the left scale.) You have now set zero.

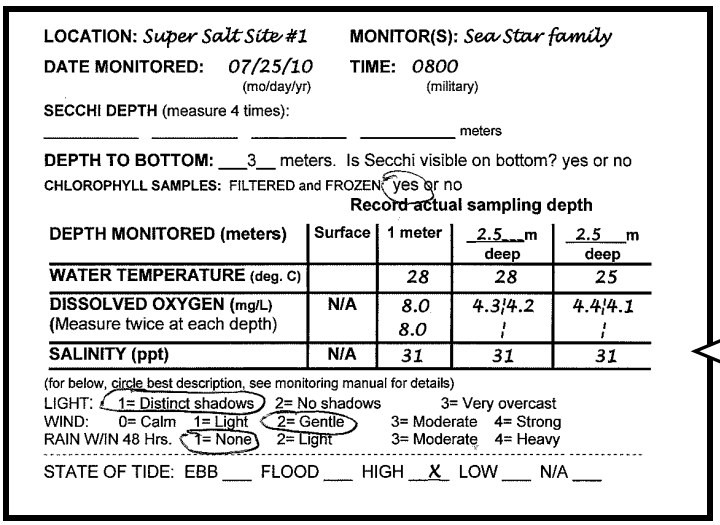
Image from: www.nisupply.ecrater.com

7. Open the daylight plate, and carefully blot the water.
8. Use the pipet to add several drops of 20 ppt salinity calibrant as in steps 1-5 above. The blue-white boundary line should be at “20” on the right-hand scale. Please contact URIWW if it does not.
9. When you have confirmed the 20 ppt calibration, open the daylight plate, rinse with the provided de-ionized water, blot the water. Set down with daylight plate open.

Measuring Salinity of Your Water Sample

This is essentially the same procedure as calibration.

1. Open daylight plate.
2. Place several drops of water to be tested on the daylight plate, covering the surface.
3. Close the daylight plate.
4. Allow the sample to sit for ~ thirty seconds for automatic temperature adjustment to take place.
5. Hold the refractometer in direction of a light source and look through eyepiece.
6. Read and record on your field data sheet, monitoring postcard and/or on-line, using whole numbers, the blue-white boundary which is the ppt salinity of your water sample, using the scale on the right side of the refractometer.



LOCATION: *Super Salt Site #1* MONITOR(S): *Sea Star family*

DATE MONITORED: *07/25/10* (mo/day/yr) TIME: *0800* (military)

SECCHI DEPTH (measure 4 times):

_____ _____ _____ _____ meters

DEPTH TO BOTTOM: ___3__ meters. Is Secchi visible on bottom? yes or no

CHLOROPHYLL SAMPLES: FILTERED and FROZEN: yes or no

Record actual sampling depth

DEPTH MONITORED (meters)	Surface	1 meter	2.5 m deep	2.5 m deep
WATER TEMPERATURE (deg. C)		28	28	25
DISSOLVED OXYGEN (mg/L) (Measure twice at each depth)	N/A	8.0 8.0	4.3¦4.2 ¦	4.4¦4.1 ¦
SALINITY (ppt)	N/A	31	31	31

(for below, circle best description, see monitoring manual for details)

LIGHT: 1= Distinct shadows 2= No shadows 3= Very overcast

WIND: 0= Calm 1= Light 2= Gentle 3= Moderate 4= Strong

RAIN W/IN 48 Hrs. 1= None 2= Light 3= Moderate 4= Heavy

STATE OF TIDE: EBB ___ FLOOD ___ HIGH __X__ LOW ___ N/A ___

Clean-up

1. Use your pipet to rinse the surface of the prism and the daylight plate with de-ionized or tap water, making sure that any salt water is rinsed off. *Do not hold the refractometer under running water or submerge it*.
2. Wipe with a soft cloth or tissue.
3. Allow to completely air dry on a flat surface with the daylight plate open.
4. Store in the padded container when dry.

For more information:

- Read the instruction manual included with the kit!
- For detailed information on measuring salinity by refractometry see: http://reefkeeping.com/issues/2006-12/rhf/index.php

THE UNIVERSITY OF RHODE ISLAND
COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES

COLLECTING WATER SAMPLES FROM WADEABLE STREAMS

(Field SOP 017)

Date: 10/20
Revision: 2
Author: Linda Green, E. Herron

University of Rhode Island Watershed Watch

Water samples are collected for a variety of laboratory analyses, as well as field processing for lab chlorophyll analysis, field analysis of dissolved oxygen, and for measuring water temperature. We collect water samples in brown glass bottles (labeled unfiltered) for total phosphorus and nitrogen, in plastic bottles for pH and alkalinity and in sterile plastic bottle for bacteria testing.

The sample bottles you are supplied with have been thoroughly cleaned and processed to make sure that they are as free from contaminants as possible. You may be given a second bottle to collect a duplicate sample. Collect your duplicate sample the exact same way you collect your original one.

