SAVE OUR STREAMS

SOS CHEMICAL MONITORING MANUAL

IZAAK WALTON LEAGUE OF AMERICA

www.IWLA.org/sos

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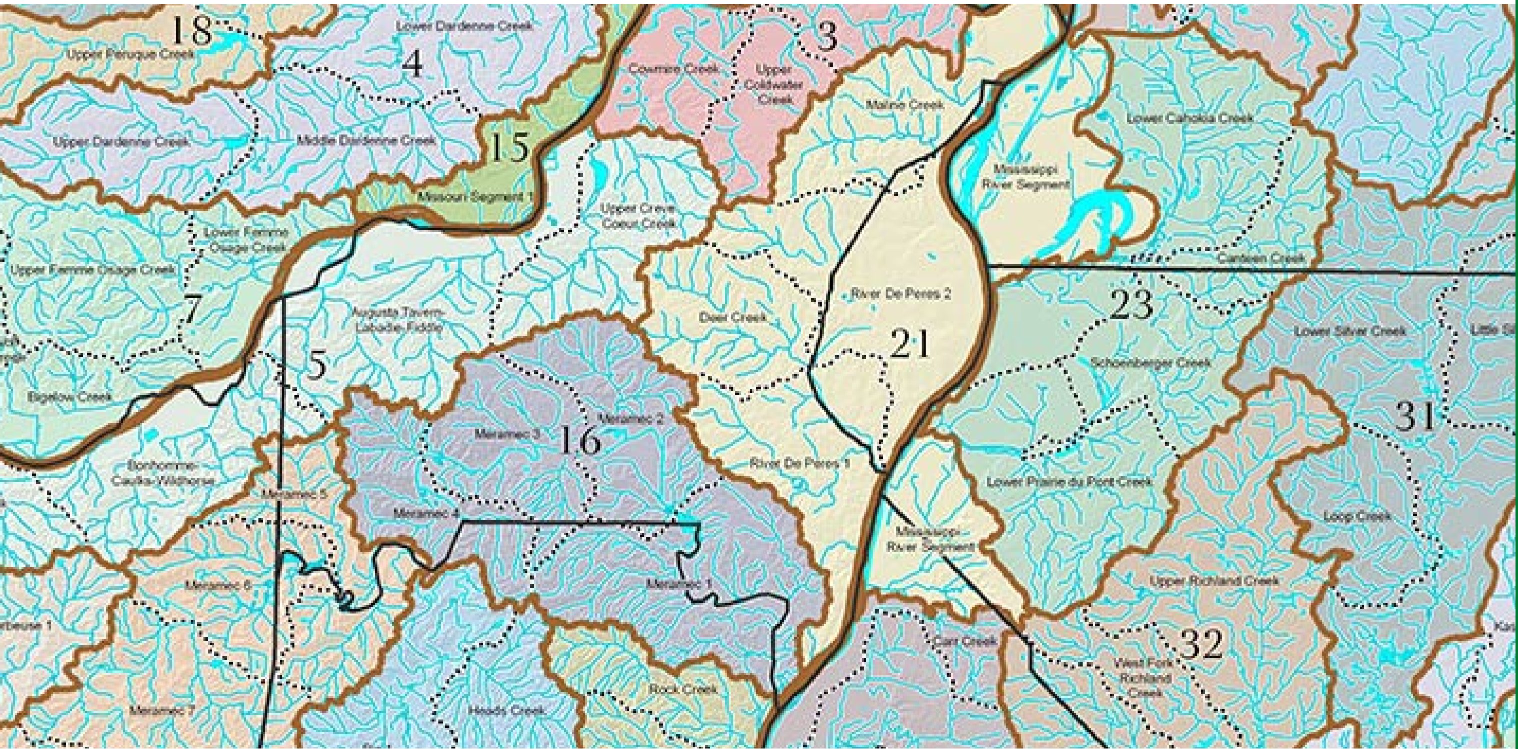
Monitoring Best Practices

Being a Save Our Streams monitor comes with a responsibility to act and speak with integrity and always follow best practices when it comes to monitoring and data reporting. In order to help you maintain the reliability and integrity of SOS data, we've included some tips, reminders, and common pitfalls to avoid when it comes to collecting and/or reporting your SOS data.

Choosing Your Site

- Try to choose a site that is **representative of the stream as a whole**.
  - Avoid monitoring immediately downstream of nearby disturbances such as log jams, bridges, tile outlets, storm drain discharges, altered habitat, etc.
  - Aim for the area of the stream with the highest flow volume during chemical monitoring.
- **Choose your site from a watershed monitoring perspective**. Having several monitoring sites throughout a watershed can help triangulate potential pollution sources or problem tributaries.
- **Take care to avoid trespassing on private land**. Always seek permission ahead of time from a landowner on private land and a government agency when monitoring on public land.



Consistent Monitoring

Establish a monitoring schedule for your site(s) and stick to it. Water quality can vary from year-to-year, month-to-month, and even day-to-day. Consistent monitoring can help establish what a “normal” baseline is at a site, allowing you to compare results across time or between locations. Additionally, consistent baseline data can help set a restoration standard to return to in the event of a pollution problem in the future.

- Macroinvertebrate monitoring should occur once in the fall and once in the spring. Chemical monitoring can be done as often as possible. Monitoring must be done consistently for several years to create a reliable baseline.
- **Do not monitor with the goal of seeking out problems.** You will likely have months or years of un-alarming data, but you should continue establishing a baseline and monitoring to catch and quantify any future pollution problems.
- **Avoid jumping to conclusions or making claims based on limited data.** One or two data points does not constitute a trend.
- **Do not purposely target extreme weather conditions that would alter water quality conditions.** Aim to monitor so you can get results that are representative of the stream normally. Create a monitoring schedule ahead of time and adhere to it to limit your variables.
- **Do not pick and choose your sites and times.** Whenever possible, aim to monitor the same sites at the same time of day on a recurring schedule.

Maintaining Equipment

Good science relies on standardized protocols and equipment. Be sure to check your gear before and after you monitor, and repair or replace any items that are worn, broken, or expired. Always ensure that your gear fully dries out between sampling events. If monitoring multiple sites in a day, thoroughly clean equipment between sites to prevent the spread of invasive species or cross-contamination.