1. **Check your stream for safety.** Is the water running too fast or is the level too high? Is the stream bank stable? Is there poison ivy or greenbrier? Remember that your safety is more important than any water sample!
2. **Record the sample date and time on your bottle label** using a pencil, ink pen or indelible marker. Do not use a gel pen, the gel washes off when wet.
3. **Go to your monitoring site!** Carefully wade into the water to midstream.
4. **Face upstream.** Make sure that whatever you stir up by wading through doesn't get into your bottles. You may need to wait until it has washed down stream.
5. **Rinse your bottle by scooping up some of the upstream water.** Cap and shake the water sample and discard it downstream of (behind) you. This is also referred to as conditioning your sample bottle.
    a. If you are collecting a water sample for bacteria testing, do not rinse your sample bottle before collecting the sample, just collect the sample, cap the bottle, put it in a cooler.
6. **Next, still facing upstream, hold the bottle upside down (inverted), lower it half way to the bottom or arm's length, whichever is less.** Be sure not to stir up bottom sediments. They will contaminate your sample.
7. **Turn the bottle upstream** to fill it and then quickly raise it to the surface. Pour out water to the shoulder of bottle. Cap it.
    a. If you are collecting a sample for dissolved oxygen testing do not pour off any water, those samples must be full to the brim. Collect a second dissolved oxygen sample.
8. **If no further field tests will be conducted on your water sample, store it in a cooler bag containing freezer packs.**

Special Situations:

If your stream site is dry, please record that important information "dry" on your field data sheet and monitoring postcard, or online datasheet.

If there is some water in your stream but it does not appear to be flowing at all *and* there are section with no flow do not collect a water sample. **Record this as "ponded" on any data sheets.** This is not representative of stream flow and it will be difficult for you to collect a water sample without getting bottom sediment in it.

If the water is raging and you are concerned about your safety *do not* collect water samples. Come back in a day or two when the flow has subsided. Record the actual day and time that you collect your sample.

If it is stormy, especially if there is thunder and lightning – STAY AWAY FROM THE WATER! Come back when the storm has passed.

Standard Operating Procedure 018

Data Management

University of Rhode Island Watershed Watch

Date: 10/20
Revision: 1
Author: E. Herron

1.0 PURPOSE AND DESCRIPTION

Managing and maintaining data quality is critical for the success of a long-term monitoring program. Please be sure to familiarize yourself with these general procedures, as well as the specific documentation requirements included in the Standard Operating Procedure (SOP) for each analysis/process. Particular attention should be focused on health and safety issues.

2.0 DOCUMENTATION, RECORDS, AND DATA MANAGEMENT

All staff and volunteers are given monitoring postcards and or field datasheets. Volunteers are provided with written monitoring manuals when they are trained and may receive updated manuals as needed. A monitoring schedule (Appendix A) is distributed to each volunteer and included in the monitoring equipment supply bags. Postcards should be returned as soon after a monitoring event as possible, and/or data should be entered online (https://web.uri.edu/watershedwatch/data/) as soon as possible so that it can be reviewed. Individual site field data sheets are returned at the end of the monitoring season for review and inclusion in the program dataset. The Program Director will try to contact all volunteers or staff to identify any problems or additional feedback that would make future sampling easier.

Field datasheets and/or postcards are compared to the data entered online or into individual Excel site to ensure that the data has been correctly entered. Online data files are downloaded for review and archiving on URI servers. The initials of the staff entering and proofing data are recorded on the postcard/data sheets.

Trained URIWW volunteers log all samples in when delivering samples on water collection days (Appendix B). The sample log sheet will be reviewed and signed at the laboratory. All sample log sheets are retained by the URI Watershed laboratory in laboratory file cabinets. Log sheets are also scanned and saved as pdfs in appropriate folders on URI servers, and available upon request.

After lab analyses are complete, sample results from the laboratory are reviewed, and entered in summary Excel files. All hard copy sample data sheets are compared to the results entered in the Excel files to ensure that results have been correctly entered, and that all appropriate analyses have been completed. Additional documentation will also be retained in project files as needed. For assays that produce electronic files, the electronic file will be stored on URI servers. Summary files will be produced and stored in both electronic and hard copy formats.

After each season, site or project specific reports may be written to share results, including documenting any monitoring plan changes. Summary tables will be generated and shared online, as will individual data via a data dashboard https://uri.maps.arcgis.com/apps/opsdashboard/index.html#/8ea0682138bd4b19ab7c39a28aa3bdc6). All information collected throughout the season will be summarized in an annual the data file formatted to meet Rhode Island Department of Environmental Management (RIDEM)

database submittal needs (Appendix C). On about an annual basis, the database submittal file shall be sent to RIDEM staff and posted online in a .CSV file accessible to the public. Data from the annual file will also be submitted to program partners upon request, with efforts made to reformat or select only relevant data according to partner needs.