Chemical Equipment Maintenance

Chemical test kits will expire roughly every 1-2 years. Expired materials will not produce reliable results. Always be sure to check expiration dates before you go out to do chemical monitoring. Avoid exposing chemical test kits to prolonged excessive heat, cold, or sunlight. If you find abnormal chemical results, repeat your tests to verify. It is helpful to do the repeat test with another kit if possible, to ensure the abnormal results are not due to the test kit you used.

Clean Water Hub

What is the Clean Water Hub?

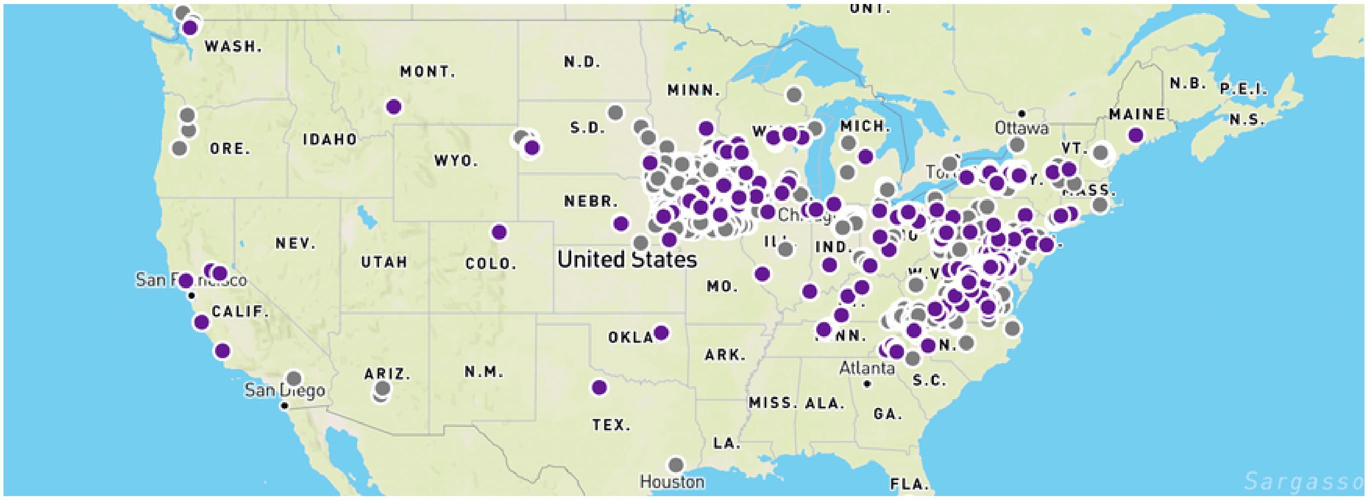
The Clean Water Hub is a collaborative data visualization tool to help water quality monitors and communities track water quality in local creeks and streams.

The Clean Water Hub currently hosts the following types of water quality data;

- National SOS benthic macroinvertebrate data
- Virginia SOS (VA SOS) benthic macroinvertebrate data
- Chemical water quality data
- Salt Watch & Nitrate Watch results
- Macroinvertebrate data collected by the Creek Critters app

CLEAN WATER HUB

Visit **www.cleanwaterhub.org** to explore the map, create an account, and add your data.



Request a Clean Water Hub Group/Organization Profile

To see all of your sites in one place and access downloads of your data, you can request an organization profile be made for your monitoring group/chapter/organization. This profile is a great way to manage data for multiple sites, and can serve as a communication tool for you to share your results with your community.

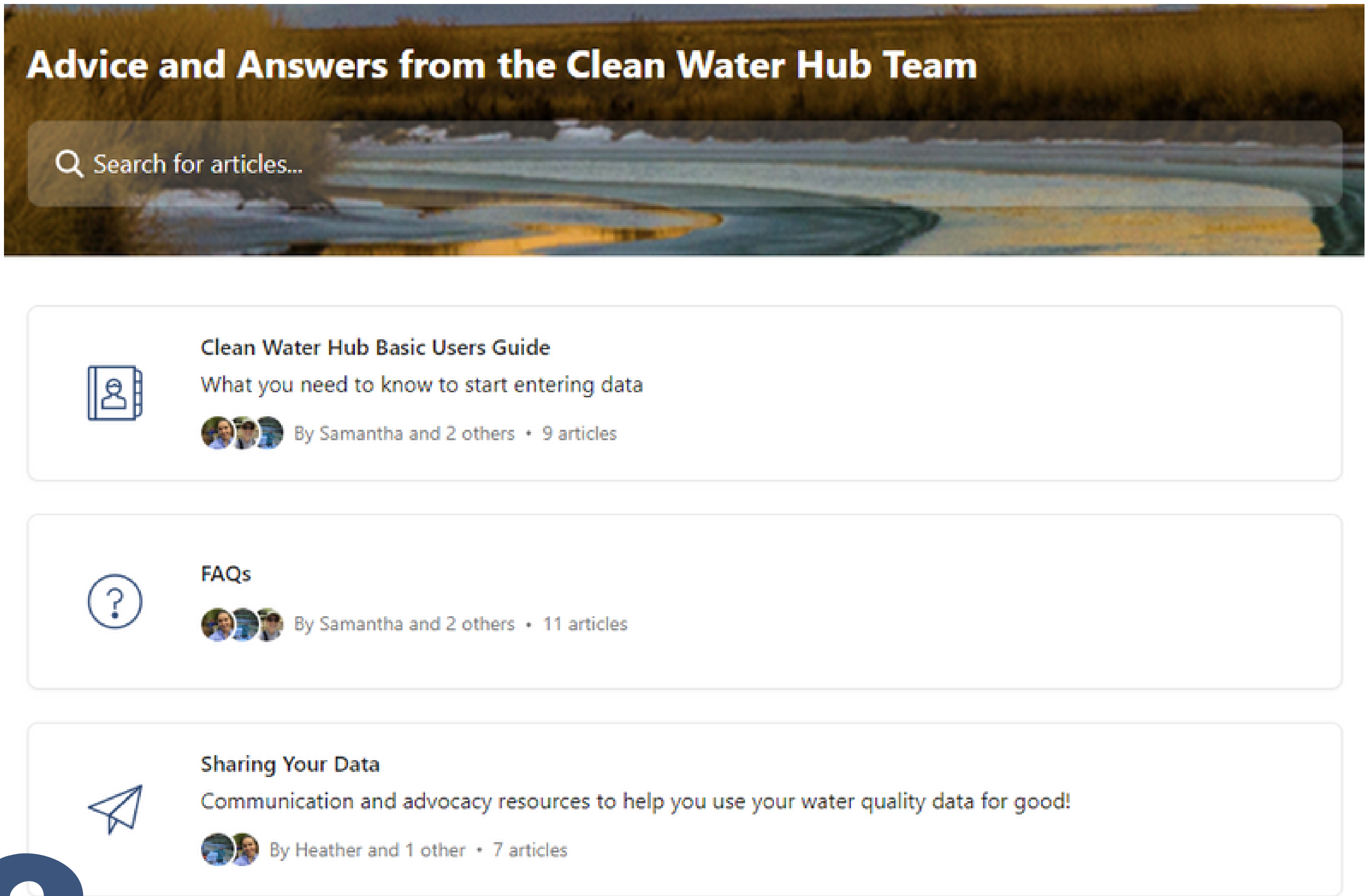
Request a profile using this online form, or by emailing **sos@iwla.org**.