Project files are maintained in the main URIWW laboratory in the URI Coastal Institute by Elizabeth Herron and Kelly Addy. This location is locked when staff are not present. Electronic data are stored on shared drive on a University of Rhode Island server, with limited access. The server is backed up daily according to institution practices. All laboratory data (electronic and hard copy) are retained for at least 10 years.

Table 1 lists records that will be generated throughout this project. Figure 1 includes the data management flow chart delineating the data entry, validation and posting process. Information included in the Annual Data File is described in Appendix C. It is based on the RIDEM's Water Quality database data submittal format.

Table 1 Project Documentation and Records.

Sample Collection Records	***Field Analysis Records***	***Fixed Laboratory Records***	***Data Assessment Records***
Monitoring postcards/field data sheets	Monitoring postcards/field data sheets	Sample log sheets	Site or Project Reports
Sample log sheets		Data worksheets	Annual Data File
Monitoring Manuals		Tabulated Data Summary Forms: draft and final	Online data dashboard

3.0 DATA VALIDATION

No general quality management reports are prepared. During the analysis of samples the technician completing sample analysis is responsible for recording any problems with meeting measurement performance criteria detailed in appropriate SOP and/or instrument operational issues. Any failure of a sample to meet defined measurement performance criteria should be recorded and the data flagged for further review upon data entry and final data validation.

Data generated by each analysis is internally validated by either Ms. Herron or Ms. Addy. The data validation process starts once the data has been produced and it is entered into Microsoft Excel files. After data has been entered into the appropriate file, URIWW staff completes an initial check to be sure all data was entered correctly. Then, Ms. Herron checks the data entered for errors and correct any. Outliers and inconsistencies are flagged for further review with corrections or verification completed by Ms. Herron.

Values for total phosphorus are compared to orthophosphate-P (dissolved phosphorus) by Ms. Addy. If dissolved P is greater than total P samples are reanalyzed for both constituents. A similar check is done to compare total nitrogen with the sum of nitrate/nitrite and ammonia. If the sum of dissolved N constituents is greater than total nitrogen, then samples are re-analyzed.

If data collected by a volunteer monitor is flagged, then the monitor is contacted to check that the data sent to the laboratory were correct. Data are compared to value obtained for similar

samples analyzed in the past. Built-in data checks automatically flag some potential errors, such as Secchi depth transparency values exceeding bottoms, or dissolved oxygen values exceeding 14 parts per million for further investigations.

Other common errors submitted by volunteers include water temperature. The thermometers used by URIWW can be switched from reporting in degrees Fahrenheit and Celsius. Thus, occasionally volunteers record temperature in degrees Fahrenheit, rather than degrees Celsius. The online data entry process prevents temperature values of greater than “32” from being submitted, requiring the volunteers to convert the values to Celsius. Similarly, URIWW staff entering field data have been trained to recognize and convert Fahrenheit data. They record and initial the fact they converted the data on the postcard or field datasheet.

Missing analyses will be identified through the creation and comparison of summary tables. If possible, samples will be found and analyzed. The acceptable holding times for some parameters may prevent this, in which case no concentration will be reported, with a comment indicating a Lab error. The decision to discard data will be made by either Ms. Herron or Ms. Addy

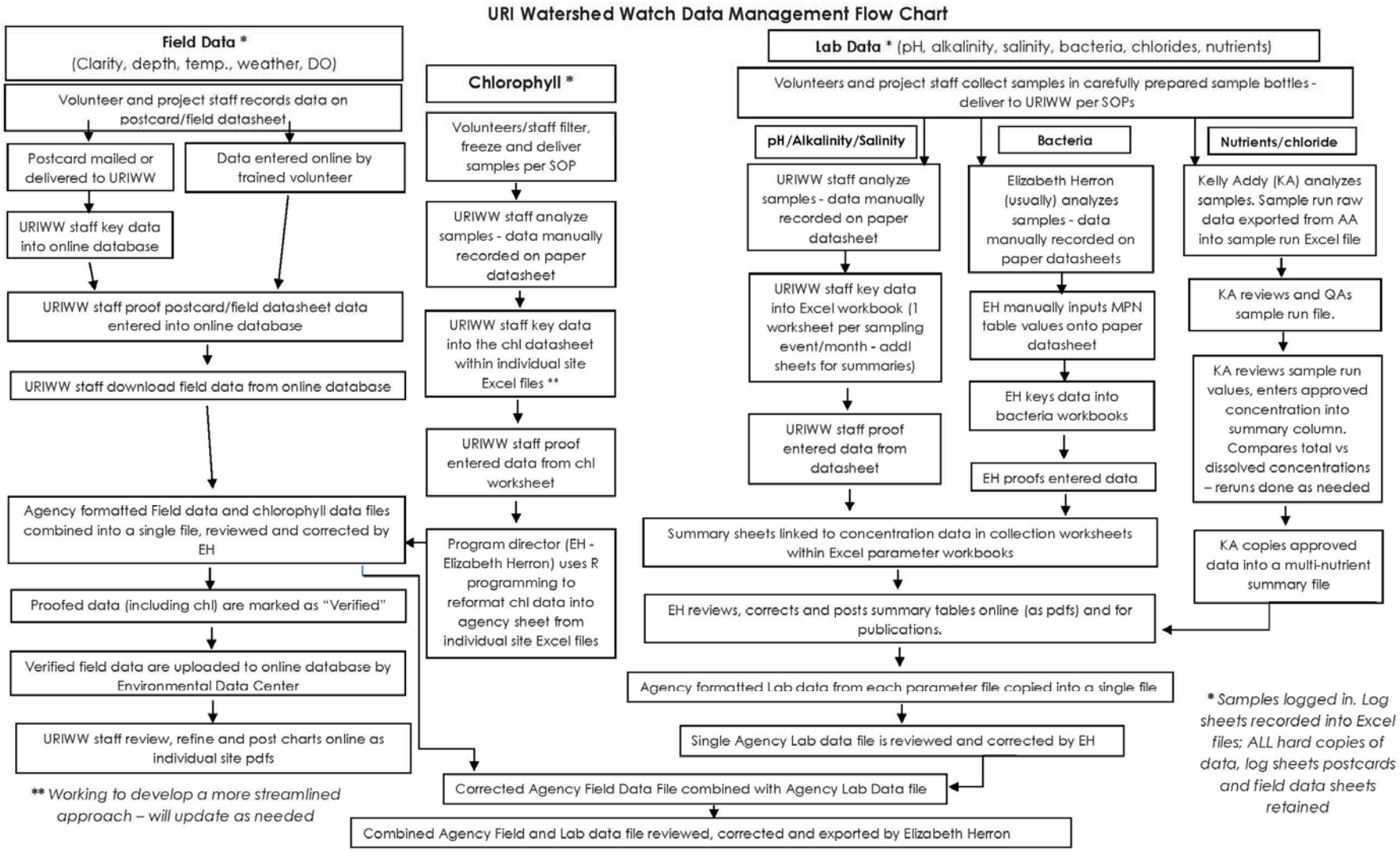
4.0 ASSESSMENTS AND RESPONSE ACTIONS

The Program Director or designee will be responsible for each of the project tasks and their associated quality assurance and quality control procedures. They will provide consistency between sampling events and volunteer sampling teams. Continual reports to Ms. Herron from URIWW staff or review of data files about the status of sampling, quality assurance, and quality control will highlight any problems that are encountered during sampling. Volunteers will be contacted to address issues. Data not meeting data quality objectives will be flagged for either rejection or be marked to indicate potential source of errors. Rejected data will be reported as no concentration for that parameter, with a qualifier code of “N” and the rational listed under the Comments field of the final annual data file.

5.0 VERIFICATION AND VALIDATION PROCEDURES

All data collected during each season is included in the final annual data file. Once the data has been collected, it will be entered online or directly into Microsoft Excel files. Program staff proofread the data entry for errors. Errors are corrected, with staff initialing changes. Outliers and inconsistencies are flagged for further review by Ms. Herron or Ms. Addy. The decision to discard data will be made by the Program Director. Data validation utilize the measurement performance criteria documented in relevant SOPs. The data management flow chart (figure 1) follows and describes each step of the validation process.

Figure 1. Data Management Flow Chart



Appendix A. Example Monitoring Schedule

URI WATERSHED WATCH
2020 WATER QUALITY BIWEEKLY MONITORING SCHEDULE
Bristol Harbor System Water Sampling Sites

All nutrient, bacteria and water-quality monitoring for all **Bristol Harbor sampling will take place between 6 and 8:30 am on Thursday mornings**. Please contact Barbara Healy (401-258-6297) or Caroline Calia (401-451-8919) Bristol Harbor Monitoring Coordinators for local coordination and sample pick-up and delivery information, questions or concerns. Please contact Elizabeth Herron, URI Watershed Watch, 874-4552 for sampling and testing methods questions or concerns. Or try our website http://web.uri.edu/watershedwatch/ .

2020 Thursday Dates	SIMPLE monitoring: Collect & run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, dissolved oxygen (DO). Collect and refrigerate tightly capped salinity bottle.	COMPLEX monitoring: SAMPLES COLLECTED & DELIVERED TO BHPHM COORDINATOR including all salinity bottles *AND* collect & run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, DO.
April 13	Saturday- April 13th	New volunteer field training and Equipment pick-up
May 14		FIRST COLLECTION: May 14th All water sample bottles, chl-a filters
May 21		
May 28	Temperature, DO, salinity into frig chl-a filters into freezer	
June 4		
June 11		SECOND COLLECTION: June 11th All water sample bottles, chl-a filters
June 18		
June 25	Temperature, DO, salinity into frig chl-a filters into freezer	
July 2	*Happy 4th Enjoy the parade!*	*Participate in the Dip-in… www.secchidipin.org*
July 9		THIRD COLLECTION: July 9th All water sample bottles, chl-a filters
July 16		
July 23	Temperature, DO, salinity into frig chl-a filters into freezer	
July 30		
August 6		FOURTH COLLECTION: August 6th All water sample bottles, chl-a filters
August 13		*Victory Day is August 12th*
August 20	Temperature, DO, salinity into frig chl-a filters into freezer	
August 27		
Sept 3		FIFTH COLLECTION: September 3rd All water sample bottles, chl-a filters
Sept 10		*Labor Day is September 7th*
Sept. 17	Temperature, DO, salinity into frig chl-a filters into freezer	
Sept. 24		
Oct. 1	End of monitoring season Return all monitoring equipment	SIXTH COLLECTION October 1st All water sample bottles, chl-a filters