Using the Clean Water Hub

Looking for help getting started on the Clean Water Hub? Visit help.cleanwaterhub.org/ to find the following resources:

- **Clean Water Hub Basic Users Guide** - all the information you need to get started entering data into the Hub
- **FAQs** - answers to frequently asked questions from Hub users
- **Sharing Your Data** - Communication and advocacy resources to help you use your water quality data for good!

help.cleanwaterhub.org/



Still stuck? Email support@cleanwaterhub.org and we will get back to you!

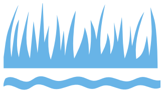
Explanation of Chemical Parameters

In this section, find additional information about the parameters measured in Save Our Streams Chemical Monitoring.

Streamside Observations

Sometimes just observing your stream before you ever step into the water can tell you about the water quality. When you first reach your stream site, spend a few minutes observing the habitat. Here are a few things you can look for:

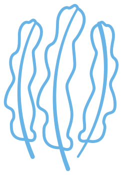
Smell. A healthy stream shouldn't have a strong smell – wet soil, decomposing leaves, and other natural smells are normally mild. If you smell sewage, chemicals like oil or gasoline, or other unnatural smells, these could be a sign of a pollution problem.



Vegetation. Most streams are bordered by some kind of vegetation, including grasses, shrubs, or trees. These plants help stabilize the banks, keep the water shaded and cool, and catch pollution before it flows into the stream. Streams without vegetation are vulnerable to bank collapse and pollution.

Erosion. Many urban streams suffer from severe erosion due to sudden changes in water level. Look for signs of erosion by comparing the high water mark with the level of the stream itself. Observe any trees with exposed roots and note if soil is actively collapsing into the stream.

Weather. Recent weather can affect stream conditions. Has it been very rainy recently? Lots of rain may make the water murky and wash in pollutants via runoff. Hot and dry? The water may be lower and warmer than usual.



Algae. Algae is a natural part of a stream habitat and can be many different colors from green to brown to orange. Excessive algae on the water's surface or covering the stream bottom can indicate excessive nutrients in the water. Check for algae by looking at the streambed and stones or even by feeling cobbles in the water.

Chemical Parameters

Save Our Streams chemical monitoring can help pinpoint the cause of a water quality problem. By combining chemical monitoring with biological monitoring, you can start to put together a full picture of your stream's health.

Dissolved Oxygen

Dissolved Oxygen (DO) is the measurement of oxygen present in a body of water and available to aquatic organisms. It is measured as a concentration in milligrams per liter or a percent-saturation. Certain processes add oxygen to a stream, while others remove or consume oxygen.

What Affects Dissolved Oxygen?

Water Temperature: Cold water holds more oxygen than warm water.

Time of Day: DO levels are highest during sunny days, when aquatic plants create oxygen.

Stream Flow: DO will vary with the volume and speed of water in a stream. Faster moving water mixes with oxygen from the air, thus increasing DO.

Sediments: Oxygen dissolves more easily in water without high amounts of salts or sediments. Sediment also blocks sunlight from reaching aquatic plants, making it difficult for these plants to produce oxygen.

Human Impacts: Human impacts that increase stream temperature or create pollution can reduce DO, like stormwater runoff, riparian habitat removal, and dams.

Algae blooms: Excess nutrients in water can cause algae to grow in thick mats or "blooms," which block sunlight to aquatic plants. Decomposing algae also releases carbon dioxide into the water.