Appendix B. Example Sample Log Sheet

2020 Bristol Harbor Log Sheet: October 1st Water Collection

Check each of the bottles listed with the monitoring location.

Monitoring Location	Delivered By	Received by (Intial/date/time)	Date of Collection	Time of Collection	Unfiltered Br. Glass	Unfiltered Plastic	Bacteria Plastic	(Chl-a) Baggy	Temp C at receipt
#01 Elks Club					1	1	1	1	
#02 Bristol Harbor Inn					1	1	1	1	
#03 Silver Creek					1	1	1	1	
#04 Windmill Pt					1	1	1	1	
#05 Mill Pond					1	1	1	1	
#06 Sanroma					1	1	1	1	
#07 Bristol Yacht Club					1	1	1	1	
#08 Brito Dock					1	1	1	1	
#09 Silver Bridge					1	1	1	1	
#10 Silver East					1	1	1	1	
#11 Silver West					1	1	1	1	
#12 Herreshoff					1	1	1	1	
#14 DaPonte P/ Wood St					1	1	1	1	
#18 Annawamscutt					1	1	1	1	
#17 Kickemuit					1	1	1	1	
#19 - Golf Course A					1	1	1	1	
#20 - Golf Course B					1	1	1	1	

Appendix C: Annual Data Summary File Fields

Field	Information, including format when appropriate	Required Data (Y/N)
Station Name	Unique site identification number for URIWW sites - WW###	Y
Date	Sample Date – MM/DD/YYYY	Y
Time	Sample Time – HH:MM:SS AM	N
Sample Type	Grab, Replicate, Duplicate, Blank or Composite (composite used for Secchi and bottom depths)	Y
Sample Media	Water (or air in some cases when air temperature is reported)	Y
Depth	Sample depth from surface – in meters	N
Parameter	Analyte or measurement being made – includes numeric code and parameter name, must match list	Y
Concentration	Analyte or measurement value	Y
Unit	Reporting unit - Parameter specific	Y
Qualifier Code	Code indicating a variety of circumstances – must match list (see Qualifier Codes table)	N
Detection Limit	Reporting detection limit	Y
Detection Limit Unit	Reporting unit - Parameter specific	Y
Quantitation Level	Typically method detection or reporting detection limit	Y
Quantitation Level Unit	Reporting unit - Parameter specific	Y
Lab Name	URIWW for laboratory processed parameter, empty for volunteer generated data	N
Analytical Method Number	Used when an appropriate analytical method is included in the CHEM_Template file	N
Sediment Particle Size	Not used by URIWW – kept in file to match RIDEM formatting	N
Particle Size Unit	Not used by URIWW – kept in file to match RIDEM formatting	N
Fish Sample Type	Not used by URIWW – kept in file to match RIDEM formatting	N
Fish Taxa	Not used by URIWW – kept in file to match RIDEM formatting	N
Comments	Can include a wide range of information. Used to flag data that may not meet data quality objectives, such as hold time	N
Location	Description of monitoring site, used during data compilation/validation to ensure accurate site ID, removed before submitting to RIDEM	Y
MONITOR 1	Volunteer monitor name or initials, removed before submitting to RIDEM	N
MONITOR 2	Volunteer monitor name or initials, removed before submitting to RIDEM	N
Watershed Code	Code/description indicating location of the monitoring site based watershed at HUC 10 level typically, used to sort data for submittal to partners	N

Qualifier codes table

Qualifier Code	Description
N	No Results (see comments for reason)
U	Indicates that the compound was analyzed for but not detected. This code shall be used to indicate that the lab value reported is less than the Method Detection Limit and is reported for informational purposes.
I	Value reported is equal to or greater than the Method Detection Limit but less than the Quantitation Level (Reporting Level). Data shall be deemed invalid.
V	Analyte was detected in both the sample and the associated method blank.
Z	Too numerous to count or value above maximum detection range. Actual recorded value (i.e. >24196 per 100 ml) or maximum range reported in Comments

TABLE OF CONTENTS

1.0 PURPOSE AND DESCRIPTION

The purpose of this method is to promote field QA/QC by ensuring that volunteer monitors are completing the field procedures as trained and according to the monitoring manual. Staff field visits also allow volunteers to ask questions and discuss site specific issues. It improves volunteer comfort and confidence in their performance, while helping staff put data into geographically relevant context.