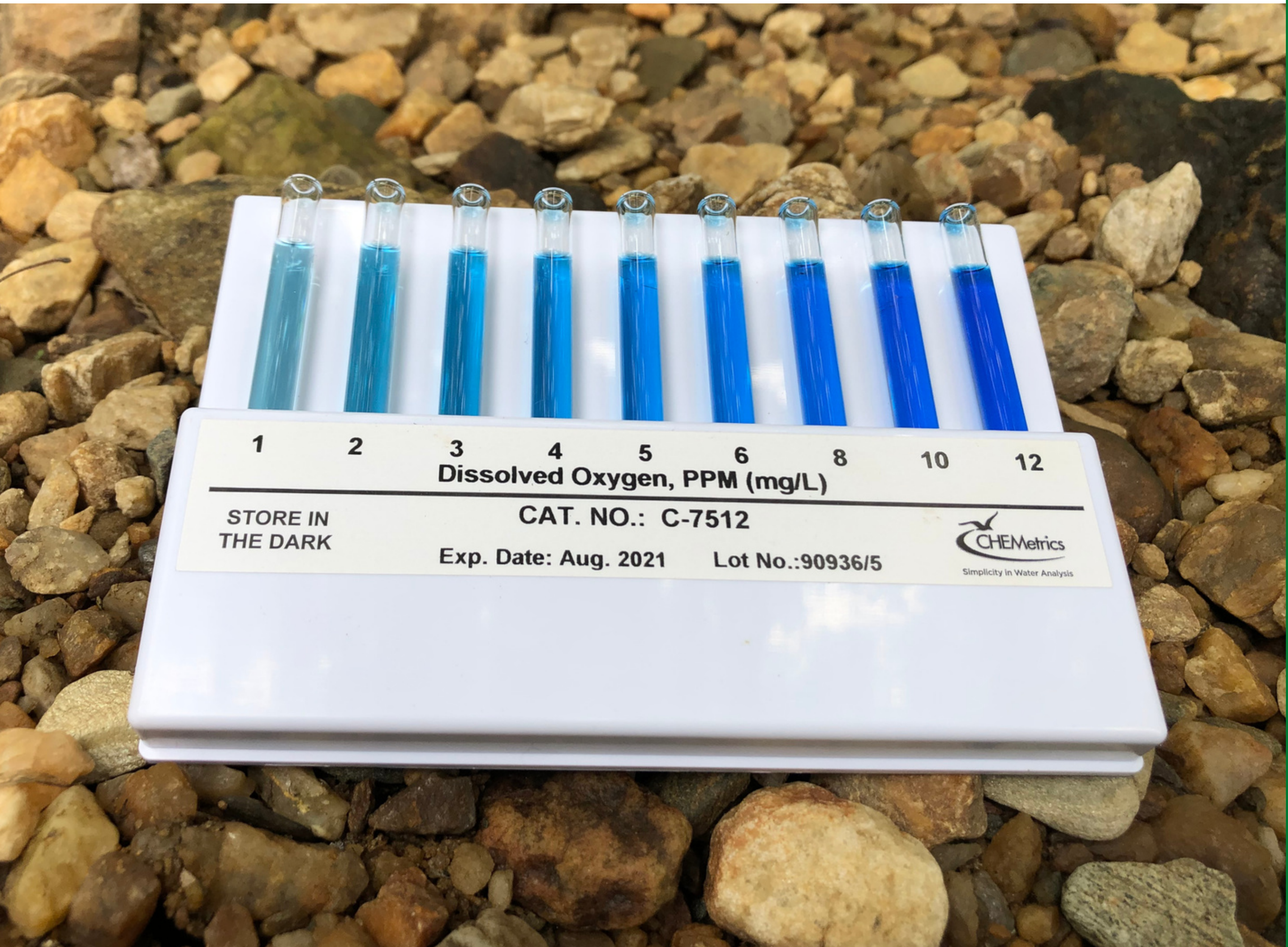
Dissolved Oxygen - continued

What's a Normal DO Reading?

The typical range for dissolved oxygen for rivers and streams is 8.7 to 12.9 mg/L. DO levels can be lower in stagnant or still water, like in marshes, lakes, or the bottoms of large, deep rivers. Low DO in a stream, however, can indicate a pollution problem.

Combining a DO test with other chemical measurements can help pinpoint potential water quality threats. Habitat assessments are also a good tool for identify potential causes of DO. Little riparian vegetation or lots of algae can both cause low levels of DO in a stream.

Finally, monitoring for macroinvertebrates will help provide a full picture of stream health. If the DO levels have been chronically low in a stream, only pollution tolerant macroinvertebrates will be present. If the DO dropped recently or for a short period of time, sensitive macroinvertebrates may still be present.



pH

pH is a measure of a water's acid/base content and is measured in pH units on a scale of 0 to 14. A pH of seven is neutral, a pH greater than seven is basic/alkaline, and a pH less than seven is acidic. The pH level of stream water is influenced by the concentration of acids in rain and the types of soils and bedrock in the state.

What Affects pH?

Rainfall: The typical pH of rainfall in the United States is slightly acidic, ranging from 5.0 to 5.6. Rainwater pH is determined by natural atmospheric processes and air pollution.

Soil: The pH of soil varies depending on both geology and vegetation. Fallen pine needles make neighboring soil and water slightly acidic, while limestone make them basic.

Human Impacts: Runoff of chemical pollutants, air pollution, wastewater from mining operations.

What's a Normal pH Reading?

Most aquatic organisms can only survive in habitats with a pH of 6.5 to 9.0. Too high or too low, and most aquatic species will die out.

Combining a pH test with other chemical measurements can help pinpoint potential causes of low of high readings. Habitat assessments are also a good tool for identify potential causes of low or high pH. Visible pollution, runoff, or vegetation types may help explain an abnormal reading.

Finally, monitoring for macroinvertebrates will help provide a full picture of stream health. If the pH levels have been chronically abnormal, only pollution tolerant macroinvertebrates will be present. If the pH recently changed or changed for a short period of time, sensitive macroinvertebrates may still be present.

Water Temperature

Many of the chemical, physical, and biological characteristics of a stream are directly affected by water temperature. Some animals, such as trout, are quite sensitive to temperature changes. Water temperatures can fluctuate seasonally, daily, and even hourly.

What Affects Water Temperature?

Air temperature: Water temperature is cooler in winter and warmer in summer. Warming air temperatures driven by climate change are also increasing average stream temperature.

Groundwater: Although groundwater springs are often cold, the temperature of groundwater feeding streams can vary.

Riparian vegetation: Plants that live along streams provide shade and keep the water cool. Removing this vegetation increases the temperature of water flowing through that section of stream.

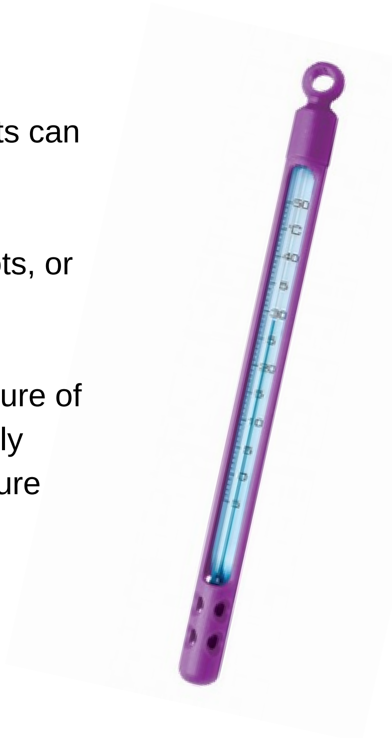
Erosion: Natural and human-caused soil erosion fills streams with soil, making water cloudier and darker. Darker water absorbs more sunlight and is thus warmer.

Human activities: Runoff from warm pavement and industrial discharge brings warm water into a stream.

Changes in water temperature affect water quality. Cool water holds more oxygen than warm water, so the amount of dissolved oxygen decreases as temperature rises. The rate of photosynthesis by algae increases in warmer waters, encouraging blooms. The metabolic rate of aquatic animals increases with higher temperatures, meaning they require more oxygen and food to survive. The sensitivity of aquatic organisms to diseases, parasites, and toxic wastes also increases with rising water temperatures, putting them at greater risk.

Water Temperature - continued

What's a Normal Water Temperature Reading?



Combining a temperature reading with other chemical measurements can help pinpoint potential causes of low or high temperatures. Habitat assessments are also a good tool for identify potential causes for temperature readings: the presence of vegetation, nearby parking lots, or erosion can all influence water temperature.