Watershed Watch staff coordinate with active, trained volunteers to schedule and conduct a visit to the assigned monitoring site with the volunteer. During that visit URIWW staff will observe the volunteer as a they conduct their regular monitoring procedures. Duplicate measurements and samples will be collected by the URIWW staff.

At each visit the URIWW staff person will 1) observe the volunteer's monitoring techniques, 2) correct any mistakes, 3) answer any questions regarding the monitoring techniques, 4) take additional measurements and water samples for field and/or laboratory analyses using the volunteer's equipment to eliminate potential bias, 5) record dissolved oxygen and temperature using a meter (profiles at lake or estuary sites) and 6) completed a volunteer evaluation checklist and site assessment form for each location.

2.0 HEALTH AND SAFETY CONSIDERATIONS

2.1 Hazards

General safety procedures should be practiced as outlined in SOP 001 – Safety First. Always wear protective clothing in the form of gloves, goggles, and personal floatation devices as appropriate. Further information regarding all chemical reagents in the field kits are included in the kits and should be reviewed. Weather and use of boats (including kayaks and canoes) can pose hazards and safety practices need to be followed.

2.2 Technician Training/Qualifications

General training in field techniques must be completed prior to conducting field visits under this method. Technician training will be provided by Elizabeth Herron, Program Director. In addition to completing standard field training, URIWW staff will be coached on techniques to put volunteers at ease so that observations of usual practices will be more likely. Suggestions on what potential problems to look for and how to correct them most effectively will be focused on in this one-on-one training.

3.0 REQUIRED MATERIALS

Equipment and Supplies

Required Material	Notes	Re-order Information
Personal floatation device	For staff	SALVS Automatic Inflatable Life Jacket
Set of water collection bottles	Will vary depending on the site	
Chlorophyll filtering kit	Include QA labels	
Cooler with cold packs	For transporting samples to the lab	
DO/Temperature/Conductivity meter	Calibrated at the lab	YSI Pro2030
Clip board/pens		
Visit checklist		
GPS or directions – including contact information	To the site or volunteer's home	
Replacement supplies	As needed by volunteers	
A set of field blank samples	Appropriate to the site (i.e. deep samples as needed)	

Equipment is maintained by the University of Rhode Island Watershed Watch (URIWW) laboratory and the Natural Resources Science Department.

4.0 SAMPLE STORAGE, PRESERVATION AND DISPOSAL

4.1 Samples Include any important info

Matrix	Sample Container	Preservation	Volume	Holding Time
Ambient fresh or marine Water	250-500 mL white HDPE, orange lidded plastic and/or brown glass bottles	Kept at 4 °C after water sample is collected	100 – 500 mL	Samples should be delivered to URIWW lab within 6 hours to begin processing
Ambient fresh or marine Water	250 mL white HDPE sterilized	Kept at 4 °C after water sample is collected	250 mL	Bacteria samples should be delivered to URIWW lab within 6 hours
Glass Fiber Filter	Aluminum Foil	Frozen	NA	6 months

See Worksheet #12b of the URIWW field QAPP for details for each of the analytes.

<u>Disposal</u>
Samples are archived for from 48 hours to up to six months (analyte specific). Aqueous samples are disposed of after final quality assurance checks are completed and the data found to be acceptable using criteria found in Section 5.2 of this SOP. Aqueous samples may be rinsed

down the drain with running water. Bottles are cleaned in accordance with SOP 003 – General Labware Cleaning Procedure. See laboratory SOPs for disposal details for other analytes.

5.0 METHOD DESCRIPTION

5.1 Scheduling Considerations

Field visits will need to be coordinated and scheduled with volunteers well in advance and may require weekend days when the lab is not open. Arrangements will need to be made to ensure staff access to the lab. A check of the status of the DO meter must be performed at least 72 hours before anticipated field visit to ensure that it calibrates properly. Reconfirm the scheduled visit date and time with the volunteer to ensure that no conflicts have evolved.

At least 24 hours before the visit, equipment should be assembled, replacement supplies for volunteer kits compiled as necessary. Data and checklist sheets should be printed as well. Make sure you have contact information for the volunteer being visited.

5.2 Quality Assurance/Quality Control

5.2.1 Method Detection Limits

These visits focus on a variety of field techniques and procedures, which vary depending on the site type. Specific method detection limits are detailed in the Field QAPP (Worksheet #9b).

5.2.2 Sample Duplication

Duplicate measurements and samples will be collected by the trained volunteer and the URIWW staff conducting the visit. Field procedures will be evaluated with acceptable variation in results between the volunteer and staff results as shown in the table below.