Finally, monitoring for macroinvertebrates will help provide a full picture of stream health. If the temperature has been chronically abnormal, only pollution tolerant macroinvertebrates will be present. If the temperature changed recently or changed for a short period of time, sensitive macroinvertebrates may still be present.

Nitrate

Nitrate is a naturally occurring compound made up of nitrogen and oxygen. Nitrogen is an essential nutrient for plant growth, but human activities produce more nitrogen than natural systems can use. Fertilizers, manure and sewage all add extra nitrogen to the landscape. As this nitrogen moves through the environment, it becomes nitrate. The nitrate can then make its way to streams and sources of drinking water via surface runoff or groundwater saturation. Excess nitrate in water can pose serious problems for the health of humans and the environment.

What Affects Nitrate?

Natural Sources: Natural sources can contribute small amounts of nitrate to water. Wildlife waste, decaying organic matter, and nitrogen-fixing plants can contribute to nitrate concentrations.

Human Sources: Nitrogen is an abundant ingredient in chemical fertilizers used on lawns, farm fields, golf courses, and gardens. Sewage, faulty septic systems, and animal feedlots can also be big contributors of nitrate. Some additional potential sources include industrial or food processing waste.

Rain Events: During and immediately following precipitation, there can be a higher volume of nitrate in waterways. However, because the volume of water has also increased, the change in nitrate concentration (parts per million or mg/L) may not accurately reflect the increased nitrate load.

Natural Filters: Because nitrate is an essential nutrient in nature, there are ways for nature to filter nitrates. Plants can slow down and extract nitrate from water. Some natural nitrate filters include wetlands, vegetated buffers around waterways, and rain gardens. Some specific bacteria also consume nitrate in conditions with low or no oxygen.

What's a Normal Nitrate Reading?

Nitrate concentration measures the volume of nitrate per volume of water as milligrams per liter (mg/L) or parts per million (ppm). When comparing a small stream and a large river with an equal concentration, the larger river will actually be carrying a higher volume of nitrate. A typical range for nitrate in a stream is 0.1 - 3 mg/L. The EPA mandates that the maximum nitrate concentration for drinking water is 10 mg/L.

Phosphate

Phosphates are chemical compounds made up of phosphorus and other elements, which plants and animals need to grow. The most common source of phosphates in waterways are artificial fertilizers used by farmers and homeowners for crops, lawns, and landscaping. Although a small amount of phosphate is important for a healthy stream, too much phosphate can cause serious problems.

What Affects Phosphate?

Natural Sources: Decomposing rocks and minerals, deposits from the air, decaying organic matter, and wildlife feces can all contribute small amounts of phosphate that are usually within healthy and necessary levels for the ecosystem.

Human Sources: Phosphates can become problematic when humans contribute more than the system is naturally meant to handle. Human sources can include the following: fertilizer, detergents, erosion and sedimentation, livestock manure, wastewater treatment plants, sewage, and industrial discharges.

Erosion and Sedimentation Control: Because phosphate and soil particles are attracted to each other, practices carried out to keep soil in place should help lower the amount of phosphate that is added to water through erosion and sedimentation.

What's a Normal Phosphate Reading?

Concentration measures the volume of phosphate per volume of water as milligrams per liter (mg/L) or parts per million (ppm). When comparing a small stream and a large river with an equal concentration, the larger river will actually be carrying a higher volume of phosphate. A typical range for phosphate concentration should be between 0.11 to 0.34 mg/L.

Transparency

Transparency is a measure of water clarity and is affected by the amount of material suspended in water. As more material is suspended, less light can pass through, making it less transparent. Suspended materials may include soil, algae, microbes, and more.

Low transparency harms aquatic animals by clogging gills, destroying habitat, and reducing the availability of food. Suspended materials in streams also promote solar heating, which can increase water temperature and reduce light penetration, both of which contribute to lower dissolved oxygen. Sediment also can carry chemical pollutants, such as phosphates or heavy metals, which can have harmful environmental effects.

What Affects Transparency?

Precipitation: Precipitation events can reduce stream transparency, as sediment, organic materials, and pollution are washed into the stream. Heavy rain events can also trigger streambank erosion, decreasing transparency.

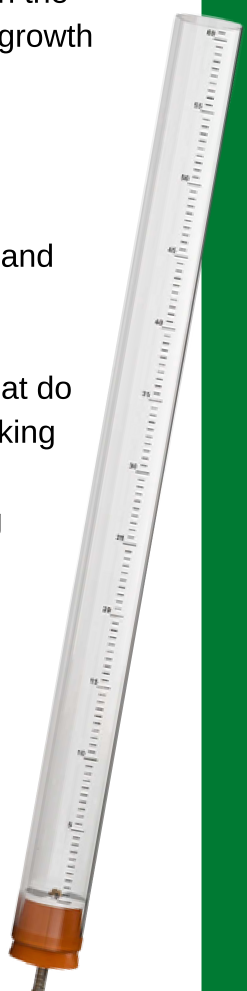
Natural Causes: Bottom-feeding fish or other animals walking through the stream can disturb the streambed and decrease transparency. Algae growth is natural and can lower transparency, though human-caused nutrient enrichment can cause algae growth to spike above normal levels.

Human Activity: Human activities on the land, such as construction, agriculture, waste discharge, storm water runoff, industrial discharge, and more can result in decreased water transparency.

Impermeable Surfaces: Impermeable surfaces are those surfaces that do not allow water to saturate down into the soil. They include roads, parking lots, roofs, sidewalks, or even heavily-compacted dense soils. These impermeable surfaces can rush water into streams very rapidly during precipitation events, which can contribute greatly to erosion within the watershed. This erosion creates cloudy water.

What's a Normal Transparency Reading?

Transparency can fluctuate greatly based on land use, land cover, and recent precipitation. However, mostly clear water is the ideal. A result of less than 15.5 cm would be considered “poor”, and greater than 60 cm would be considered “excellent.” A transparency reading between 15.5-35 cm is “fair,” and 35-60 cm is “good.”



Chemical Monitoring Equipment

<u>You can find a **list of recommended equipment on our website** with suggested links to purchase.</u>

Transparency Tube

Phosphate Test Kit

Dissolved Oxygen Test Kit

Nitrate/Nitrite Test Strips

pH Test Strips

Chloride Test Strips

Additional supplies:

- Waste container
- SOS datasheets and instructions
- Pencils/pens
- Clipboard

Aquatic thermometer

Check Your Equipment Before Going Out in the Field

Before each monitoring session, check to make sure all of the materials are clean, in good condition, and not expired.