Analytical Parameter	Analytical Method/ SOP Reference	Anticipated Concentration Range	Measurement Performance Criteria
Secchi Depth	Field SOP 005	0.1 – 20 m	+/- 0.25 m
Temperature	Field SOP 006	5 – 32 °C	+/- 1 °C
Dissolved Oxygen	Field SOP 010	0 – 14 ppm	+/- 1 ppm

Corrective Action: Values falling outside of the acceptable range will be investigated to understand the source of the difference and to adjust the volunteer technique as needed. Resampling will be done by both the volunteer and staff to ensure that the adjustment results in values within the measurement performance criteria.

5.2.3 Calibration: DO meter

The meter used by URIWW is the YSI Model Pro2030. This meter measures dissolved oxygen, conductivity, and temperature in water. The meter is equipped with an electrode at the end of a 10-meter cable, marked at 0.5-meter intervals.

Calibration of the meter is completed each day prior to use. The instruction manual for the DO meter and electrodes is kept in a cabinet in room 002, with a copy kept in the case used to transport the meter for use in the field to provide more detailed instructions.

Perform this calibration procedure when Quick DO Calibration is enabled in the System Setup menu (see the YSI manual for details).

1. Ensure the DO sensor has a good membrane with electrolyte installed. A good membrane is free of wrinkles, tears, fouling and air bubbles. Install the sensor guard onto the probe.
2. Moisten the sponge in the grey calibration/storage sleeve with a small amount of clean water and install it over the sensor guard. The sponge should only be moistened, and the calibration/storage sleeve should not have excess water in it that could cause water droplets to get on the membrane. The storage sleeve ensures atmospheric venting.
3. Power the instrument ON and, wait approximately 5 to 15 minutes for the chamber to become completely saturated. Auto Shutoff should be disabled or set to at least 20 minutes. See System Setup menu for more information on adjusting the Auto Shutoff.
4. Ensure the barometer is reading accurately. If necessary, calibrate.
5. Press and hold the Calibrate key for 3 seconds. Using the up or down arrow key, highlight Dissolved Oxygen and press enter. The Pro2030 will indicate ‘Calibrating %DO’ on the display. The instrument will automatically calibrate the sensor to the current barometric pressure. If DO Local% is enabled, the sensor will calibrate to 100%. This may take up to 2 minutes depending on the age of the sensor and membrane. You can press the Cal key at this time to cancel the calibration.
6. ‘Calibration Successful’ will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
7. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the error message and return to the Run screen. See the Troubleshooting guide for possible solutions. Analysis

5.2.4 Procedure – Dissolved Oxygen/Temperature profiles

The YSI meter will be used to measure dissolved oxygen, temperature, and conductivity (or salinity) at the mid-depth of stream sites or from the usual sampling depth in estuarine sites. Results will be recorded on the QC field visit form.

For sites that are not flow dominated, a site profile will be conducted using the following steps.

1. Following calibration of the meter and arrival at the designated site (anchored if in a boat) the electrode end of the cable will be lowered at 0.5 m intervals.
2. Temperature, dissolved oxygen and conductivity or salinity will be measured and recorded at each depth from the surface (0.0 m) to within 0.5 m of the bottom by lowering the cable to the next 0.5-meter interval marked by the labeled color tape. Do not dangle the electrode in the bottom sediment – it will not read correctly.
3. Ensure that measurements were recorded from each depth on the Profile datasheet comparing results as you raise the cable.

6.0 REFERENCE

URI Watershed Watch Field Monitoring Manuals. 2022. URI Cooperative Extension, 1 Greenhouse Ro, Kingston, RI 02881. https://web.uri.edu/watershedwatch/resources/training-manuals/

User Manual: YSI Pro2030 Rev. C. 2010. YSI Incorporated, Hanna Instruments, 1700/1725 Brannum Lane, Yellow Springs, OH 45387. https://www.ysi.com/

7.0 DOCUMENTATION

Staff will complete site visit forms to evaluate the volunteer's techniques and record any corrections made. Volunteers may ask to review the forms, but they will not be publicly available due to the potential personal nature of some of the responses. Data users with demonstrated need to review forms may request to do so. Data may also be aggregated to report on volunteer performance overall.

The site visit form will serve as mechanism for keeping track of the samples collected during the visit, but samples will be logged in at the laboratory using the standard URI Watershed Watch sample log sheets. Site visit forms will be scanned and maintained as pdfs for a period of at least 10 years in the URI Watershed Watch computers.

Profile forms will also be completed primarily on lakes, but also some estuarine sites. Profile data will be entered into Excel files to create charts and to maintain those data. Site temperature and dissolved oxygen data from these sites will be incorporated into the URI Watershed Watch dataset.

A site description form will be completed during each site visit to document the exact monitoring site. The form will be used to update site information as necessary and maintained to help guide future volunteers to the same location. The form will be kept for at least 10 years and scanned for inclusion in the URI Watershed Watch Site Information folder on the server.