SOS Chemical Datasheet

SAVE OUR STREAMS
IZAAK WALTON LEAGUE OF AMERICA

Chemical Monitoring Data Form for Stream Monitors

Name of Stream: ______________________ Name of monitoring site: ______________________

Name of Certified Monitor(s): ____

Group/Organization: ______________________________ Number of participants: __________

City/State: ______________ Latitude: ______________ Longitude: ______________

Survey Date: ______________ Start time: ______________ End time: ______________

Description of site location: ____

Record stream site information here. Be sure to list ALL certified monitors present at each monitoring event.

WEATHER CONDITIONS (check all that apply)

Today:	☐ Sunny	☐ Overcast	☐ Intermittent Rain	☐ Steady Rain	☐ Heavy Rain	☐ Snow
Yesterday:	☐ Sunny	☐ Overcast	☐ Intermittent Rain	☐ Steady Rain	☐ Heavy Rain	☐ Snow
Day Before Yesterday:	☐ Sunny	☐ Overcast	☐ Intermittent Rain	☐ Steady Rain	☐ Heavy Rain	☐ Snow

COLLECTED DATA

Dissolved Oxygen: __________ mg/L __________ % saturation (*See page 2 of this form to calculate % saturation)*

pH: ______________ pH units

Chloride: ______ Quantab Units ______ mg/L *(Convert Quantab Units to mg/L using the chart provided on the bottle)*

Phosphate: ______________ mg/L

Nitrate-N: ______________ mg/L

Transparency (record whole numbers only): ______________ centimeters

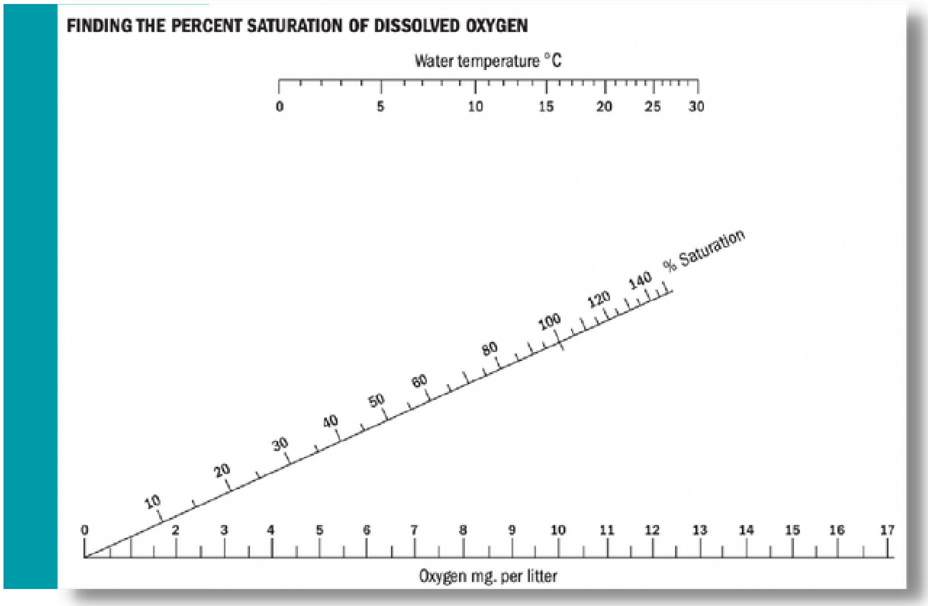
Water temperature: __________ °C

Other Stream Assessment Observations and Notes: ____

____

Determining Dissolved Oxygen Percent Saturation

Use the chart on the back side of the Chemical Monitoring Data Form to determine dissolved oxygen percent saturation. Place a straight edge on the concentration (mg/L) of dissolved oxygen you measured at your site, then place the other end of the straight edge on the water temperature. The point where the straight edge passes through the line labeled “% Saturation” is your dissolved oxygen percent saturation.



Water Quality Summation

Compare your chemical readings to the values on the Water Quality Summation table on the back side of the Chemical Monitoring Data Form.

WATER QUALITY SUMMATION for Chemical Tests				
	Excellent	**Good**	**Fair**	**Poor**
Dissolved Oxygen (% saturation)	80-120	70-79 121-140	50-69 >140	<50
pH (units)	7.0-7.5	6.5-6.9 7.6-8.5	5.5-6.4 8.6-9.0	<5.5 >9.0
Chloride (Cl) (mg/L)	0-20	21-50	51-250	>250
Reactive Phosphate (PO_4X^3) (mg/L)	0-0.2	0.3-0.5	0.6-2.0	>2.0
Nitrate (NO_3) (mg/L)	0-3	>3-5	>5-10	>10
Transparency (cm)	≥65.0	64.9-35.0	34.9-15.5	<15.5

Chemical Monitoring Protocol

Objective:

Perform chemical tests on a water source to determine if environmental conditions are influencing the water chemistry. Use the SOS chemical datasheet to record your results and determine water quality.

Dissolved Oxygen

For use with the CHEMetrics dissolved oxygen test kit

1. Remove the 25 ml sample cup from the kit and rinse it three times with stream water.
2. Wade out to the spot with the greatest flow of water.
3. Lower the sample cup down to wrist depth while holding it upside down. Turn the opening downstream so that the cup backfills with water, then turn the cup upstream and carefully remove cup and water sample from stream.
4. Place a glass ampoule in the sample cup, tilting it so the tip is wedged in one of the spaces along the side of the sample cup.
5. Snap off the tip of the ampoule by pressing it against the side of the cup, allowing it to fill with water.
6. Remove the ampoule from the cup and mix the water by inverting the ampoule several times. Be careful not to touch the broken end, as it will be sharp.
7. **Two minutes** after you break off the ampoule tip, compare the ampoule to the color standards provided in the kit. Remove sunglasses before making a color determination. NOTE: It's important to read the ampoule exactly at two minutes – it will continue to change color.
8. Hold the comparator nearly flat while standing directly beneath a bright source of light. Place your ampoule between the color standards moving it from left to right until the best color match is found. Record your result on the Chemical Data Form.

Note: For each chemical test, check the expiration dates on all test strips, ampoules, etc. If materials have expired, DO NOT USE them.

pH

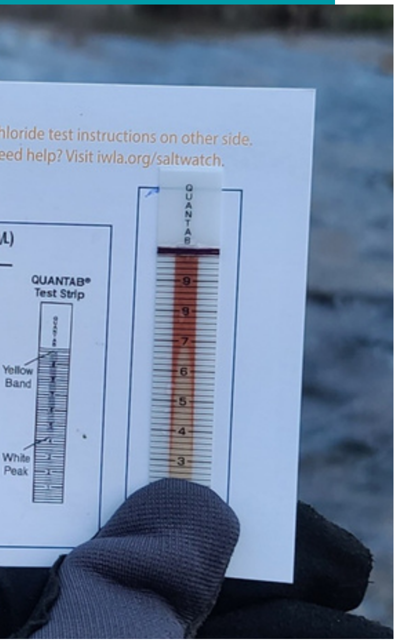
For use with Hach® pH test strips

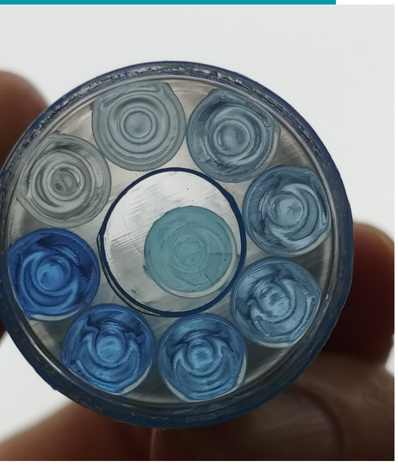
1. From your monitoring station, wade straight out to the spot with the greatest flow of water and, facing upstream, dip the test strip in the water and remove it immediately.
2. Hold the test strip level for **15 seconds**. DO NOT SHAKE excess water from the test strip.
3. Estimate pH by comparing the test strip to the color chart on the test strip bottle. Remove sunglasses before reading the strip. The strip will continue to change color, so it is important to make a color determination immediately after 15 seconds.
4. Record results on the Chemical Data Form.

Chloride

For use with Hach Chloride QuanTab® titration strips

1. Rinse a sample cup three times with stream water.
2. From your monitoring station, wade straight out to the spot with the greatest flow of water and, facing upstream, fill the sample cup with approximately 1 inch of water.
3. Remove a test strip from bottle and replace the cap immediately.
4. Insert the lower end of the test strip into the sample cup filled with water. Do not submerge past the yellow line at the top of the titrator.
5. Allow the sample water to completely saturate the wick of the titrator. There is no time limit for this test – the reaction is complete when the yellow line turns dark (this will take a few minutes).
6. Note where the tip of the white chloride peak falls on the numbered QuanTab scale. This represents the QuanTab unit value.
7. Refer to the table on the QuanTab test strip bottle to convert the QuanTab units into a chloride concentration (units of ppm or mg/L). Record the result on the Chemical Data Form.
8. If the QuanTab unit value is below the smallest value on your test strip bottle, report the chloride concentration as the lowest concentration listed on the test strip bottle and make a note in the comments section.





Phosphate

For use with CHEMetrics phosphate test kit

1. Remove the 25 ml sample cup and black lid from the kit and rinse them three times with stream water.
2. Wade out to the spot with the greatest flow of water.
3. Lower the sample cup down to wrist depth while holding it upside down. Turn the opening downstream so that the cup backfills with water, then turn the cup upstream and carefully remove the cup and water sample from the stream.
4. Gently tip the sample cup to pour off excess water. The cup should be filled to the 25 mL mark.
5. Add 2 drops of A-8500 Activator Solution, place the black cap on the sample cup, and shake to mix the contents.
6. Place a glass ampoule in the sample cup, tilting it so the tip is wedged in one of the spaces along the side of the sample cup.
7. Snap off the tip of the ampoule by pressing it against the side of the cup, allowing it to fill with water.
8. Remove the ampoule from the cup and mix the water in the ampoule by inverting it slowly several times. Be careful not to touch the broken end, as it will be sharp.
9. **Two minute**s after you break off the ampoule tip, compare the ampoule to the color standards provided in the kit. Remove your sunglasses before making a color determination. NOTE: It’s important to read the ampoule exactly at two minutes – it will continue to change color.
10. Based on the color of your ampoule, use the appropriate color comparator to estimate the phosphate concentration.
    a. The low-range circular comparator measures concentrations ranging from 0 to 1 mg/L. To use the circular comparator, place your ampoule, flat end downward, into the center tube. Direct the top of the comparator up toward a good light source while viewing from the bottom. Rotate the comparator to match your ampoule to the standards and record your results on the Chemical Data Form.
    b. The high-range comparator in the lid of the kit measures concentrations ranging from 1 to 10 mg/L. Hold the high range comparator nearly flat while standing directly beneath a bright source of light. Place your ampoule between the color standards moving it from left to right until the best color match is found. Record result on the Chemical Data Form.

Nitrate

For use with Hach® nitrate-N/nitrite-N test strips

1. Dip the test strip into the water for one second and remove. DO NOT SHAKE excess water from the test strip.
2. Hold the strip level, with pad side up, for 30 seconds.
3. At exactly **30 seconds**, compare the NITRATE (upper) test pad to the nitrate-nitrogen color chart on test strip bottle, estimate the nitrate concentration in mg/L, and record your reading on the Chemical Data Form. (Remove sunglasses before reading the strip.) The pad will continue to change color, so make a determination immediately after 30 seconds.

Note: Each nitrate-N/nitrite-N test strip also has a second tab for measuring nitrite-N. Save Our Streams chemical monitoring does not collect nitrite-N data, so you may disregard this test pad.

Transparency

For use with transparency tube

1. Make sure the finger clamp on the hose is closed.
2. From your monitoring station, wade straight out to the spot with the greatest flow of water and, facing upstream, fill the transparency tube.
3. Hold the tube upright and in the shade. Use your body to shade the tube if nothing else is available.
4. With your back to the sun, look directly into the tube from the open top and release water through the small hose, regulating the flow with the finger clamp until you are able to distinguish the black and white pattern (Secchi pattern) on the bottom of the tube. Close the finger clamp.
5. Read the number on the outside of the tube that is closest to the water line. Record your reading in centimeters (cm).
6. If the Secchi pattern is visible when the transparency tube is completely full of water, record a transparency reading of 65.0 cm and make a note in the comments section.
7. Rinse the tube after each use so that the bottom Secchi pattern does not become dirty and clouded.