7.1 Data sheet for Site Visit

WATER QUALITY QA/QC VISIT

DATE: TIME: URIWW STAFF:

LOCATION:

WATER QUALITY MONITOR:

SEASONS AS A MONITOR:

WEATHER: LIGHT_____ WIND_____ RAIN (past 48 hrs): _____

TYPE OF WATER SAMPLER USED: _____

Any concerns with how the sampler was used? Yes No

If yes, in what way? _____

What correction was made/suggested? _____

Did the volunteer try using the corrected technique? Yes No

SECCHI DEPTH TRANSPARENCY

VOLUNTEER		STAFF	
_____ m	_____ m	_____ m	_____ m

Bottom depth: _____ m Bottom depth: _____ m
Secchi on the bottom? yes no Secchi on the bottom? yes no
Did the volunteer use a view tube? yes no
Did the volunteer measure from the "sunny side" of the boat/dock? yes no NA

DISSOLVED OXYGEN / TEMPERATURE

DEPTH (m)	TEMP. C	DISS. OX		DEPTH (m)	TEMP. C	DISS. OX	
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

Were bubbles visible in any of the DO bottles? ? yes no
Were any corrections made,and if so, what were they?

1 meter WATER SAMPLES: (check when collected)

Brown glass:		Brown glass:	
pH/alkalinity:		pH/alkalinity:	
Chlorophyll 1 of 2		Chlorophyll 1 of 2	
Chlorophyll 2 of 2		Chlorophyll 2 of 2	

Deep WATER SAMPLES: (as appropriate - check when collected)

Sample depth:		Sample depth:	
Brown glass:		Brown glass:	
pH:		pH:	

Bacteria samples (optional): _____ Bacteria samples (optional): _____

Any questions or concerns about the volunteer's procedures, please correct and note on the back of this form. Plese also report questions from the volunteer, especially if you weren't able to respond adequately.

7.2 Data sheet for DO/Temp profile

Dissolved Oxygen Profile Data Sheet:

Location:		Time:		Secchi (meters):		
Date:		Tech:				

Depth (m)	YSI Pro D. O. (mg/l)	YSI Pro Temp (°C)	YSI Pro Conductivity (mS/cm)
0.5			
1			
1.5			
2			
2.5			
3			
3.5			
4			
4.5			
5			
5.5			
6			
6.5			
7			
7.5			
8			
8.5			
9			
9.5			
10			
10.5			
11			
11.5			
12			
12.5			
13			
13.5			
14			
14.5			
15			

Light:		1=Distinct Shadows	2=No Shadows	3=Very Overcast		
Wind:		0=Calm	1=Light	2=Gentle	3=Moderate	4=Heavy
Rain w/in 48 Hrs.:		1=None	2=Light	3=Moderate	4=Heavy	
Comments:						

7.3 Station Description – Lake/Pond/Reservoir

URI Watershed Watch
URI Cooperative Extension, Dept. Natural Resource Sciences
1 Greenhouse Road, Kingston, RI 02881

Lake or Pond Name: «Site_DESCR»

Station Name: «WW_Station»

WBID: «WBID»

Town: «Town»

Watershed: «HUC_12_NAME»

Lake type (Reservoir/Pond or Lake): «WB_Type»

LAKE ACCESS: - *How do you access the pond or lake you monitor?*

Public Access: (circle one) Yes No

Pond Access: (circle one) Boat Ramp Dirt Path
Personal Dock Other (specify) _____

Access Notes: _____

_____

SAMPLING SITE – *Where do you collect your data on the pond or lake you monitor?*

Sampling Site Coordinates: (circle one) GPS Phone Other (specify) _____

Latitude: _____

Longitude: _____

Sampling Site Depth: _____

Sampling Site Location Description: (note landmarks or distances used to navigate to your site)

_____

_____

_____

Safety Hazards (if applicable): _____

_____

The marine site form is nearly identical, so not included in the SOP.

7.4 Station Description – River/Stream

URI Watershed Watch
URI Cooperative Extension, Dept. Natural Resource Sciences
1 Greenhouse Road, Kingston, RI 02881

River or Stream Name: «Site_DESCR»

Station Name: «WW_Station»

WBID: «WBID»

Town: «Town»

Watershed: «HUC_12_NAME»

Site Type: «WB_Type»

SITE ACCESS: - *How do you access the stream/river site you monitor?*

Public Access: (circle one) Yes No

Stream Access: (circle one) Boat Ramp Bridge Path
Personal Dock Other (specify) _____

Access Notes: _____

_____

SAMPLING SITE – *Where do you collect your data on the river or stream you monitor?*

Sampling Site Coordinates: (circle one) GPS Phone Other (specify) _____

Latitude: _____

Longitude: _____

Sampling Site Depth: _____

Sampling Site Location Description: (note landmarks or distances used to navigate to or mark your site)

_____

_____

_____

Safety Hazards (if applicable): _____

_____

If possible, please send photos (digitally) of your monitoring site, facing upstream, downstream and at the access point. Please name the file with river name and "up" "down" or "access" or send information so we can determine which image is linked with which direction