Water Temperature

For use with an aquatic thermometer

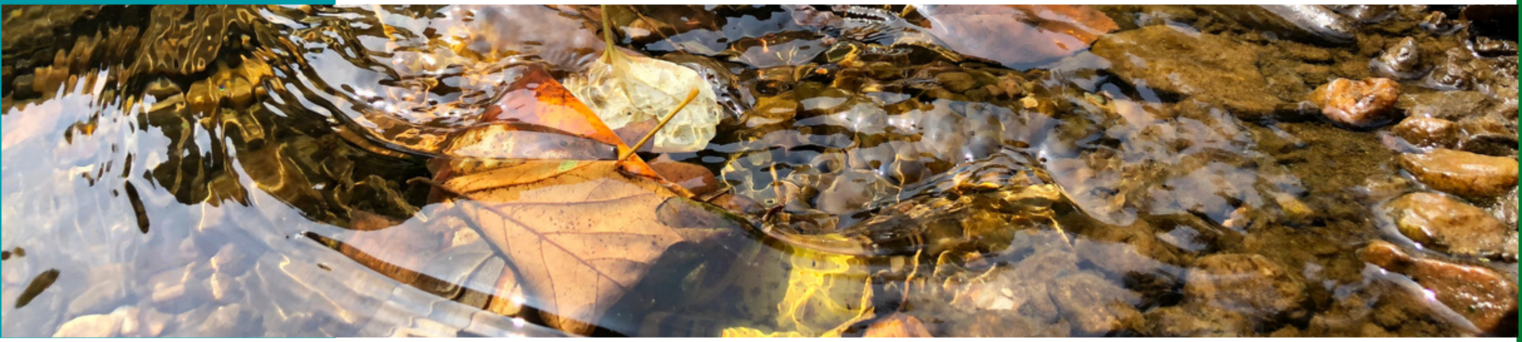
1. From your monitoring station, wade straight out to the spot with the greatest flow of water and place the thermometer or probe directly into the stream
2. Hold the thermometer underwater for at least **two minutes** so the reading can stabilize.
3. Record the temperature on your Chemical Data Form in degrees Celsius (°C).

Use and Storage of Chemical Testing Materials

Chemicals in test kits, though not dangerous, can cause mild skin and eye irritation and should be handled with care. Ampules are made of glass and can be very sharp. Test strips along with waste materials can be disposed of as you would any household item.

Store all chemical testing materials at room temperature. Dissolved oxygen and phosphate testing kits must be stored in the dark. Check expiration dates and avoid using expired materials (which could provide inaccurate results).

You can find links to purchase stream monitoring test kits and equipment on the Izaak Walton League website at **iwla.org/water/resources-for-monitors.**



Other Monitoring Opportunities

Salt Watch

IWLA sends **free kits** to volunteers to track levels of road salt (chloride) in their local streams throughout the year and submit their data to a national database. Volunteers can share and use these data with their local watershed groups, neighbors, and local government. Interested in partnering? We can send you bulk kits for your monitoring or education groups.

Creek Critters

Perfect for classes, families, public programs, and even as a solo activity, Creek Critters is easy and fun. Collect bugs by following simple step-by-step instructions, and identify your bugs with an interactive identification key. The app automatically calculates your Stream Health Score based on your findings. The score tells you how healthy your stream is – plus your results are added to the Clean Water Hub, our public database of water quality in America.

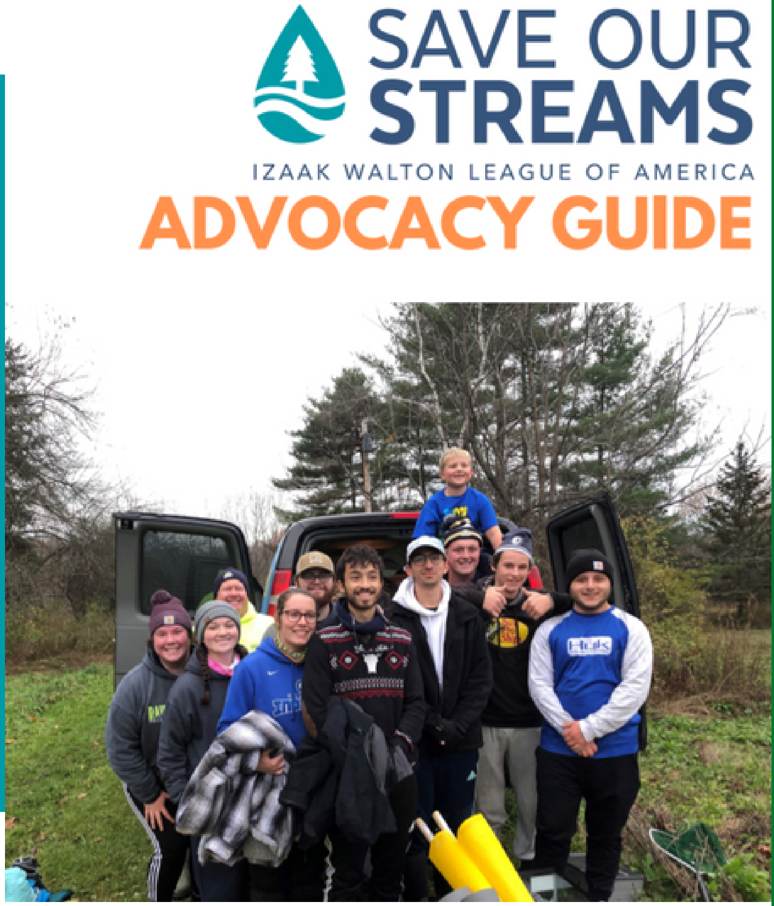
Nitrate Watch

Nitrate Watch is the newest community science program from the IWLA Clean Water team. It mobilizes volunteers across the country to track nitrate levels in surface water and drinking water. Request your Nitrate Watch kit and find educational resources and advocacy actions at **www.NitrateWatch.org**.

Advocacy Guide

Use Your Data!

Stream monitoring is one step of many that you can take to protect your waterways. The **[Save Our Streams Advocacy Guide]** shows you how to take action at the local, state or federal level to protect the waterways you monitor. You'll find valuable tips and advice on how to organize your community, influence policymakers and create positive change for your streams. Plus, read inspiring success stories from fellow monitors and other League members.



Contact Us

Email us at SOS@iwla.org

Find us online at www.iwla.org/sos

Call us at 301-548-0150

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